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Smart Grocery Expense Tracker

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Abstract: ***This work introduces an automated online system for recording bills and generating invoices for online grocery shopping with the aim of solving issues faced in traditional manual ways of generating invoices adopted by most small retail shops. The system introduced makes it easier for retailers to manage all their activities using a single web application for generating invoices, recording sales and managing credits of customers. The use of technologies like HTML, CSS, Java Spring Boot, JavaScript, and MySQL is employed in designing the system. Implementation of this system saves time and ensures accurate calculations, and also organizes information. According to tests, the system is capable of generating invoices 40% – 60% faster compared to manual methods while remaining highly accurate. The system's integrated credit management system makes it easier for managing credits of individual clients.***

Keywords: Automated Billing System, Grocery Management System, Invoice Generation, Retail Automation, Credit Management, Spring Boot, MySQL, Web-Based Application, Digital Transformation.

I. INTRODUCTION

This paper emphasizes the significant role of small grocery stores, commonly known as kirana shops, in daily life, particularly in developing economies, while highlighting the challenges associated with their reliance on traditional billing and record-keeping methods. Conventional practices such as handwritten invoices and manual registers are often inefficient, prone to human error, and difficult to maintain. With the rapid advancement of technology, the demand for digital solutions in small-scale businesses has increased; however, most existing Point of Sale (POS) systems remain expensive and complex for small shop owners. To address this issue, the Smart Grocery Expense and Billing System is proposed as a simple, cost-effective, and efficient solution tailored to the needs of small retailers. The system focuses on ease of use, minimal resource requirements, and streamlined functionality, enabling shopkeepers to improve accuracy, enhance operational efficiency, and adopt digital practices without significant financial or technical constraints.

Background

In the modern digital age, technology has helped improve efficiency and accuracy in business operations. Nevertheless, most kirana stores continue to use traditional practices such as manual billing and writing down details, which take a lot of time and are subject to mistakes. Shop owners find it difficult to handle sales, record transactions, and keep track of credit given to customers during peak periods.
It helps in quick bill generation, accurate calculations, proper data storage, and basic sales tracking, making daily work simpler and more efficient while supporting the shift towards digital business practices.

II. REVIEW OF LITERATURE

Various studies show that billing and retail management systems have improved efficiency through digital solutions like billing and inventory management. However, many of these systems are expensive and too complex for small shopkeepers. Some also depend on continuous internet connectivity, which is not always practical. Additionally, they often lack features like offline support, simple interfaces, and proper credit management.

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Sr. No.	Paper Name	Year of Publication	Author	Proposed Work	Research Gap
1	Smart Billing System	2020	R. Sharma	Digital billing using software	High cost
2	POS System for Retail	2021	A. Patel	Automated billing and inventory	Complex for small shops
3	Web-Based Billing System	2022	S. Kumar	Online billing system	Requires internet always
4	Retail Management System	2023	M. Singh	Complete shop management	Expensive hardware required
5	Web-Based Retail Billing System	2019	K. Verma & P. Singh	Developed a web-based billing system for retail shops	Lacks offline support and credit management
6	Automated Billing System using Java	2020	R. Gupta et al.	Java-based billing software with database integration	Limited user interface and scalability
8	Cloud-Based Billing and Inventory System	2022	S. Iyer & M. Shah	Cloud system for billing and stock management	Depends on continuous internet connection

Overall these limitations highlight the need for a system that is simple affordable and easy for small shopkeepers to use without needing technical knowledge the solution should reduce reliance on constant internet access cut operational costs and provide essential features like accurate billing record management and customer credit tracking keeping these requirements in mind the proposed smart grocery expense billing system aims to offer a practical and user-friendly approach it focuses on simplifying daily tasks improving efficiency and helping small grocery stores transition smoothly from manual methods to a more reliable digital system overall these limitations clearly show the need for a system that is simple affordable and easy for small shopkeepers to use without requiring technical knowledge the solution should reduce dependency on constant internet access minimize operational costs and provide essential features like accurate billing record management and customer credit tracking keeping these requirements in mind the proposed smart grocery expense billing system is designed to offer a practical and user-friendly approach it focuses on simplifying daily tasks improving efficiency and helping small grocery stores smoothly shift from manual methods

A. Existing System

Current systems used in grocery shops:

1) Billing using manual note book means that bills will be written by hand in the shops. Although efficient in practice, the method is quite time-consuming and has risks of miscalculation and errors in writing the records. Furthermore, the method makes it difficult to store and organize information.

