

**Smart-Cost: Smart Supply Chain Cost Analytics and
Profit Prediction System for Micro-SMEs - (Predictive
Supply Chain Volatility Forecasting)**

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Project Proposal Report

DASANAYAKA M P J R – IT22152664

B.Sc. (Hons) Degree in Information Technology Specialized in
Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology Sri Lanka

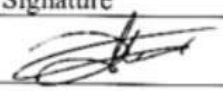
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DECLARATION

I declare that this is my own work, and this proposal does not knowingly incorporate any material previously submitted for a degree or diploma at any other university or higher education institution, nor does it contain any material that has been previously published or written by another person apart from where proper acknowledgment is given in the text.

Name	Student ID	Signature
DASANAYAKA M P J R	IT22152664	

The above candidate is conducting research for their undergraduate Dissertation under my supervision.

Name	Date	Signature
Mr.Deemantha Siriwardana	12 / 03 /2026	

ABSTRACT

Micro, Small, and Medium Enterprises (MSMEs), particularly in the food and beverage sector such as bakeries and cafés, often operate with very limited financial management tools. While many businesses use Point-of-Sale (POS) systems to track daily sales, most of them still rely on paper receipts to record ingredient purchases and operational expenses. This separation of sales data and cost data creates a significant challenge in accurately monitoring real-time profitability. As a result, business owners often recognize financial problems only after profits have already declined.

This research proposes the development of **SmartCost**, a mobile-based intelligent expense and profit analytics system designed to assist micro-SMEs in monitoring their operational costs and profit margins. The system integrates receipt image processing, semantic data extraction, predictive analytics, and dynamic profit monitoring to provide real-time financial insights. Receipt images captured by the user are processed using computer vision techniques to extract expense data, which is then categorized using natural language processing methods. Historical cost data is further analyzed using time-series forecasting models to predict future ingredient price trends.

A key innovation of the proposed system is the **Predictive Profit Margin and Dynamic Threshold Alert System**, which continuously evaluates business profitability using real-time expense data and manually entered sales data. The system visually presents financial health through interactive dashboards and generates automated alerts when profit margins decline below predefined thresholds.

The proposed solution will be implemented using **React Native for mobile application development, Python-based analytics services, and modern data visualization libraries**. The expected outcome is an intelligent financial decision-support tool that helps small businesses anticipate cost fluctuations, protect profit margins, and make data-driven business decisions.

Keywords: Expense Analytics, Profit Prediction, Mobile Business Intelligence, SME Financial Management, Predictive Analytics

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
MSME	Micro, Small and Medium Enterprise
POS	Point of Sale
OCR	Optical Character Recognition
NLP	Natural Language Processing
COGS	Cost of Goods Sold
API	Application Programming Interface
SaaS	Software as a Service
BI	Business Intelligence
UI	User Interface
DSR	Design Science Research

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1. INTRODUCTION

1.1 Background and Context

Small food enterprises, bakeries, and coffee shops are examples of Micro, Small, and Medium Enterprises (MSMEs) that are essential to the world economy. These companies make a substantial contribution to economic expansion and job creation. The World Bank estimates that MSMEs account for about 50% of jobs and almost 90% of enterprises globally. Small enterprises play a major role in the local economy of Sri Lanka, especially in the retail and food industries.

Despite their significance, many small firms struggle to efficiently manage their financial operations. Even while contemporary Point-of-Sale (POS) technologies assist in documenting daily sales transactions, operational expense management is still mostly done by hand. It is challenging to keep an eye on expenses in real time since business owners usually keep purchase information on paper receipts.

Business owners are unable to effectively assess their real-time profit margins due to the lack of integration between cost and sales data. Profit margins may drop without being immediately apparent due to the frequent fluctuations in ingredient pricing, particularly in food-related enterprises. Financial losses or ineffective pricing tactics are frequently the outcome of this circumstance.

Current financial management solutions, including accounting software, prioritize historical reporting over real-time company analytics. These systems lack intelligence tools for dynamically tracking changes in profit and frequently require manual data entering.

This study suggests creating a Predictive Profit Margin and Dynamic Threshold Alert System incorporated into a mobile application as a solution to this problem. The system computes real-time profit margins by continuously analyzing sales and spending data, and it sends out notifications when profitability

This solution helps small enterprises improve their financial sustainability through digital technology, which is in line with Sustainable Development Goal (SDG) 8: Decent Work and Economic Growth. Furthermore, the study, which focuses on the use of data-driven decision support systems, is part of the Business Intelligence and Data Analytics research cluster.

1.2 Literature Review

The use of data analytics tools and financial management systems to assist in company decision-making has been the subject of numerous studies. Digital alternatives for documenting financial transactions are offered by accounting software like Xero and QuickBooks. However, rather than real-time operational analytics, these systems mostly concentrate on bookkeeping and financial reporting.

The use of optical character recognition (OCR) technology for data extraction from receipt photos has also been studied. OCR systems can efficiently transform printed text into machine-readable formats, claim Zhang and Liu (2021). However, noise and fading are common in thermal paper receipts, which lowers extraction accuracy.

Recent advances in predictive analytics have allowed firms to foresee financial patterns using historical data. Demand forecasting and financial prediction models have made extensive use of time-series forecasting methods like Facebook Prophet and ARIMA.

ARIMA and Facebook Prophet are two time-series forecasting approaches that are commonly employed in financial prediction models and demand forecasting.

Furthermore, research on business intelligence systems emphasizes the value of real-time analytics dashboards in boosting decision-making processes. Managers may efficiently monitor key business performance indicators using interactive dashboards and visual analytics tools.

Despite these advancements, most existing systems still focus on either expenditure recording or income monitoring separately. There has been little research into merging cost and sales data to deliver real-time profitability insights tailored to micro-SMEs.

Furthermore, contemporary commercial applications rarely include predictive profit margin monitoring with automated alert systems.

1.3 Research Gap

Although several financial management tools exist, there is still a significant gap in systems designed specifically for micro-SMEs that require simple yet intelligent financial insights.

Firstly, existing accounting software focuses on historical financial reporting rather than real-time business analytics. Business owners must manually analyze financial reports to understand their profitability, which is time-consuming and inefficient.

Secondly, receipt scanning applications only store expense data without analyzing how those expenses affect business profitability. These tools lack mechanisms for correlating cost data with revenue data to calculate profit margins dynamically.

Thirdly, most POS systems operate as isolated platforms that track revenue but do not integrate purchasing cost data automatically. As a result, businesses must manually update cost information, which often leads to inaccurate financial analysis.

Furthermore, predictive analytics capabilities are rarely available in financial tools designed for small businesses. Large enterprises use advanced forecasting models to predict supply chain fluctuations and cost trends, but such technologies are often inaccessible to micro-SMEs due to cost and complexity.

Therefore, this research aims to bridge this gap by developing an intelligent system that integrates expense digitization, predictive analytics, and dynamic profit monitoring. The proposed Predictive Profit Margin and Dynamic Threshold Alert System introduces a proactive approach to financial management by continuously evaluating business profitability and generating early warnings when profit margins decline.

2. OBJECTIVE

2.1 Main Objective

To create a Predictive Profit Margin Monitoring System that analyses sales and expense data in real time and sends automated notifications when business profitability drops.

2.2 Specific Objective

- Create an algorithm that generates real-time profit margins based on sales and cost data.
- Create a dynamic threshold alert system that categorizes corporate financial health.
- Create dynamic dashboards that show profit patterns and financial performance.
- Integrate predictive analytics algorithms to forecast future ingredient cost fluctuations.
- Create a mobile-based financial monitoring interface for small business users.
- To assess the systems correctness and usability via performance metrics and user testing.

3. METHODOLOGY

The methodology of this research describes the systematic approach used to design, develop, and evaluate the Predictive Profit Margin and Dynamic Threshold Alert System, which is responsible for analyzing financial data collected from the SmartCost system and transforming it into meaningful business insights. This component focuses on integrating sales data with expense data derived from receipt processing modules to calculate real-time profit margins and identify financial risks.

Small food businesses often record revenue through Point-of-Sale systems while their operational costs are stored separately in paper receipts or simple expense records. As a result, business owners lack the ability to continuously evaluate their financial performance. This research addresses the problem by developing a financial analytics engine that can dynamically calculate profit margins, visualize financial trends, and generate alerts when profitability falls below safe thresholds.

The methodology combines financial computation models, data analytics techniques, predictive cost forecasting integration, and interactive data visualization mechanisms to enable intelligent profit monitoring. By continuously evaluating the relationship between revenue and expenses, the system provides proactive insights that support better financial decision-making for micro and small enterprises.

