



Smart Calculator for Shopkeepers

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Abstract— The "Smart Calculator for Shopkeepers" project aims to revolutionize retail operations by introducing a user-friendly tool tailored to shopkeepers' needs. It streamlines pricing, discount, and tax calculations, while offering visualization tools for sales trends and inventory management. With a secure database system, it ensures the integrity of sales records and enables future data analysis. Ultimately, this initiative empowers shopkeepers, enhances decision-making, and fosters the success of small and medium-sized retail businesses.

Keywords—Smart Calculator, FSN Analysis, Profit Analysis

I. INTRODUCTION

The "Smart Sales Tracker for Shopkeepers" modernizes sales tracking and inventory management in small and medium-sized retail businesses, replacing manual processes. It aims to provide real-time insights, tackling the challenges of profit calculations. By employing advanced technology and data analytics, it enhances operational efficiency and facilitates informed decision-making. This project addresses shortcomings in traditional cash registers, generic accounting software, cloud-based POS systems, and spreadsheets. It offers comprehensive solutions tailored to the unique needs of retail businesses. Through sophisticated algorithms, it streamlines financial decision-making processes, empowering shopkeepers with financial acumen. Ultimately, it enables effective resource allocation, strategic investment, and long-term profitability in the competitive retail industry.

A. Background and Motivation

1) **Background:** The "Smart Sales Tracker for Shopkeepers" project addresses the prevalent inefficiencies in manual processes within small and medium-sized retail businesses. By recognizing the reliance on outdated methods such as handwritten ledgers or basic spreadsheets, the project

aims to revolutionize sales tracking and inventory management. It acknowledges the critical need for real-time insights in the retail landscape, striving to provide immediate access to essential sales and inventory data to facilitate informed decision-making.

2) **Motivation:** Moreover, the project confronts the complex challenge of accurate profit calculations, considering the intricate nature of diverse product lines, fluctuating discounts, and tax rates. It endeavors to develop a smarter solution capable of navigating these complexities, empowering shopkeepers with comprehensive and precise financial insights. Through the implementation of advanced technology and data analytics, the project seeks to enhance operational efficiency, optimize resource allocation, and foster sustainable growth within the competitive realm of the retail industry.

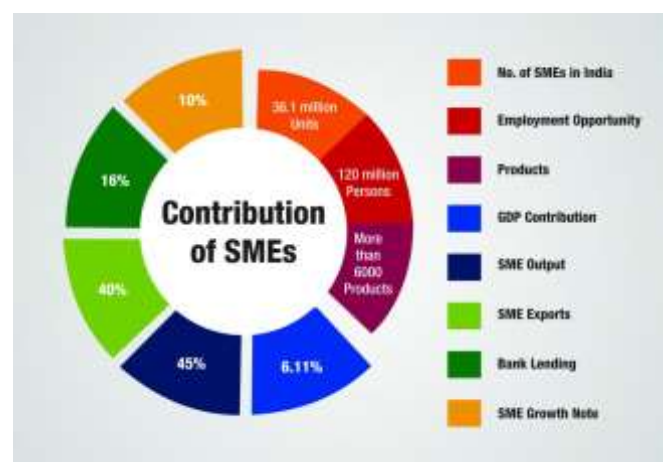


Fig. 1. Contribution of Small and Medium scaled businesses in India.

Furthermore, the project's focus on accurate profit calculations reflects a commitment to empowering shopkeepers with the financial acumen needed to sustain and grow their businesses. By developing sophisticated algorithms capable of navigating complex pricing structures and tax regulations, the project aims to streamline financial decision-making processes. Ultimately, this enables shopkeepers to allocate resources more effectively, invest strategically, and drive long-term profitability and success.

B. Exiting Systems

The "Smart Sales Tracker for Shopkeepers" project recognizes the shortcomings of current retail management systems, highlighting specific challenges faced by shopkeepers:

1) *Traditional Cash Registers*: While they're effective for transaction recording, lack the sophistication needed for comprehensive inventory management and advanced analytics.

2) *Generic Accounting Software*: Although widely used, often lacks features tailored to the unique requirements of retail businesses, leaving shopkeepers with partial solutions.