2) Use of calculator for totals refers to summing up the prices of commodities being sold. Although fast, the method requires manual input of the numbers and hence high chances of wrong amounts being recorded. The method lacks any facility for recording transaction details.

3) Use of Excel sheets for storing and organizing information gives more advantages than manual methods. The method requires some computer skills and constant updates in order to maintain accurate information. However, this method may prove difficult to embrace for many shop keepers.

4) Lack of adequate system to track daily/monthly sales records Lack of adequate system for recording sales records is a challenge to business operations for shop owners. This makes it impossible to conduct an analysis of profit and loss hence decision-making becomes inefficient.

5) Use of bills without having a digital storage system creates dangers of losing information. Such transactions are risky to information storage and retrieval. Furthermore, such records are unreliable.
6) Use of manual calculations and record keeping leads to a cumbersome way of conducting shop activities and less efficient. large amounts of records becomes difficult and unorganized.

B. Limitations of Existing System

The existing system has several drawbacks:

1) Time-consuming billing process Manual billing takes up time as the totals of all the items as well as the total sum will have to be manually done. Manual billing is expected to take more time than other billing methods, which will force the customers to wait for a long period.
2) High chances of calculation errors Errors in calculation can be made when doing manual computations, thus making it hard to determine whether the total computation is right or not. The slightest mistake in computation can affect the accuracy of billing, causing losses for the organization.
3) No real-time tracking of sales Shopkeepers will not be able to monitor sales immediately without such a system in place because they would need to go through their records to know how they performed that day.
4) Difficult to manage credit (udhaar) customers It becomes very challenging to manage the credit record manually. The owner of the store may forget the amount owed by the customer or may even miscount the total amount owed to him. This can result in disputes or even loss.
5) Risk of data loss in paper records However, paper records are vulnerable to damage, loss, and misplacement. Once they are lost, they are impossible to retrieve. This makes history difficult to keep track of and reduces its dependability.
6) No proper reporting or analysis The manual system does not generate structured reports and analysis. The shop owners cannot easily track sales trends or profit margins. Therefore, planning becomes challenging. This hinders development and improvement prospects. All this makes the work more inefficient and cumbersome for shop owners.

These issues reduce efficiency and increase the workload of shopkeepers

III. PROPOSED SYSTEM

This project is a web-based Grocery Billing System that allows shop owners to automate their daily tasks with creating and printing bills and instantly calculating totals to save them time and effort. Automatic data storage of all transactions including customer information, sales records, etc. provides shop owners with easy access and management of this information. The system also provides for easy credit (udhaar) customer management along with daily and monthly sales tracking without errors.

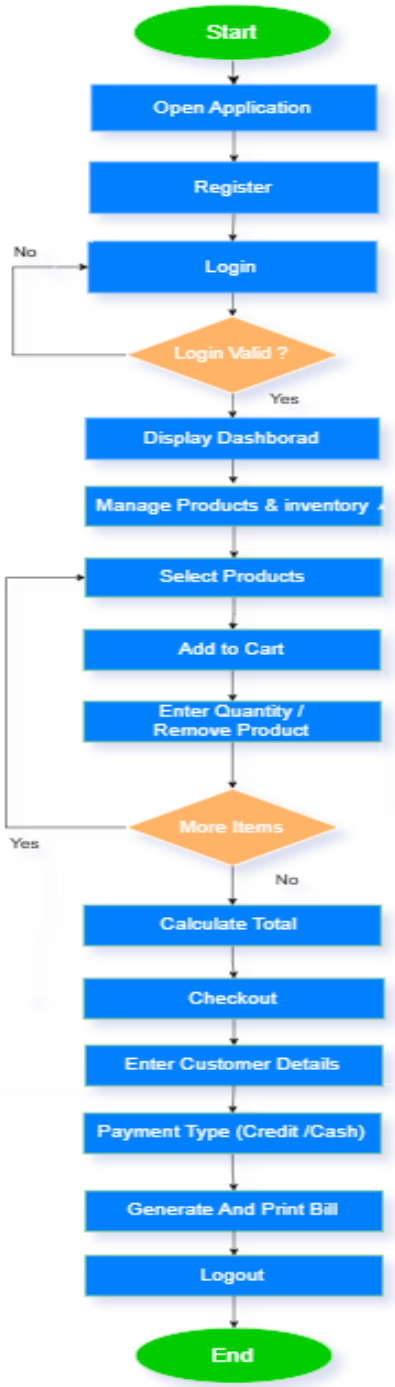
With less manual work, shop owners will be able to perform transactions faster, have more accurate receipts since there will be no calculation error, and have more efficient overall operations because of better digital recordkeeping through the system. As a result, the system is a simple, inexpensive,and effective solution designed primarily for small grocery stores.