3.1 Research Approach

This research adopts a Design Science Research (DSR) approach, which focuses on designing and evaluating an innovative technological artifact that addresses a real-world business problem. The goal of this research is to design and implement a system component capable of continuously analyzing business performance using real-time financial data.

The research process follows several stages.

First, the problem domain is analyzed by studying how small and medium-sized food businesses track their sales and operational expenses. This analysis identifies the limitations of existing systems, particularly the absence of tools that dynamically calculate profit margins based on real-time data.

Second, the system artifact is designed, introducing the Predictive Profit Margin Engine as a core component of the SmartCost system. This component integrates financial calculation models, predictive analytics outputs, and dynamic alert mechanisms to evaluate business health.

Third, the proposed system is implemented using mobile application technologies and data analytics frameworks. The implementation focuses on combining expense data extracted from receipts with manually entered sales data to generate accurate profit calculations and visual insights.

Finally, the system artifact is evaluated using experimental validation methods to measure the accuracy of profit calculations, the effectiveness of alert mechanisms, and the usability of financial dashboards. The evaluation ensures that the system provides reliable and actionable financial insights for small business owners.

3.2 Technical Methods and Algorithms

The proposed system utilizes several computational techniques to analyze financial data and generate meaningful insights regarding business profitability. These techniques include profit margin calculation, threshold-based alert detection, trend analysis, and predictive profit estimation.

First, the system calculates the Cost of Goods Sold (COGS) using expense data collected from receipt processing modules. This cost represents the total value of ingredients and supplies used during a given period.

Second, the system computes profit values by subtracting the cost of goods sold from the recorded sales revenue. This allows the system to determine the financial outcome of daily business operations.

Profit is calculated using the formula:

$$\text{Profit} = \text{Revenue} - \text{Cost of Goods Sold (COGS)}$$

Third, the system calculates the profit margin percentage, which represents the proportion of profit relative to revenue.

$$\text{Profit Margin (\%)} = (\text{Profit} / \text{Revenue}) \times 100$$

Fourth, the system applies a dynamic threshold alert algorithm to classify business health based on profit margin values. The algorithm categorizes financial performance into three levels:

- Healthy (Profit Margin $\geq 35\%$)
- Warning (Profit Margin between 25% and 35%)
- Critical (Profit Margin $< 25\%$)

When the calculated margin falls below the warning or critical thresholds, the system automatically generates notifications that alert the user to potential financial risks.

Additionally, the system integrates future cost predictions generated by forecasting models developed in other components of the Smart Cost system. These predicted cost values are used to simulate future profit margins and estimate how changes in ingredient prices may impact business profitability.

Finally, the system visualizes financial trends using interactive line graphs and dashboards that allow users to observe how profit margins evolve over time.

Financial Data Analysis & Alert System

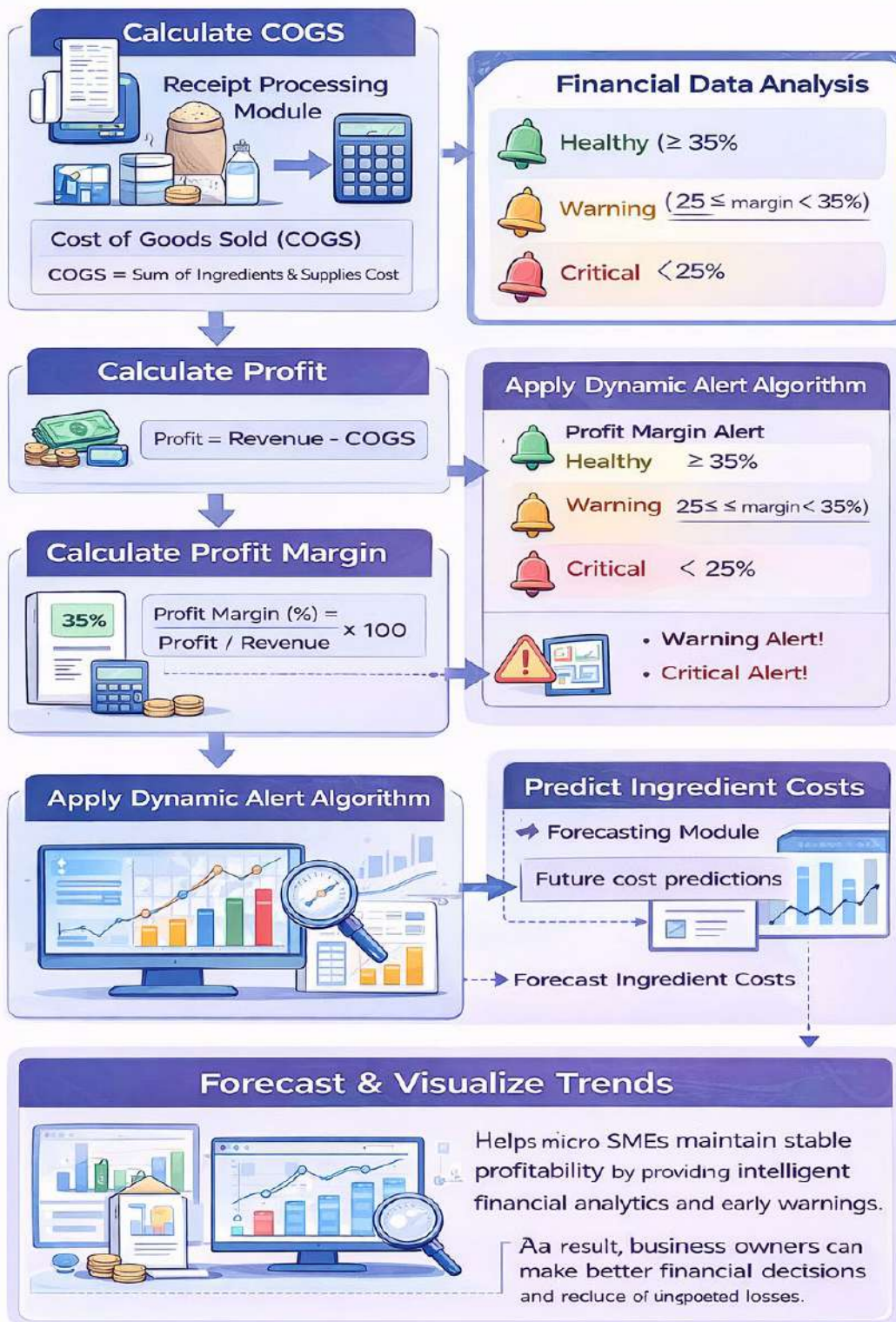


Figure 1

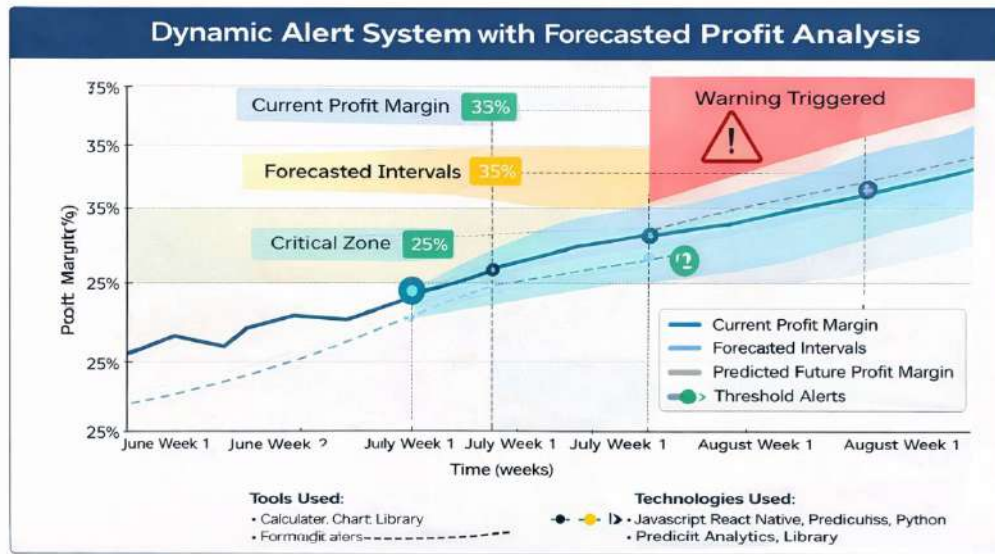


Figure 2

3.3 Tools and Platforms

The development of the Predictive Profit Margin and Dynamic Threshold Alert System requires several software platforms and programming tools that support financial data analysis and mobile application development.