3) *Cloud-Based POS Systems*: While cloud-based POS systems offer remote access and storage benefits, the associated costs can be prohibitive for smaller retail establishments, potentially limiting their accessibility.

4) *Spreadsheets*: While familiar and commonly used, have limitations such as manual data entry errors and a lack of real-time insights, hindering shopkeepers' ability to make timely and informed decisions.

II. LITERATURE SURVEY

1) N. Sohail and T. H. Sheikh [1] "A Study of Inventory Management System Case Study" study delves into the complexities of inventory management within supply chains, particularly spotlighting its critical role in industries like steel manufacturing. By emphasizing ABC classification and demand forecasting, the research underscores the delicate balance needed to meet customer demand while minimizing holding costs. The study also highlights the direct link between efficient inventory management and a company's performance, especially in terms of Return on Assets (ROA). Through a detailed exploration of inventory-related challenges in a small-scale steel manufacturing context, the paper provides valuable insights into various inventory management techniques aimed at optimizing operations and achieving business success.

2) Dr. Asita Ghewari [2] "Inventory Control in a Manufacturing Industry Using ABC and FSN Analysis," this research underscores the vital importance of inventory management in navigating the uncertainties inherent in manufacturing environments. By introducing ABC and FSN analyses as essential tools, the study offers practical strategies for categorizing inventory items based on their value and movement speed. The paper also examines concepts such as safety stock and economic order quantity (EOQ), providing a nuanced understanding of how these techniques can enhance inventory control and resource allocation in manufacturing settings. Through a case study approach that combines

interviews, record analysis, and literature review, the research offers valuable insights into the practical application of inventory management strategies to reduce costs and optimize resources.

3) S. S. Wasnik, C. Gidwani [3] "FSN analysis for inventory management - case study of sponge iron plant" this study delves into the application of FSN analysis in inventory management within the context of a power generation company. By categorizing inventory items into fast-moving, slow-moving, and non-moving categories based on consumption rates, the research aids in informed decision-making regarding inventory stocking and management. Through primary and secondary data collection methods, including interactions with personnel and record analysis, the study provides a comprehensive overview of inventory management practices at the Koradi Thermal Power Station. The research underscores the importance of effective inventory management in ensuring continuous electricity supply and reducing operational disruptions, highlighting the critical role of FSN analysis in optimizing inventory, maintaining quality, and enhancing operational efficiency in power generation companies.

III. PROBLEM STATEMENT AND OBJECTIVES

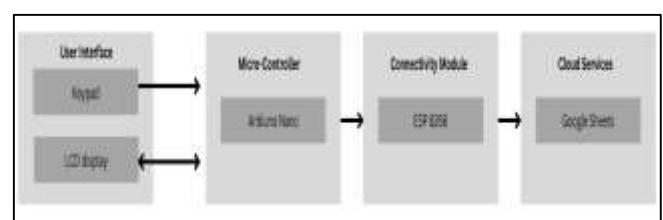
The "Smart Calculator for Shopkeepers" project aims to create a specialized tool tailored to the unique needs of retail businesses. Unlike conventional calculators, this smart calculator integrates features essential for streamlining retail operations, such as robust sales tracking and reporting capabilities. It emphasizes an intuitive interface accessible to both tech-savvy and non-tech-savvy shopkeepers, enabling efficient utilization without a steep learning curve.

One key aspect of the project is the development of a user-friendly software tool or device to simplify shopkeeping calculations, including pricing, discounts, and tax calculations. The project also focuses on implementing a secure database system for storing sales data and developing a mobile application for real-time access to sales and profit data, enhancing decision-making capabilities on-the-go. Additionally, data analytics capabilities are integrated to generate valuable insights for optimizing business strategies and enhancing efficiency.

In summary, the project offers a comprehensive solution comprising a user-friendly smart calculator, secure database storage, a mobile application for remote access, and data analytics capabilities. By addressing the intricate needs of shopkeepers, it aims to significantly enhance efficiency and decision-making in managing retail businesses.

IV. BLOCK DIAGRAM

The ESP8266 serves as the central communication hub in this system, acting as the bridge between the hardware and software components. Linked to the cloud through its Wi-Fi capabilities, the ESP8266 enables seamless communication,



allowing for remote access and control. This module enhances the system's connectivity, making it versatile and accessible from various locations.