A. System Architecture

The Smart Grocery Billing and Inventory Management System has a layered structure that consists of five main sections; the Input Layer, Processing Layer, Transaction/Analytics Layer, Database Layer, and Output Layer.

1) The Input Layer gathers information from owners of stores, which typically includes logging in, providing product information, information about customers, types of payment, and selecting Products for Billing. This collected input will then be delivered to the Processing Layer for validation and execution.
2) The Processing Layer manages product authentication, management, and cart processing. This layer validates the store owner's log in, manages product records, and computes Sub-totals on the Customer's bill.
3) The Transaction/Analytics Layer generates an Invoice after payment has been processed. This layer also automatically updates the inventory after each transaction, keeps track of Credit records, and provides reporting to the store owner by generating Daily, monthly, and group Reports by Category.
4) All data in the System is stored in the Database Layer. Categories, Products, Bill, and Bill Items are all stored in the Database Layer for maximum efficiency in management and retrieval of all System Data.
5) Finally, the Output Layer displays Dashboard analytics, printable invoices, Credit Customer Records, updated Inventory Status, and Sales Charts to allow the owner of the store to monitor Performance in their store more efficiently.

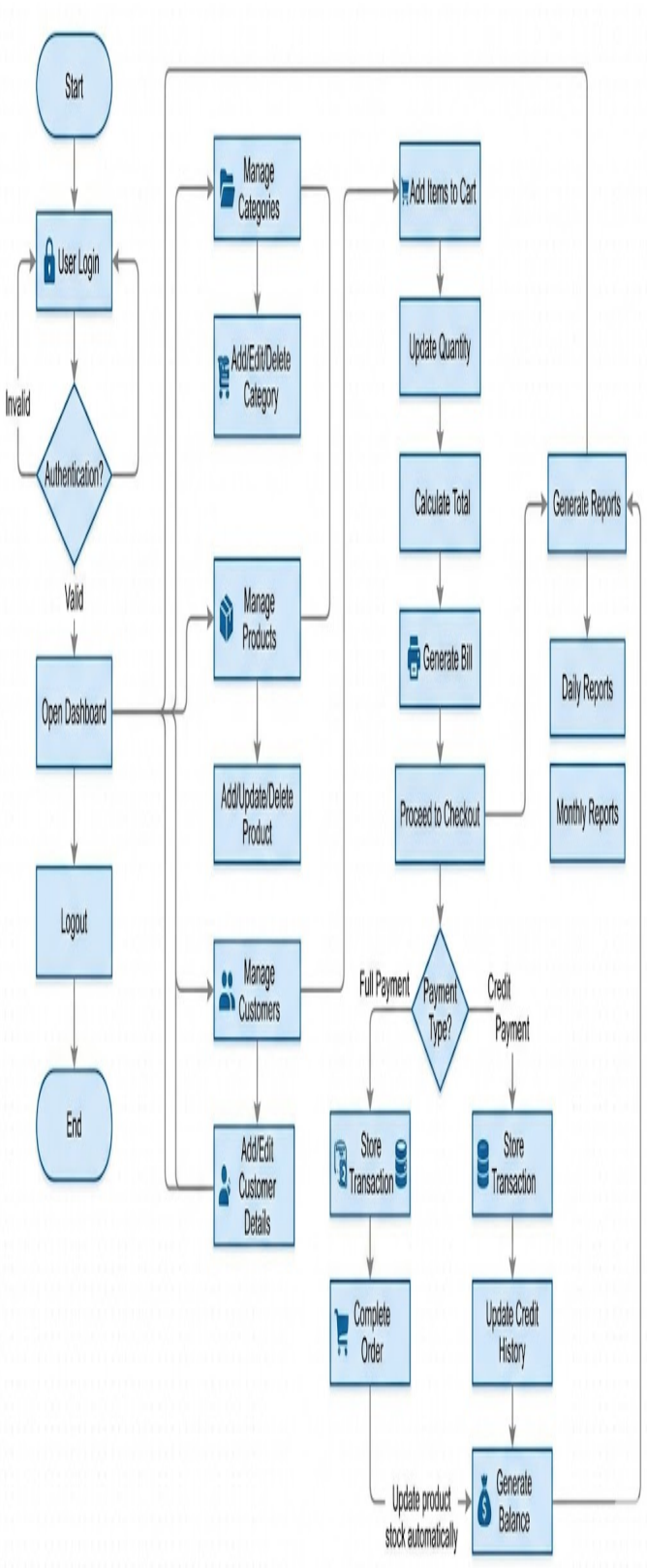
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IV. METHODOLOGY