The system will be implemented primarily using React Native, which allows cross-platform mobile application development for both Android and iOS devices. React Native provides efficient user interface development and integrates well with modern data visualization libraries.

The financial computation logic will be implemented using JavaScript and TypeScript, which allow the system to process sales and expense data efficiently within the mobile application environment.

Data visualization components will be developed using libraries such as React Native Chart Kit or React Native Gifted Charts, which provide interactive graphical representations of financial trends.

For backend data processing and prediction integration, Python-based services may be used to analyze historical financial data and generate forecasting results. These services can communicate with the mobile application through secure API connections.

The system database will be implemented using Firebase or PostgreSQL, allowing structured storage of sales records, expense data, and calculated financial metrics.

Development and testing will be conducted using integrated development environments such as Visual Studio Code, which provides comprehensive support for React Native and JavaScript development. Version control tools such as Git will also be used to manage source code and track development progress.

3.4 Data Collection and Ethical Considerations

The research requires datasets that represent real-world financial information related to business operations, including sales revenue and ingredient purchase costs. Data collection will involve gathering sample financial records from small bakeries, cafés, and home-based food businesses. These datasets will help simulate real-world scenarios where businesses track their daily sales and operational expenses.

The collected financial data will be used to calculate Cost of Goods Sold (COGS) and determine profit margins over time. By combining expense data obtained from receipt processing modules with manually entered sales data, the system will be able to evaluate business profitability dynamically. These datasets will also be used to test the system's ability to detect profit margin fluctuations and trigger appropriate alerts.

In addition to real business data, simulated financial datasets may also be generated to test the predictive capabilities of the system under different business conditions such as rising ingredient prices or fluctuating sales volumes. These datasets will help evaluate how accurately the system predicts future profit trends and generates early warning alerts.

To ensure ethical compliance, all financial data used in the research will be anonymized before processing. Sensitive business information such as company names, addresses, supplier identities, or financial account details will be removed from the dataset before analysis.

The collected data will be used strictly for academic research purposes and will comply with institutional ethical guidelines regarding data privacy and responsible data handling.

Summary of Financial Data Sources for Profit Margin Analysis

Dataset Name	Data Type	Data Source	Data Format	Time Range	Attributes	Purpose
Daily Sales Dataset	Revenue	Mobile App Sales Entry	CSV / JSON	2024–2025	Date, Product ID, Quantity Sold, Revenue	Used to calculate daily business revenue
Ingredient Cost Dataset	Expense	Receipt Processing Module	CSV / Database	2024–2025	Ingredient Name, Quantity, Unit Price, Purchase Date	Used to compute Cost of Goods Sold (COGS)
Operational Expense Dataset	Expense	Business Financial Records	CSV / JSON	2024–2025	Expense Type, Amount, Date	Used to calculate total operational costs
Predicted Ingredient Cost Dataset	Forecast Data	Forecasting Module (Member 3)	JSON / API	Future Predictions	Ingredient Name, Predicted Price, Time Period	Used to estimate future profit margins
Profit Margin Dataset	Analytical Data	System Generated	Database	Real-time	Revenue, COGS, Profit, Profit Margin	Used to monitor business financial health

Table 01

Data Processing Steps for Profit Margin Monitoring System

Step	Description	Tools / Libraries Used	Output
Data Collection	Collect sales and expense data from mobile application and receipt processing modules	React Native, API Integration	Raw financial dataset
Data Cleaning	Remove duplicate records and validate missing values in sales and expense datasets	Pandas / Data Validation Methods	Clean financial dataset
Cost Aggregation	Calculate total Cost of Goods Sold (COGS) using ingredient purchase records	Python / Financial Calculation Algorithms	Total cost dataset
Profit Calculation	Compute profit values by subtracting COGS from total revenue	Python / NumPy	Profit dataset
Profit Margin Computation	Calculate profit margin percentage using revenue and profit values	Financial formulas / Python	Profit margin dataset
Prediction Integration	Integrate predicted ingredient prices from forecasting module	Python / API Integration	Future cost dataset
Alert Detection	Identify profit margins below predefined thresholds and generate alerts	Rule-based alert algorithms	Alert notifications
Data Visualization	Display financial insights through dashboards and graphs	React Native Chart Kit / Matplotlib	Profit trend graphs

Table 02

3.5 Validation Strategy and Performance Metrics

The performance of the Predictive Profit Margin and Dynamic Threshold Alert System will be evaluated using experimental testing methods and quantitative performance metrics.

The validation process will focus on measuring the accuracy and reliability of profit calculations and the effectiveness of alert mechanisms.

Several evaluation metrics will be used during testing.

Profit Calculation Accuracy will measure how accurately the system calculates profit margins using the provided revenue and expense data.

Prediction Impact Analysis will evaluate how predicted ingredient cost changes influence future profit margin estimations.

Alert Detection Accuracy will measure how effectively the system identifies situations where profit margins fall below predefined thresholds.

In addition, system usability testing will be conducted to evaluate how easily business owners can understand and interact with the financial dashboard interface.

Experimental testing will be conducted using labeled financial datasets where the correct profit margins and alert conditions are known in advance. The system-generated results will be compared with these ground truth values to determine overall performance accuracy.

The evaluation results will provide quantitative evidence demonstrating that the proposed system can effectively monitor business profitability and support data-driven financial decision-making for small businesses.

4. HIGH-LEVEL SYSTEM ARCHITECTURE

The proposed SmartCost system is designed as an integrated decision-support platform that enables small and medium-sized food businesses to analyze operational costs and monitor business profitability in real time. The system architecture follows a modular layered structure where receipt-based expense data and manually entered sales data are processed, analyzed, and transformed into meaningful financial insights.

Within this architecture, the Predictive Profit Margin and Dynamic Threshold Alert System (Member 4 component) plays a key role in analyzing financial data and monitoring the profitability of small businesses. After ingredient purchase data and cost information are processed through earlier system modules, the financial analytics component calculates profit margins and evaluates business performance over time.

The Predictive Profit Margin Engine integrates expense data derived from receipt processing modules with daily sales information recorded through the mobile application interface. By combining these datasets, the system calculates the Cost of Goods Sold (COGS) and determines real-time profit margins.

In addition to real-time calculations, the module integrates predictive analytics outputs from the forecasting component to estimate future ingredient costs. These predicted values are used to simulate future profit margins and identify potential financial risks before they occur.

The system architecture ensures modular separation of responsibilities so that each component can function independently while contributing to the overall SmartCost platform. This modular design improves system flexibility, scalability, and maintainability.

4.1 System Overview

The SmartCost system architecture consists of several interconnected modules designed to process financial data and transform it into meaningful business insights.

The process begins when the system collects expense data and sales information from users. Expense data is obtained from the receipt digitization and ingredient normalization modules, while sales data is entered manually through the mobile application interface.

Once the financial data is collected, it is transmitted to the Predictive Profit Margin Engine, which analyzes the relationship between revenue and operational costs. The system calculates the Cost of Goods Sold (COGS) and determines the profit generated within a specific time period.

After calculating profit values, the system computes the profit margin percentage, which represents the ratio of profit relative to total revenue. This metric allows the system to assess the financial health of the business.

The calculated profit margins are then visualized through an interactive financial analytics dashboard, enabling business owners to monitor performance trends. Additionally, the system integrates cost predictions from forecasting models to estimate future profit margins.

The architecture also includes a Dynamic Threshold Alert System, which continuously monitors profit margin values and triggers warning notifications when profitability falls below predefined thresholds.

The modular architecture ensures that each component performs a specific function while interacting seamlessly with other system modules.