Fig. 2. Block Diagram for Proposed Methodology

The Arduino Uno, equipped with a connected keypad, serves as the user input interface. Users can input commands and data through the keypad, initiating processes within the system. The Arduino Uno processes these inputs and generates corresponding outputs, which are then displayed on an LCD screen. This real-time interaction provides users with immediate feedback and enhances the overall user experience.

The integration of a cloud-connected Wi-Fi module expands the system's capabilities by enabling data transfer and synchronization with cloud-based services. This connection facilitates remote monitoring, data analysis, and the presentation of graphical representations through a user interface. The synergy of the ESP8266, Arduino Uno, and cloud connectivity creates a comprehensive and user-friendly system that seamlessly combines hardware functionality with cloud-based intelligence.

V. METHODOLOGY

The smart calculator system is a comprehensive solution designed to streamline inventory management and financial transactions. Upon initialization, users interact with the system through a keypad, making selections using key values. The system's web interface presents options to record cash transactions, both incoming and outgoing, seamlessly integrating with a secure database. This database serves as a repository for inventory data, cash transactions, and other crucial information. The user-friendly interface allows users to access, analyze, and generate reports for insights into inventory levels, cash flow, and various metrics.

1) *User Input through Keypad*: Upon turning on the smart calculator, users are prompted to provide inputs through a connected keypad. The keypad facilitates the selection of items using designated key values, ensuring a user-friendly interaction.

2) *Cash Handling*: The system incorporates a 'Cash-In' button, enabling users to input the amount of cash received. A 'Cash-Out' button on the web interface allows users to record cash payments for expenses. All cash transactions are updated in real-time to the secure database, ensuring accuracy and accountability.

3) *Database Integration*: The system seamlessly integrates with a secure database, serving as a centralized repository for inventory and financial data. Each transaction, whether related to inventory or cash, is systematically stored for future reference and analysis.

4) *Inventory Management*: Users can efficiently manage inventory by removing items when sold, ensuring accurate tracking of stock levels. The system automatically updates the database with each sale, maintaining an up-to-date record of inventory transactions.

5) *User Interface*: The user interface, accessible through the web, provides a clear and intuitive platform for users to interact with the system. Users can easily navigate through options, input data, and retrieve information for analysis and reporting purposes.

6) *Data Analysis and Reporting*: The stored data in the database allows users to generate detailed reports, offering insights into inventory levels, cash flow, and other relevant metrics. Users can visualize data through charts or graphs, facilitating easy analysis and decision-making.

7) *Secure Shutdown*: When the user turns off the smart calculator, the system ensures the secure shutdown by saving any unsaved data. This safeguarding mechanism ensures data integrity and prevents any loss of critical information.

V. ANALYSIS

FSN Analysis, through its categorization of inventory items based on their movement speed, enables businesses to tailor their inventory management strategies according to demand patterns. By identifying Fast-Moving, Slow-Moving, and Nonmoving items, companies can allocate resources effectively, ensuring that high-demand products are readily available while minimizing excess stock of slower-moving items. Profit Analysis, which includes Gross Profit and Net Profit assessments, serves as a crucial tool for evaluation.

A. Inventory Analysis:

FSN Analysis categorizes inventory into Fast-moving, Slow-moving, and Nonmoving items based on consumption patterns. It aids businesses in prioritizing inventory management efforts efficiently. By allocating resources effectively, FSN analysis optimizes inventory control strategies. This technique enhances overall operational efficiency and reduces inventory holding costs.

1) *Fast-Moving Items (F)*: These items have high demand and frequent sales, requiring constant monitoring and prompt replenishment to avoid stockouts and meet customer demand.

2) *Slow-Moving Items (S)*: With lower demand and less frequent sales, managing these items involves strategies like bulk ordering or longer reorder cycles, as they don't demand the same level of attention as fast-moving items.

3) *Nonmoving Items (N)*: Items with little to no movement within the inventory over time, making them candidates for reassessment, clearance, or potential discontinuation. Reallocating space for items with better turnover rates is often more effective.