Smart Grocery Expense Tracker employs modular design technique in the development process. Modules are used in developing various parts of the system, which includes the Authentication Module, Product Management Module, Category Management Module, Cart Module, Billing Module, and Credit Tracking Module.

Modules are designed and tested independently before integration into one whole system.


Start
User Login
Invalid
Authentication?
Valid
Open Dashboard
Logout
End
Manage Categories
Add/Edit/Delete Category
Manage Products
Add/Update/Delete Product
Manage Customers
Add/Edit Customer Details
Add Items to Cart
Update Quantity
Calculate Total
Generate Bill
Proceed to Checkout
Full Payment
Payment Type?
Credit Payment
Store Transaction
Store Transaction
Complete Order
Update Credit History
Update product stock automatically
Generate Balance
Generate Reports
Daily Reports
Monthly Reports

V. MODULE DESCRIPTION

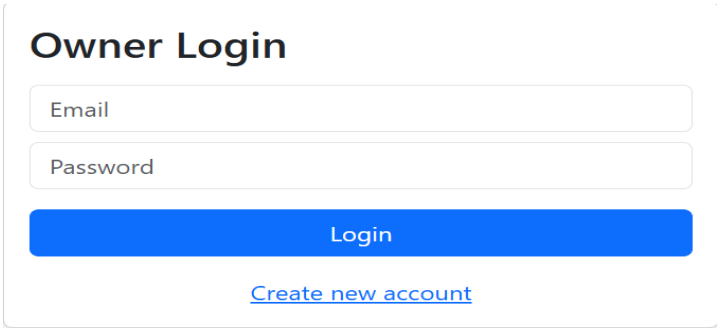


Fig 5.1 Login Page

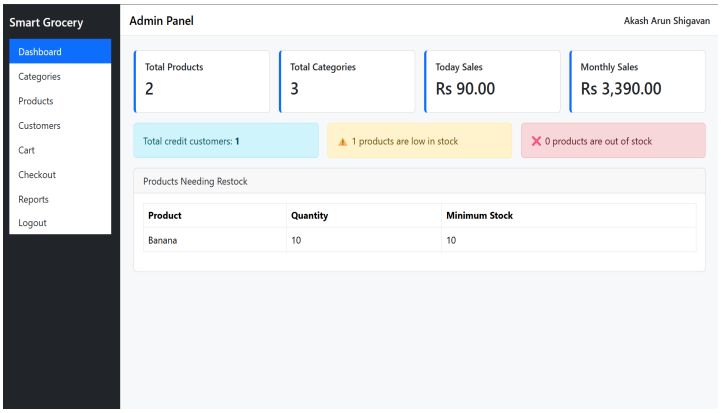


Fig 5.2 Dashboard Page

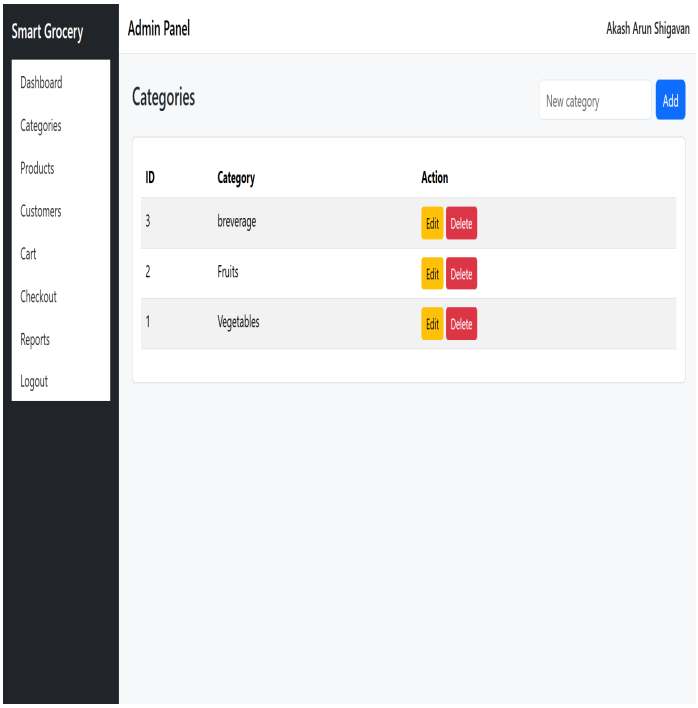


Fig 5.3 Category Management Page

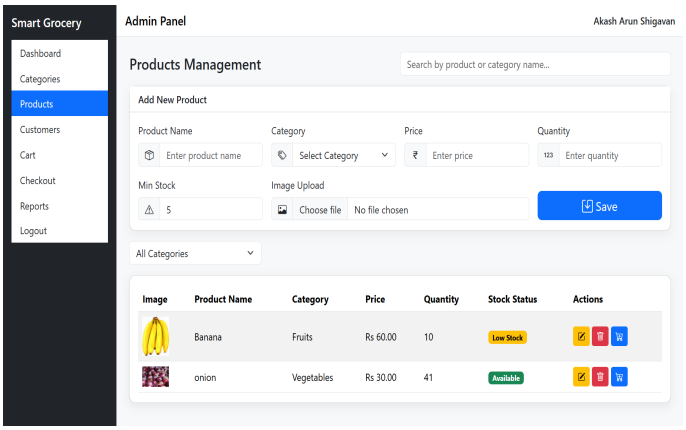


Fig 5.4 Product Management Page

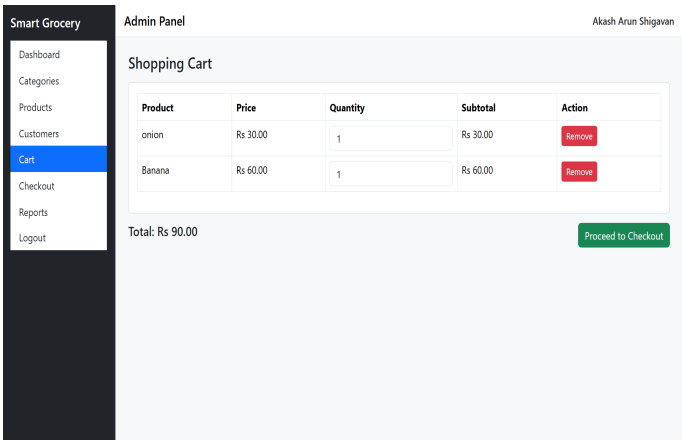


Fig 5.5 Cart Page

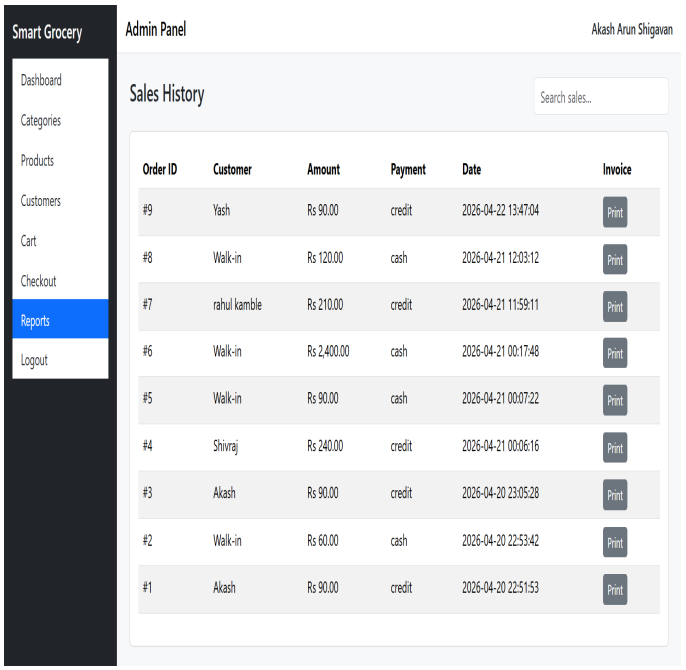


Fig 5.6 Sales Report Page