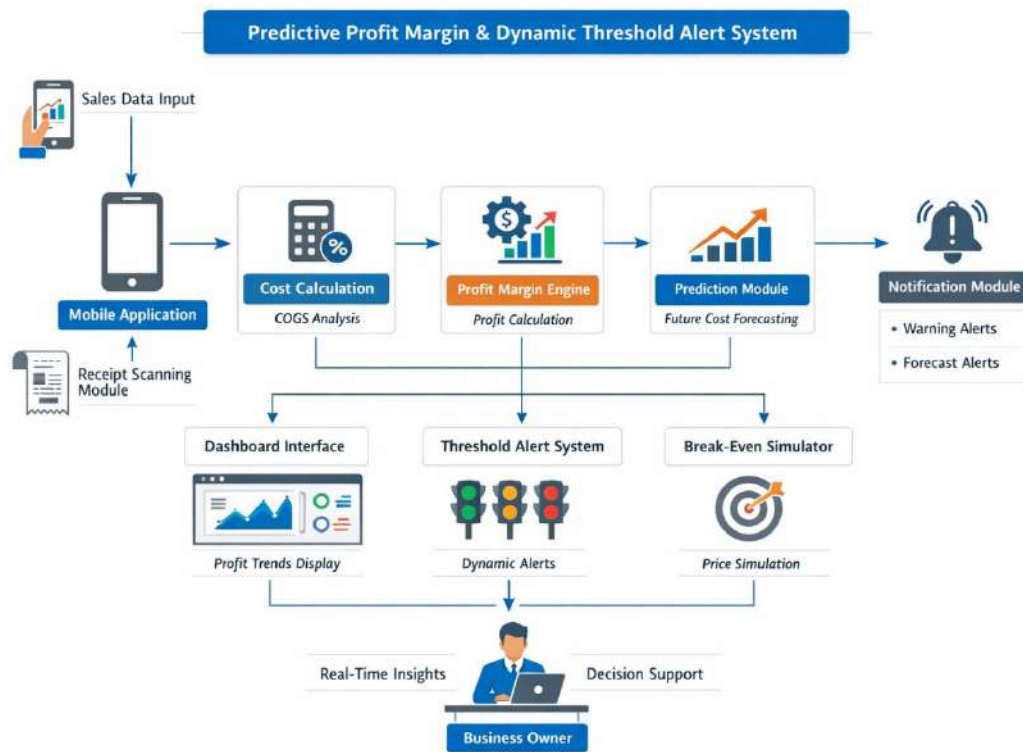


Figure 3

4.2 System Component Diagram

The high-level system architecture consists of the following key components.

1. Sales Data Input Module

This module allows users to manually enter daily sales revenue through the mobile application interface. The recorded revenue data represents the income generated from product sales and serves as the primary input for profit calculations.

2. Expense Data Processing Module

Expense data is collected from receipt scanning and normalization components developed by other system modules. This module provides structured ingredient purchase costs that are used to calculate the total cost of goods sold.

3. Profit Margin Calculation Engine

This component calculates the Cost of Goods Sold (COGS) and determines the profit generated during a specific time-period. Using financial computation formulas, the module calculates both absolute profit values and profit margin percentages.

4. Predictive Cost Integration Module

This module integrates forecasting outputs generated by the time-series prediction models. Predicted ingredient prices are used to estimate future operational costs and simulate future profit margins.

5. Dynamic Threshold Alert System

The alert system continuously evaluates profit margin values and categorizes business performance into predefined levels such as healthy, warning, and critical. When profitability falls below safe thresholds, the system generates notifications to alert business owners.

6. Financial Analytics Dashboard

The dashboard provides a graphical interface that displays profit margins, revenue trends, expense summaries, and predictive insights. This interface enables users to monitor business performance and make informed financial decisions.

The system component diagram illustrates how these modules interact to transform raw financial data into meaningful profitability insights.

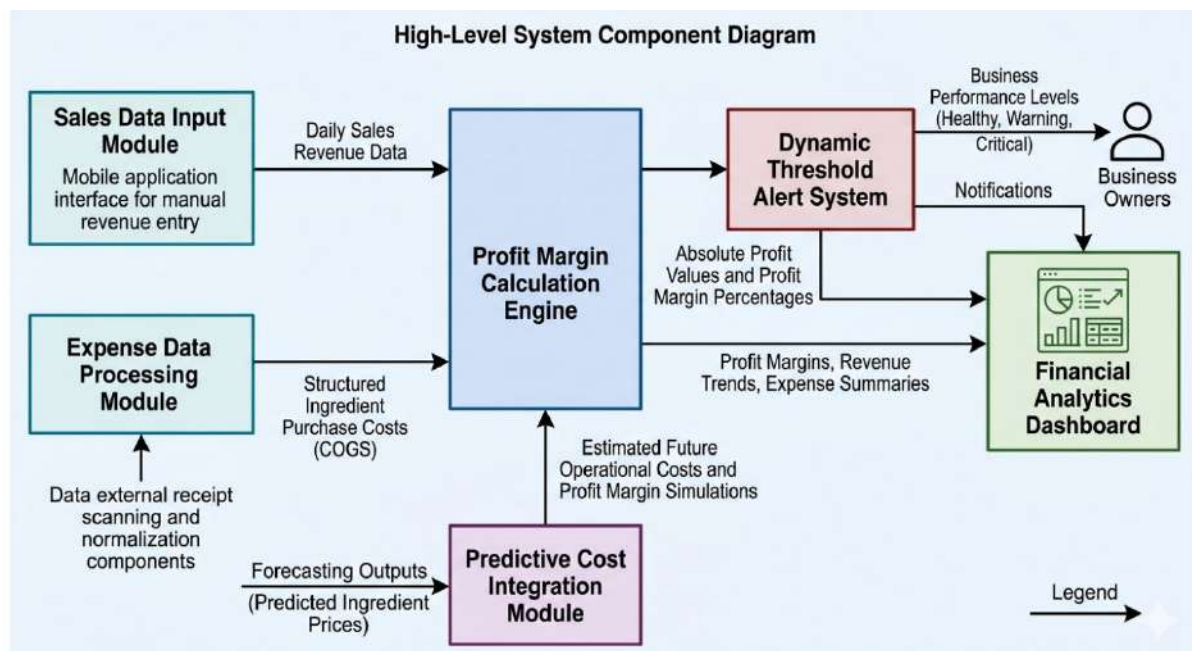


Figure 4

4.3 Component Interactions

The interaction between system components follows a structured financial data processing workflow.

The process begins when users enter daily sales information through the mobile application interface. At the same time, expense data is extracted from receipts through the receipt processing modules and stored in the system database.

The sales and expense data are then transmitted to the Profit Margin Calculation Engine, where the system calculates the total cost of goods sold and determines the resulting profit value.

After computing profit values, the system calculates the corresponding profit margin percentage. This value is then analyzed by the Dynamic Threshold Alert System, which compares the calculated margin against predefined thresholds.

If the profit margin falls below a warning threshold, the system generates a notification advising the user to review pricing strategies or operational costs. If the margin falls into the critical zone, a higher-priority alert is triggered.

Simultaneously, the system integrates future cost predictions generated by the forecasting module. These predicted costs are used to simulate future profit margins, enabling the system to anticipate potential financial risks.

Finally, the calculated metrics and predictions are presented through the financial analytics dashboard, allowing users to visualize business performance trends.

4.4 Data Flow Explanation

The system processes financial data through a structured pipeline designed to ensure accurate analysis of business profitability.

1. Input Stage

Users enter daily sales revenue through the mobile application interface. Expense data is obtained from receipt processing modules.

2. Cost Aggregation Stage

The system aggregates ingredient purchase costs to calculate the total Cost of Goods Sold (COGS).

3. Profit Calculation Stage

The system calculates profit by subtracting total costs from recorded revenue.

4. Profit Margin Computation Stage

The profit margin percentage is calculated using financial computation formulas to determine business profitability.

5. Prediction Integration Stage

Forecasted ingredient costs are integrated to simulate future profit margins and identify potential financial risks.

6. Alert Detection Stage

The Dynamic Threshold Alert System evaluates profit margins and triggers alerts if profitability falls below predefined thresholds.

7. Output Stage

The results are displayed through the financial analytics dashboard, allowing users to view profit trends and financial insights.

This data flow ensures that financial data is systematically processed and transformed into actionable business intelligence.

4.5 Scalability and Security Considerations

Scalability is a critical factor in the design of the SmartCost system, as the platform must support an increasing number of users and financial records over time. The modular system architecture allows individual components to scale independently.

For example, the Profit Margin Calculation Engine can be deployed as a separate service capable of processing multiple financial datasets simultaneously. Similarly, cloud-based databases can be used to store large volumes of transaction data while maintaining system performance.

Security is also a major consideration, particularly because the system processes sensitive financial information. To protect user data, several security measures will be implemented.

First, financial data stored in the database will be protected through access control mechanisms that restrict unauthorized access. Only authenticated users will be allowed to view or modify financial records.

Second, secure communication protocols such as encrypted API connections will be used to ensure that data transmitted between system components remains protected.

Finally, sensitive financial information such as business identifiers and transaction details will be anonymized where necessary to protect user privacy.

By incorporating both scalability and security considerations, the SmartCost system aims to provide a reliable and secure environment for financial analysis and decision-making for small businesses

5. USER REQUIREMENTS

5.1 Stakeholder Identification

Several stakeholders are involved in or affected by the proposed Predictive Profit Margin and Dynamic Threshold Alert System. Each stakeholder interacts with the system differently and has specific expectations regarding the functionality, performance, and usability of the financial analytics module.