B. Profit Analysis:

Profit analysis for small businesses is essential for understanding and improving the financial performance of the company. It involves evaluating revenue, costs, and other

financial metrics to determine profitability and make informed decisions.

1) *Gross Profit*: Determine how much profit the business makes after deducting the direct costs associated with producing or purchasing the goods or services it sells.

Gross Profit = Total Revenue - Cost of Goods Sold (COGS)

2) *Net Profit*: Evaluate the overall profitability of the business after accounting for all expenses, including interest, taxes, and other non-operating costs.

Net Profit = Operating Profit - Interest, Taxes, and Other Non-Operating Expenses

VI. ALGORITHM

1. Start
2. Initialize system and check the mode select switch status.
3. If the mode select switch input is 1 (high):
 - a. Enter Calculator Mode:
 - i. Prompt user to enter the first number.
 - ii. Capture and display the first number on the LCD.
 - iii. Prompt user to enter a mathematical operator.
 - iv. Capture and display the operator on the LCD.
 - v. Prompt user to enter the second number.
 - vi. Capture and display the second number on the LCD.
 - vii. If "#" is pressed:
 - Perform the selected mathematical operation.
 - Display the result on the LCD.
 - viii. If "*" is pressed:
 - Clear all inputs.
 - Restart Calculator Mode.
4. If the mode select switch input is 0 (low):
 - a. Enter IoT Billing Mode:
 - i. Prompt user to enter the item code.
 - ii. Capture the item code.
 - iii. Retrieve and display item details based on the code.
 - iv. Calculate and display the item's total cost.
 - v. If "A" is pressed:
 - Accept and add the next item code to the list.
 - Update and display the new total cost.
 - vi. If "#" is pressed:
 - Finalize the list of items.
 - Send the item codes and grand total to the ESP8266 module.
5. ESP8266 operations:
 - a. Check for the availability of Serial data.
 - b. If Serial data is available:
 - i. Extract the item list and grand total from Serial data.
 - ii. Upload the grand total to the IoT Google Sheet.
 - iii. Update the item list on the IoT Google Sheet, one by one.
6. End

VII. RESULTS AND DISCUSSIONS

The "Smart Calculator for Shopkeepers" project seeks to revolutionize the way retail businesses manage their operations by offering a tailored solution that goes beyond conventional calculators. In addition to basic arithmetic functions, this smart calculator integrates advanced features specifically designed to address the needs of retail environments. These features include comprehensive sales tracking capabilities that allow shopkeepers to monitor transactions, track inventory levels, and analyze sales trends in real-time. By providing detailed reporting functionalities,

the smart calculator empowers shopkeepers to make informed decisions regarding inventory management, pricing strategies, and



overall business performance. Moreover, the user interface of the smart calculator is intuitively designed to cater to the diverse skill levels of shopkeepers, ensuring that even those with limited technical proficiency can effectively utilize its functionalities.



Fig 3. Calculator mode

Fig 3 showcases the first mode of the smart calculator, featuring its standard functionality akin to a traditional calculator. This mode provides a familiar and reliable tool for basic arithmetic calculations, enhancing versatility for diverse user needs.



Fig 4. Calculator mode result.

Fig 4 illustrates the total calculation feature, emphasizing the calculator's capability to swiftly and accurately provide cumulative sums.



Fig 6. Invoice uploaded to Excel sheet.

Fig 6 showcases the calculator's integration with Excel, enabling seamless transfer of item totals for efficient record-keeping and analysis. This functionality enhances organizational capabilities, empowering shopkeepers to manage finances with precision and ease.



Fig 5. Adding items

Fig 5 showcases the capability to add items to the cart is exemplified, underscoring the calculator's convenience in managing inventory and facilitating seamless transactions.

Fig 7. Website Homepage

Fig 7 exhibits the website's homepage, offering a credit system for enhanced financial flexibility, seamlessly integrated with the calculator.

Fig 8. Data Uploaded to google spreadsheet.

Fig 8 displays customer details such as name, due amounts, and phone numbers being uploaded to Google Sheets, enhancing record-keeping and customer management capabilities.