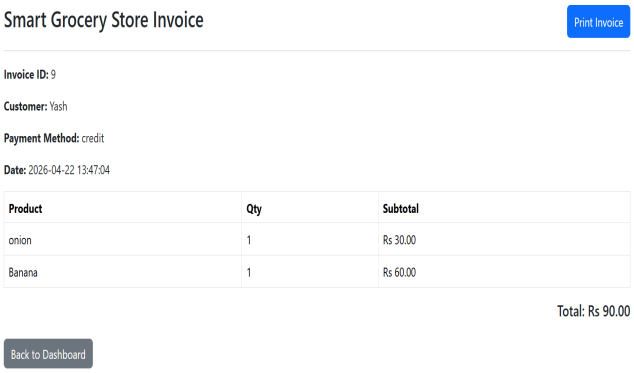


Fig 5.7 Invoice Generation Page

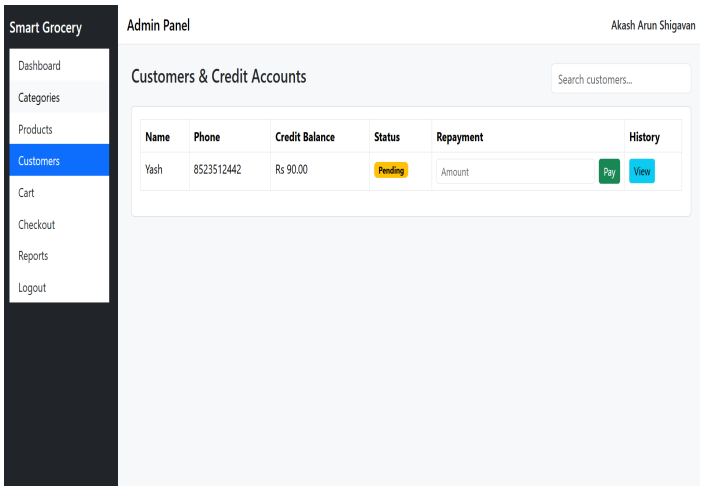


Fig 5.8 Credit Customer History Page

VI. SYSTEM REQUIREMENTS

A. Hardware Requirements

Processor : Intel(R) Core(TM) Ultra 5 125H (3.60 GHz)
Speed : 4800 MT/s
RAM : 16 GB
Hard Disk : 477 GB
Monitor : Acer
Input Devices: Keyboard and Mouse

B. Software Requirements

Operating System : Windows 11
Frontend Technologies: HTML, CSS, JavaScript
Backend Technology : PHP
Database : MySQL
Server Environment : XAMPP Server
Code Editor : Visual Studio Code
Web Browser : Google Chrome / Microsoft Edge
Other Tools : Microsoft Word (for documentation