1. Micro-SME Business Owners (Primary Users)

Micro-SME business owners, particularly bakery operators, café owners, and small food production entrepreneurs, represent the primary users of the financial analytics system. These users rely heavily on ingredient purchases and daily sales transactions to operate their businesses. The Predictive Profit Margin system will help them monitor real-time profitability by analyzing revenue and operational costs. The system also provides alerts when profit margins decline, enabling business owners to take corrective actions such as adjusting product pricing or controlling ingredient expenses.

2. Inventory and Procurement Managers

Inventory or procurement personnel are responsible for managing ingredient purchases and monitoring operational costs. These stakeholders benefit from the system by gaining insights into the relationship between ingredient costs and overall business profitability. By understanding how cost changes affect profit margins, procurement managers can optimize purchasing strategies and reduce unnecessary expenses.

3. System Administrators and Developers

System administrators and developers are responsible for maintaining the financial analytics module and ensuring its proper functionality. They monitor system performance, manage database operations, and ensure that profit calculation algorithms and alert mechanisms function correctly. Developers may also update the system by improving financial analytics models and integrating additional features.

4. Business Analysts and Researchers

Academic researchers and business analysts may use the system to study financial patterns in small businesses. The financial analytics data generated by the system can help researchers analyze profit trends, evaluate business sustainability, and identify operational risks faced by micro-SMEs.

5.2 Functional Requirements

Functional requirements describe the specific capabilities that the Predictive Profit Margin module must provide to support users in analyzing business profitability and identifying financial risks.

- **FR1 – Sales Data Entry**

The system shall allow users to input daily sales revenue data through the mobile application interface.

- **FR2 – Expense Data Integration**

The system shall retrieve ingredient purchase costs and operational expenses from receipt processing modules and financial records.

- **FR3 – Profit Calculation**

The system shall calculate profit values by subtracting the total Cost of Goods Sold (COGS) from recorded sales revenue.

- **FR4 – Profit Margin Computation**

The system shall calculate profit margin percentages based on revenue and profit values to determine business profitability.

- **FR5 – Predictive Profit Analysis**

The system shall integrate predicted ingredient cost values obtained from forecasting modules to estimate future profit margins.

- **FR6 – Dynamic Threshold Monitoring**

The system shall continuously monitor calculated profit margins and compare them against predefined financial health thresholds.

- **FR7 – Alert and Notification Mechanism**

The system shall generate alerts and notifications when profit margins fall below warning or critical thresholds.

- **FR8 – Financial Dashboard Visualization**

The system shall provide a graphical dashboard that displays profit margins, revenue trends, cost summaries, and predictive financial insights.

- **FR9 – Data Access Integration**

The system shall provide APIs or data interfaces that allow other modules of the SmartCost system to access profit analytics results.

5.3 Non-Functional Requirements

Non-functional requirements describe the quality attributes and operational constraints that the Predictive Profit Margin system must satisfy.

1. Performance Requirements

The system should process financial data and generate profit margin calculations within a short response time. Real-time financial analytics should be available to users with minimal delay to support timely business decision-making.

2. Scalability Requirements

The architecture should support scalability so that the system can handle increasing numbers of users and financial records. As the SmartCost platform grows, the profit analysis module should be capable of processing larger datasets and supporting additional business analytics features.

3. Reliability Requirements

The system should maintain stable and consistent performance during continuous operation. The profit calculation engine must produce accurate results and should handle unexpected data issues such as missing or incomplete financial records without system failure.

4. Security Requirements

The system must ensure the protection of sensitive financial data. Secure authentication mechanisms and encrypted communication protocols such as HTTPS should be implemented to prevent unauthorized access to financial records.

5. Usability Requirements

The financial analytics dashboard should present information in a clear and user-friendly format. Graphs, charts, and alert notifications should be easily understandable for business owners who may not have advanced financial knowledge.

6. Maintainability Requirements

The system architecture should follow modular design principles, allowing individual components such as the profit calculation engine, alert system, and dashboard interface to be updated or improved independently without affecting the entire system.

6. COMMERCIALIZATION PLAN

The Predictive Profit Margin and Dynamic Threshold Alert System is designed to provide financial analytics and decision-support capabilities for micro and small businesses operating in the food and retail sectors. Many small businesses lack access to advanced financial monitoring tools that help them track operational costs and maintain stable profit margins. The proposed system addresses this gap by providing a mobile-based financial analytics platform that combines expense tracking, profit monitoring, and predictive insights.

The commercialization strategy focuses on delivering the SmartCost platform as an affordable and scalable digital solution that can support business sustainability and improve financial decision-making for micro-SMEs.

6.1 Target Market and Customer Persona

The primary target market for the SmartCost system includes micro and small-scale food businesses that require effective financial monitoring tools to manage operational costs and maintain stable profit margins. These businesses include bakeries, cafés, restaurants, catering services, and home-based food production enterprises. Such businesses rely heavily on ingredient purchases and daily sales transactions, making it essential to continuously monitor profitability.

Many small business owners currently rely on manual bookkeeping or basic Point-of-Sale systems that track revenue but fail to provide detailed insights into operational expenses and profit margins. As a result, business owners often struggle to identify declining profitability caused by rising ingredient costs or inefficient pricing strategies.

The Predictive Profit Margin and Dynamic Threshold Alert System is designed to assist these businesses by providing real-time financial insights and automated alerts when profit margins decline. By integrating sales data with ingredient cost data, the system helps business owners understand how operational expenses affect profitability and supports better financial decision-making.

In addition to independent businesses, the system may also benefit small business cooperatives, franchise food outlets, and financial consultants who manage financial records.

Bakery Owner Persona



Mr. Dinesh Fernando
Owner of a Small Bakery

- Role: Owner of a Small Bakery
- Business Size: 3–8 employees
- Business Type: Local bakery producing bread, pastries, and cakes



Goals	Challenges
- Maintain stable profit margins despite fluctuating ingredient prices - Monitor daily business revenue and operational expenses - Improve pricing strategies to ensure business sustainability	- Difficulty identifying the impact of ingredient price increases on profitability - Lack of real-time financial monitoring tools

Goals

- Maintain stable profit margins despite fluctuating ingredient prices
- Monitor daily business revenue and operational expenses
- Improve pricing strategies to ensure business sustainability

Technology Usage

- Uses a mobile phone to track daily sales and manage business operations
- Uses simple POS systems or manual records for financial tracking

The Predictive Profit Margin and Dynamic Threshold Alert System addresses these needs by providing automated financial analysis, predictive insights, and early warning alerts that enable business owners to take proactive action to maintain profitability.



Café Manager Persona



Mr. Praveen Silva
Manager of a Café

- Manager of a Café
- Business Size: 5–12 employees
- Business Type: Local café offering coffee, snacks, and light meals



Goals	Challenges
- Monitor daily sales revenue and operational expenses - Optimize menu pricing to maintain profitable margins - Identify trends in costs and revenue to improve business decisions	- Difficulty tracking ingredient costs and operational expenses - Limited access to detailed profit margin reports - Delayed identification of declining profitability

Technology Usage

- Uses a tablet to manage sales and monitor café operations
- Uses POS system and basic bookkeeping software to track expenses

Technology Usage

- Uses a tablet to manage sales and monitor café operations
- Uses POS system and basic bookkeeping software to track expenses

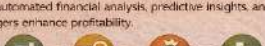
Needs

- Real-time profit margin analysis
- Alerts for declining profitability

Needs

- Real-time profit margin analysis
- Alerts for declining profitability

The Predictive Profit Margin and Dynamic Threshold Alert System addresses these needs by providing automated financial analysis, predictive insights, and alert notifications that help café managers enhance profitability.



Home-Based Food Entrepreneur Persona



Mrs. Kavindi Perera
Home-Based Food Entrepreneur

- Business Size: Solo operation with occasional part-time help
- Business Type: Home-based food business selling meals and baked goods



Goals	Challenges
- Maintain profitability while working from home - Track costs of homemade dishes and baked goods - Receive alerts when profit margins decline	- Difficulty balancing ingredient costs and sales pricing in spreadsheets - Manual tracking of expenses and revenue in spreadsheets and notebooks

Goals

- Maintain profitability while working from home
- Track costs of homemade dishes and baked goods
- Receive alerts when profit margins decline

Technology Usage

- Uses a smartphone to manage sales and orders
- Uses online food platforms for customer orders and payments

Needs

- Automatic profit margin calculations based on homemade dish expenses
- Easy-to-use financial dashboard to view income and costs

Needs

- Automatic profit margin calculations based on homemade dish expenses
- Easy-to-use financial dashboard to view income and costs

The Predictive Profit Margin and Dynamic Threshold Alert System addresses these needs by providing automated financial analysis, predictive insights, and alert notifications that help home-based food entrepreneurs maintain profitability.