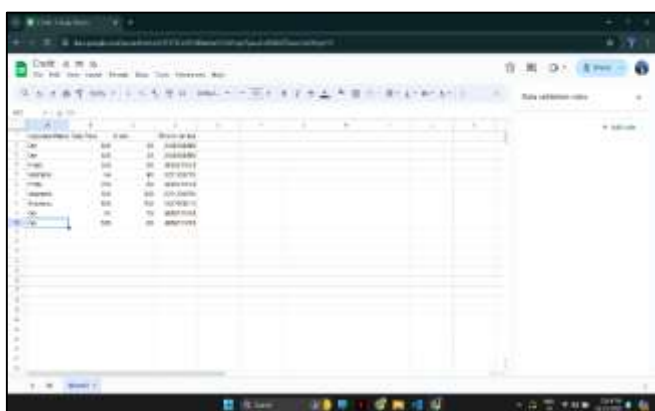




Fig 9. Analysis report.

Fig 9 displays sales and profit insights through various graphs, alongside total sales and profit figures. It offers the feature of viewing data on a monthly or weekly basis for enhanced analysis and decision-making.



Fig 10. Credit and Target report

Fig 10 shows the credit amounts per customer, total credit amount, and achieved profit targets. It also displays total profit on products for comprehensive financial insights.

VIII. CONCLUSION

In conclusion, this project has focused on developing a robust and user-centric e-commerce platform aimed at delivering a seamless and intuitive shopping experience. Through the implementation of dynamic features such as comprehensive inventory management, transparent pricing insights, and real-time alerts for inventory thresholds, the platform empowers users to efficiently navigate the online marketplace. The integration of user-friendly interfaces and proactive functionalities underscores our commitment to enhancing user satisfaction and streamlining operational processes. Moving forward, continual refinement and optimization will remain paramount to adapt to evolving user needs and technological advancements, ensuring the sustained success and relevance of our e-commerce ecosystem in the dynamic digital landscape.

IX. FUTURSCOPE

The project aims to integrate AI algorithms for predictive analytics and personalized recommendations, utilizing

machine learning for trend analysis and demand forecasting. Enhanced security features ensure data privacy, while IoT devices enable real-time monitoring of inventory levels and equipment status. Blockchain technology facilitates secure transaction tracking, while collaboration with third-party platforms expands functionality. Localization and customization options cater to specific business needs, with mobile applications enabling remote access and management. Reporting capabilities encompass advanced financial analysis, with continuous innovation to meet evolving demands. Implementation includes offline storage for data retention and automatic cloud uploads upon reconnection. Transitioning website functionalities into a mobile app enhances accessibility, utilizing cross-platform frameworks for efficient development.

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REFERENCES

- [1] N. Sohail and T. H. Sheikh, A study of inventory management system case study, *Journal of Dynamical and Control Systems*, vol. 10, no. 10, pp. 11761190, 2018.
- [2] R. Nadkarni and A. Ghewari, An inventory control using abc analysis and fsn analysis, *International Journal of Engineering, Business and Enterprise Applications*, vol. 16, no. 1, pp. 2428, 2016.
- [3] D. Plinere and A. Borisov, Case study on inventory management improvement, *Information Technology and Management Science*, vol. 18, no. 1, pp. 9196, 2015.
- [4] D. C. U. Cadavid and C. C. Zuluaga, A framework for decision support system in inventory management area, in *Ninth LACCEI Latin American and Caribbean Conf*, pp. 35, 2011.
- [5] Y. Kumar, R. K. Khaparde, K. Dewangan, G. K. Dewangan, J. S. Dhiwar, and D. Sahu, Fsn analysis for inventory management case study of sponge iron plant, *International Journal for Research in Applied Science & Engineering Technology (IURASET)*, vol. 5, no. 2, pp. 5357, 2017.
- [6] S. Mitra, M. S. Reddy, and K. Prince, Inventory control using fsn analysis a case study on a manufacturing industry, *International Journal of Innovative Science, Engineering & Technology*, vol. 2, no. 4, pp. 322325, 2015.
- [7] Y. S. Parihar, Internet of things and nodemcu a review of use of nodemcu esp8266 in iot products, *Journal of Emerging Technologies and Innovative Research*, vol. 6, no. 6, pp. 10851088, 2019.