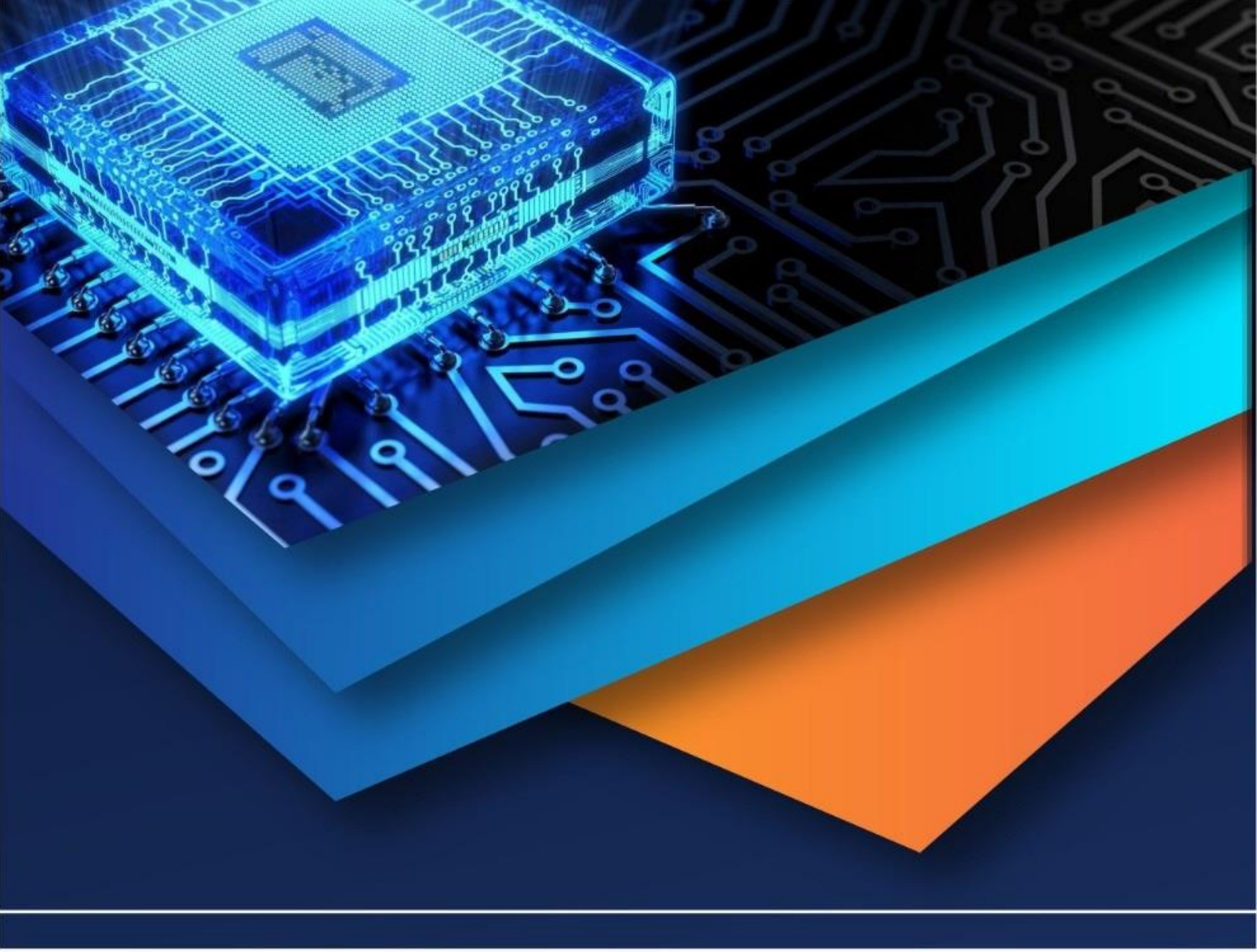
VII. CONCLUSION

Smart Grocery Shop Management System is an exceptionally user-friendly internet-based program designed to make it easier to handle the grocery shop management processes. The system provides automation for stock management, billing process, and customer credit management. Moreover, all sales-related statistics for daily and monthly periods will be updated on their own. Thanks to this highly innovative system, one will be able to manage their grocery shops with ease.

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