Small Food Manufacturer Persona



Mrs. Nisansala Fonseka
Owner of a Small Food Manufacturing Business

- Business Size: 8–15 employees
- Business Type: Small-scale food manufacturing business producing sauces, snacks, and packaged foods



Goals	Challenges
- Optimize production costs and maintain healthy profit margins - Track ingredient prices and operational expenses accurately - React promptly to rising ingredient costs to protect profit margins	- Limited tools for analyzing production costs and revenue - Use filing fiscal reports back sale fromer bands - Identifying unprofitable production lines late due to delayed financial reports

Goals

- Optimize production costs and maintain healthy profit margins
- Track ingredient prices and operational expenses accurately
- React promptly to rising ingredient costs to protect profit margins

Technology Usage

- Uses an inventory management system to track ingredient and batch production costs
- Uses accounting software to manage operational expenses

Needs

- Predictive alerts for rising ingredient costs that impact profit margins
- Real-time financial reports that highlight production cost trends

Needs

- Predictive alerts for rising ingredient costs that impact profit margins
- Real-time financial reports that highlight production cost trends

The Predictive Profit Margin and Dynamic Threshold Alert System addresses these needs by providing automated financial analysis, predictive insights, and alert notifications that help small food manufacturers improve profitability.



6.2 Value Proposition

The value proposition of the proposed system lies in its ability to transform basic financial data into actionable business intelligence for small businesses.

The system offers the following key benefits:

- Real-time profit margin monitoring
- Automated cost and revenue analysis
- Predictive insights into future profit trends
- Dynamic alert notifications when profitability declines
- Visual financial dashboards for easy interpretation of business performance

Unlike traditional accounting systems that focus primarily on record keeping, the SmartCost system emphasizes predictive analytics and proactive financial monitoring. This allows business owners to identify financial risks early and adjust their strategies accordingly.

6.3 Revenue Model

The SmartCost platform may adopt a Software-as-a-Service (SaaS) business model, where users subscribe to the system through monthly or annual plans.

Possible revenue streams include:

- Monthly subscription plans for small businesses
- Premium analytics features with advanced forecasting insights
- Business intelligence reporting services
- Integration services for external accounting or POS systems
- A tiered pricing structure may also be introduced to support businesses of different sizes.

6.4 Cost Estimation

The estimated operational costs associated with deploying and maintaining the system include cloud hosting services, system maintenance, and ongoing software development.

Key cost components include:

- Cloud infrastructure and database hosting
- Application maintenance and updates
- Customer support and technical assistance
- Data storage and security services

Using open-source technologies for development significantly reduces software licensing costs and makes the system more affordable for small businesses.

6.5 Pricing Strategy

The pricing strategy for the SmartCost platform focuses on affordability and accessibility for micro-SMEs.

Possible pricing options include:

1. Basic Plan: Free or low-cost plan providing basic expense tracking and profit monitoring features
2. Standard Plan: Subscription plan offering advanced analytics dashboards and financial insights
3. Premium Plan: Advanced subscription including predictive analytics, forecasting integration, and automated alert systems

This pricing structure ensures that small businesses can access essential financial monitoring tools without significant financial investment.

6.6 Competitive Advantage

The proposed SmartCost system offers several competitive advantages compared to existing financial management tools.

- First, the system integrates receipt-based expense tracking with predictive analytics, which is rarely available in traditional accounting applications.
- Second, the system focuses specifically on small food businesses, providing customized financial insights that address the operational challenges of this sector.
- Third, the platform provides real-time profit margin monitoring and automated alert notifications, enabling business owners to identify financial risks early.
- Finally, the mobile-first design ensures that business owners can access financial insights anytime and anywhere.

6.7 Intellectual Property Considerations

The SmartCost platform may involve intellectual property elements related to its system architecture, financial analytics models, and predictive alert mechanisms.

The software components developed for the Predictive Profit Margin and Dynamic Threshold Alert System may be protected through software licensing agreements and intellectual property rights.

Future commercialization efforts may also include patenting innovative analytical methods or proprietary algorithms used for profit prediction and alert generation.

7. BUDGET AND JUSTIFICATION

The development of the Predictive Profit Margin and Dynamic Threshold Alert System requires several resources including hardware infrastructure, software development tools, cloud computing services, and human effort. Although the proposed system primarily relies on software-based technologies, certain resources are required to support the development, testing, deployment, and evaluation of the financial analytics module.

The budget estimation focuses on the resources required for financial data processing, profit calculation algorithms, dashboard development, alert notification mechanisms, and system integration with other SmartCost components. Wherever possible, open-source technologies will be utilized to minimize development costs while maintaining system efficiency and reliability.

The following sections describe the estimated costs associated with implementing the Member 4 component and provide justification for each expense category.

7.1 Hardware Costs

Hardware resources are required to support the development and testing of the Predictive Profit Margin and Dynamic Threshold Alert System. Since the system involves financial data analysis, dashboard visualization, and real-time alert generation, a reliable computing device is necessary for running development environments and testing system components.

The primary hardware requirement for this research includes a development workstation or laptop capable of running programming environments, database management systems, and data analytics tools. This workstation will be used for implementing profit calculation algorithms, testing alert generation mechanisms, and developing the financial dashboard interface.

Additionally, a mobile device may be required for testing the mobile application interface used by business owners to monitor profit margins and receive financial alerts. This device will allow researchers to simulate real-world user interactions and verify the usability of the dashboard and notification features.

Since most financial analytics processes can be performed using standard computing devices, the hardware requirements remain relatively moderate. Existing personal computing devices may also be used during development to reduce overall hardware costs.

Item	Quantity	Estimated Cost (LKR)	Purpose
Laptop / Development Computer	1	300,000	Used for backend development, financial analytics implementation, and system testing
External Storage Device	1	20,000	Backup storage for financial datasets and system testing results
Internet Router / Connectivity	1	15,000	Required for API integration, cloud database access, and system communication
Total Hardware Cost		LKR 335,000	

Table 03

7.2 Software Licenses

The Predictive Profit Margin system will primarily rely on open-source software tools and development frameworks, which significantly reduces the need for expensive proprietary software licenses. The financial analytics module will be developed using programming languages and libraries that support data analysis, visualization, and system integration.

Python programming libraries such as Pandas and NumPy will be used for financial data processing and profit margin calculations. Visualization libraries such as Matplotlib or Chart.js may be used to generate graphical dashboards that display financial trends and profitability insights.

In addition, integrated development environments such as Visual Studio Code or PyCharm Community Edition may be used during development. These tools provide debugging capabilities, code management features, and integration with version control systems.

Because these tools are freely available, the software licensing cost is expected to remain minimal, which helps maintain the affordability of the research project.

Software Tool	License Type	Estimated Cost (LKR)	Purpose
Python Programming Language	Open Source	0	Backend development and financial analytics implementation
Pandas Library	Open Source	0	Data processing and financial dataset analysis
NumPy Library	Open Source	0	Numerical calculations for profit margin analytics
FastAPI Framework	Open Source	0	Development of backend APIs for financial analytics
Visualization Libraries	Open Source	0	Displaying financial dashboards and trend charts
Total Software Cost		LKR 0	

Table 04

7.3 Cloud Services

Cloud services may be required to support data storage, application hosting, and system scalability. Since the SmartCost platform is designed to support multiple users accessing financial insights through mobile devices, cloud infrastructure can provide reliable and scalable deployment capabilities.

Cloud-based databases may be used to store financial datasets such as sales records, ingredient costs, and profit margin calculations. These databases allow the system to manage large volumes of financial data while maintaining efficient data retrieval performance.

Cloud computing services may also be used to host the backend services responsible for-profit calculations and alert generation. Hosting the analytics services in a cloud environment allows the system to process user requests efficiently and support multiple users simultaneously.

Many cloud providers offer free development tiers or research-level hosting plans, which can significantly reduce the operational costs during the initial stages of system development.

Cloud Service	Estimated Cost (LKR)	Purpose
Firebase Cloud Database	15,000	Storage of sales records, expense data, and profit calculations
Cloud Storage	8,000	Backup storage for financial datasets
API Hosting Infrastructure	10,000	Deployment of financial analytics APIs
Network Bandwidth	7,000	Data communication between mobile app and backend
Estimated Cloud Cost	LKR 40,000	

Table 05

7.4 Human Effort Cost

Human effort represents a major component of the overall project cost. Developing the Predictive Profit Margin and Dynamic Threshold Alert System requires significant time and expertise from researchers and developers involved in the project.

The development process includes designing the financial analytics architecture, implementing profit calculation algorithms, integrating cost and revenue datasets, and developing dashboard interfaces for financial visualization. Additional effort is required for implementing the alert detection mechanism, testing system performance, and validating the accuracy of profit calculations.

Researchers will also need to conduct literature reviews, analyze business financial data, perform experimental evaluations, and prepare research documentation for the final project submission.

Although the project is conducted as part of an academic research initiative, estimating the human effort involved provides a realistic understanding of the resources required to develop such a system in a real-world environment.

The total effort includes activities such as system design, algorithm implementation, financial data analysis, system testing, and documentation of research findings

8. WORK BREAKDOWN STRUCTURE (WBS)

Task ID	Task Description	Tools / Technology	Duration
T1	Literature review on financial analytics and profit margin monitoring systems	Research Papers, IEEE Xplore, Google Scholar	2 Weeks
T2	Requirement analysis for profit margin monitoring and alert mechanisms	System Analysis Tools, Documentation Tools	1 Week
T3	Design of financial analytics architecture and profit calculation workflow	System Design Diagrams, UML Tools	1 Week
T4	Development of revenue and cost data processing modules	Python, Pandas, NumPy	2 Weeks
T5	Implementation of profit margin calculation algorithms	Python, Financial Calculation Methods	2 Weeks
T6	Development of dynamic threshold monitoring and alert detection algorithms	Python, Rule-Based Algorithms	2 Weeks
T7	Integration of predicted ingredient prices from forecasting module	REST API, Python Integration	1 Week
T8	Development of financial dashboard visualization for profit monitoring	React Native, Chart Libraries	2 Weeks
T9	System integration with SmartCost platform and database	REST API, MySQL / PostgreSQL	2 Weeks
T10	Testing and validation of profit margin predictions and alert accuracy	Python Testing Tools, Experimental Evaluation	1 Week
T11	Documentation and research report preparation	Microsoft Word, Research Documentation Tools	1 Week

Table 06

9. GANTT CHART

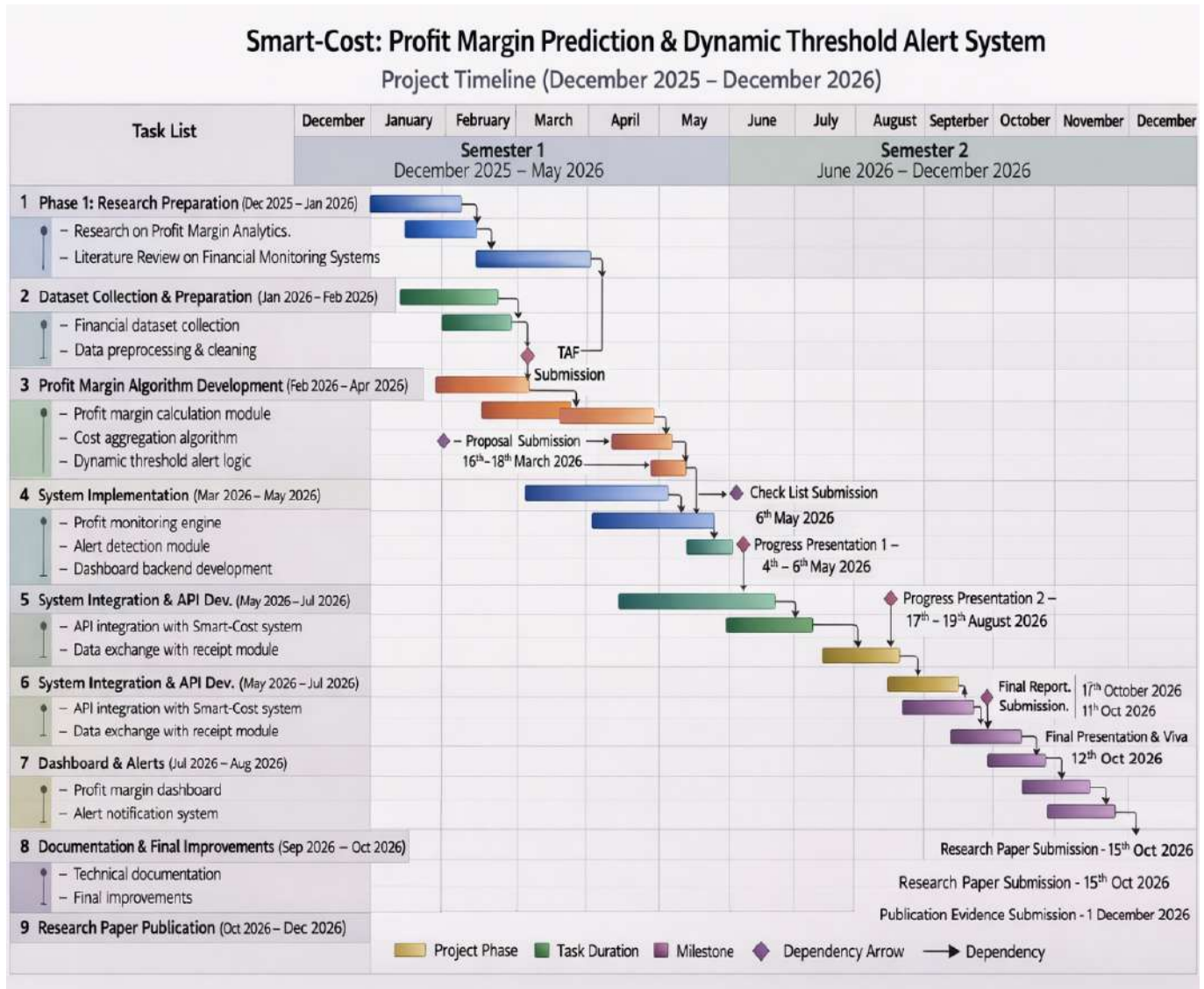


Figure 05

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11.APPENDICES

The appendices provide supplementary materials that support the design, development, and evaluation of the Predictive Profit Margin and Dynamic Threshold Alert System within the SmartCost platform. These materials include survey instruments used to understand financial management challenges faced by small businesses, technical diagrams illustrating the profit analytics architecture, preliminary user interface mockups, risk analysis related to financial analytics implementation, and ethical documentation concerning the use of business financial data.

Appendix A – Survey Instruments

To better understand the financial management challenges faced by small food businesses, a preliminary survey will be conducted among bakery owners, café managers, home-based food entrepreneurs, and small food manufacturing operators. The purpose of the survey is to gather insights into how these businesses currently track daily sales, monitor expenses, and evaluate profitability.

The survey will consist of structured and semi-structured questions designed to identify common problems related to financial record keeping, profit margin monitoring, and decision-making. The responses collected from this survey will help guide the development of the Predictive Profit Margin and Dynamic Threshold Alert System by identifying real-world user needs and expectations.

Example survey questions include:

- How do you currently calculate your daily or monthly profit?
- Do you use any digital tools to monitor expenses and revenue?
- What challenges do you face when tracking ingredient costs and profit margins?
- How often do you review your business profitability?
- Would a system that provides real-time profit margin analysis and automated alerts be useful for your business?

The survey results will be used to refine the financial dashboard, improve alert mechanisms, and ensure that the system aligns with the needs of small business users.

11.5 Appendix B – Detailed Diagrams

Several technical diagrams will be used to illustrate the design and operation of the Predictive Profit Margin and Dynamic Threshold Alert System. These diagrams provide a visual representation of the system architecture, profit calculation workflow, and data flow between different components.

Key diagrams include:

- System Architecture Diagram – illustrates how the sales input module, expense data module, profit calculation engine, alert system, and dashboard interact within the SmartCost system.
- Profit Margin Data Flow Diagram – shows the step-by-step process of converting sales and expense data into profit margin analytics.
- Algorithm Workflow Diagram – explains the sequence of operations used to calculate profit, determine margin percentages, and generate financial alerts.
- Dashboard Interaction Diagram – illustrates how users interact with financial dashboards, alerts, and predictive reports.
-

These diagrams help demonstrate how the profit analytics module integrates with other SmartCost components and how financial data moves throughout the system.

11.4 Appendix C – Preliminary UI Mockups

Preliminary user interface mockups will be developed to demonstrate how users interact with the Predictive Profit Margin and Dynamic Threshold Alert System through the mobile application. These mockups provide an early visualization of system functionality before full implementation.

The UI mockups will illustrate several key screens of the application, including:

- Sales Entry Screen – allows users to enter daily sales revenue through the mobile application.
- Profit Monitoring Dashboard – provides an overview of revenue, cost, profit, and profit margin performance.
- Alert Notification Screen – displays warning or critical alerts when profit margins decline below predefined thresholds.
- Prediction View Screen – shows future cost and profit forecasts based on predictive analytics outputs.
- These mockups help validate system usability and ensure that the application design meets the needs of business owners who require clear and accessible financial insights.

11.4 Appendix D – Risk Analysis

The implementation of the Predictive Profit Margin and Dynamic Threshold Alert System may involve several potential risks related to data quality, algorithm accuracy, and system integration. Identifying these risks early allows the research team to prepare appropriate mitigation strategies.

Potential risks include:

- Incomplete or Inaccurate Financial Data

Sales or expense records may be incomplete, inconsistent, or missing, which can affect the accuracy of profit calculations.

- Prediction Integration Errors

Predicted cost data received from forecasting modules may not always align perfectly with actual business conditions.

- Alert Threshold Misconfiguration

If alert thresholds are not properly configured, the system may generate excessive or insufficient notifications.

- System Integration Challenges

Integrating the financial analytics module with receipt processing, forecasting, and mobile dashboard components may require careful API and database design.

Mitigation strategies include implementing data validation rules, testing alert thresholds thoroughly, monitoring integration reliability, and providing fallback mechanisms for incomplete datasets.

11.5 Appendix E – Ethical Clearance Documents

The Predictive Profit Margin and Dynamic Threshold Alert System processes business-related financial data collected from participating small enterprises. Although the system does not handle highly sensitive personal data, it may process information such as sales records, purchase details, and operational expenses. Therefore, ethical considerations must be addressed during data collection, system testing, and evaluation.

To ensure ethical compliance, the following procedures will be implemented:

- Informed Consent

Business owners who participate in testing or data collection will be informed about the purpose of the research and how their financial data will be used.

- Data Anonymization

Any identifying information such as business names, account details, or transaction identifiers will be removed or anonymized before being used for research purposes.

- Data Usage Limitation

Collected data will be used strictly for academic research and system development purposes.

- Data Security

Appropriate security measures will be implemented to protect stored financial records and prevent unauthorized access.

These ethical safeguards ensure that the research adheres to responsible data management practices and respects the privacy and confidentiality of participating businesses.

FACULTY OF COMPUTING
Research Ethics Review Form

All students undertaking research in the Faculty of Computing must fill in and submit this form to the respective coordinator / supervisor as instructed by the program head.

SECTION 1

1. Project/research type

☒ B.Sc. ☐ M.Sc. ☐ MPhil/PhD

2. Project/research details

Project ID (if any): R26-IT-026
Research Title: Smart-Cloud Smart Supply Chain Cost Analytics and Profit Prediction System for Micro-SMEs

3. Student details (if the project is a group project, insert the details of group leader first)

Student ID	Name	Email	Phone
IT2244072	Kodhanaraku K.A.C.H	IT22544872@mysiit.lk	0760152947
IT22151010	Perera N.K.M	IT22151010@mysiit.lk	0798864190
IT22162250	Jayasingha D.D.M	IT22162250@mysiit.lk	0773505133
IT22132866	Dissanayake M.P.R	IT22132866@mysiit.lk	0712209554

4. Supervisor details

Supervisor Name	Mr. Desanratna Seneviratne
Co-supervisor Name (if any)	MuAjisha Wijesiriya
External supervisor (if any)	

SECTION 2: DATA COLLECTION AND STORAGE

Read the following table before answering the questions.

Data Source	Description	Data Collection Methods
Primary Data	Primary data collection happens when researchers obtain information directly from the original sources.	Survey / Interviews / Observations / Focus groups / New Images etc.
Secondary Data	Datasets already gathered from previous research. This data is usually already analyzed and put into context. Sources of secondary data can include:	Books / Past research papers / Annual reports / Newspapers / Reports / Websites / Online Databases etc.

Provide details of all data required for your project. (Indicate what data will be required for each component, where the data is available, and how you plan to collect that data.)

Research Component	Data required. (e.g. Images of leaves)	Amount of Data Required	Data Source (Primary /Secondary)	Collection Method
Adaptive Thermal Receipt Authentication for QR Based Inventory Organization	Thermal receipt images from bakeries, supermarkets, and small food businesses	2000-1000 receipt images (clean, faded, damaged)	Primary Data	Direct collection from shops, mobile camera capture
Semantic Inventory Normalization Engine	Ingredient names, abbreviations, scientific, and measurement units from	2000-1000 receipt images (clean, faded, damaged)	Primary + Secondary Data	Extracted from collected receipts, manual dataset creation
Hybrid Predictive Supply Chain Visibility Forecasting	historical ingredient price data (Rice, sugar, oil, corn, etc.)	2-3 years historical price records	Secondary Data	Government statistics websites, Kaggle datasets, online databases
Profit Margin Prediction & Dynamic Reorder Point System	Simulated sales transactions and ingredient purchase records	200-500 simulated business transactions	Primary Data	Generated from dataset and manual data entry

5. DATA COLLECTION: If you require primary data, do you intend to collect data from following groups?

☐ Children or young people
☐ Pregnant women
☐ Individuals with cognitive disabilities
☐ People suffering from specific diseases
☐ Animals
☒ Certain group of people involved in an organization

6. DATA COLLECTION: If you are collecting information related to people, in what form will be the data collected?

☒ Individually identifiable	Data can directly lead to the identification of an individual or organization
☒ Re-identifiable*	Data indirectly leads to the identification of a person or organization (even through direct identifiers are removed)
☐ Non-Identifiable	Data does not lead to the identification of a specific individual

*Anonymous data from which the individual could be discovered

7. DATA COLLECTION: Does your project possibly cause/involve any of the following?

☐ Physical stress/distress, or discomfort to participants
☐ Psychological/mental stress/distress, or discomfort to participants
☒ Collection of sensitive/confidential data of individuals
☒ Collection of confidential data of organizations
☐ Development of a product harmful for a particular group or society

8. DATA COLLECTION: Explain the procedures you will be following to ensure privacy of participants or organizations during data collection, data analysis and publishing of results.

☒	Before the data collection, participants will be given an information sheet to create awareness
☒	Data will be collected only from the participants who have given consent through a consent form
☒	Personally identifiable data will not be collected
☒	If identifiable data is present in the data set, data will be either anonymized or coded

Additional Measures:

The research will primarily collect receipt images and publicly available price datasets, which do not contain personal information. If any business-related information appears on receipts (such as shop names or addresses), it will be removed or anonymized during preprocessing. All collected data will be used strictly for academic research purposes.

9. DATA STORAGE: If you are collecting information related to people, in what form will the data be stored?

☐	Individually identifiable	☐	Re-identifiable	☒	Non-identifiable
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10. DATA STORAGE: Where will data be stored and what measures will be taken to ensure security of data ?

☐	Paper-based data stored in locked filing cabinets within SLIIT.
☒	Data stored in hard-drives and computers will be protected by password and encryption.
☒	Data will be anonymized and will not be re-identifiable.
☐	After the completion of the project, all data will be permanently deleted from all student devices. Only a single copy will be securely stored within a repository in the institution.

Additional measures:

All research data including receipt images, datasets, and experimental results will be securely stored in password-protected computers and cloud storage. Access to the data will be limited only to the research team members and supervisors. The datasets will be anonymized and used strictly for academic research purposes.

11. How would you rate the overall risk associated with the research? (These risks may occur when the collected data is exposed to unauthorized parties, etc.)

☐	High Risk	☒	Low Risk	☐	Negligible Risk
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12. Declaration of the participants.

I/we certify that the details given above are accurate and agree to adhere to the conditions of approval specified by the panel. Furthermore, I/we will inform the FoI Research Project coordinator of any deviation from the specified details.

Student ID	Name	Signature
IT2254872	Kudithowukka R.A.C.H	
IT22151810	Pepera N.K.M	
IT22163250	Jayasingha D.D.M	
IT22152664	Desanayake M.P.J.R	

13. Approval of the Supervisor

Supervisor Recommendation (please select one option)	☐ Ethics committee Approval NOT Required	
	☐ Ethics committee Approval Required	
If approval required, clearly specify the reasons:		
Supervisor Name	Supervisor Signature	Date

**** Please note that if the supervisor has recommended that ethics committee approval required, student should fill the 'Ethics Review Form' of the SLIIT ERC and submit it to the faculty Ethics Sub-committee.**