

Cashew Factory Coordination System integrated with Real-Time Monitoring and Automation

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Abstract— The real problem for the Cashew Industry is small and medium-sized factories efforts to manage processing, inventory, workforce, and financial operations. Inefficiencies, errors and absence of real-time insights are usually the outcomes of using traditional manual record keeping methods. In order to overcome these challenges, this paper proposes an integrated digital solution as the Cashew Factory Coordination System (CFCS) that aims to automate the principal factory activities. Developed in Python for data processing and MySQL for secure database management, CFCS allows users to track cashew processing, employee attendance, salary calculation, and financial expenditures in real-time. It includes an interactive Admin Dashboard, role-based authentication, and operation analytics to support decision-making. It is designed using modular architecture where Tkinter is used for Graphical User Interface (GUI) design and the built-in Python SQL libraries or SQLAlchemy are used for interactions with the database. The system includes saving the records generated into a cloud storage like Google Drive providing system automation. By providing built-in measurement analytics, system improves efficiency, reduces manual error and creates data transparency allowing factory admins to monitor their workflow and make data driven decisions. CFCS plays a potent role here, significantly enhancing resources and productivity in cashew factories by giving a structured automated way.

Keywords - Cashew Industry, Process Automation, Real-time Monitoring, Database Management , Role-Based Access Control

I. INTRODUCTION

The cashew industry is growing fast as more people worldwide want cashews. But small and medium-sized factories find it hard to keep track of sales, costs, inventory, workers, and customer info. Old-school paper methods often cause mistakes and waste time so these factories need a computer system to make things run smoother and more .

To fix these problems, the Cashew Factory Coordination System (CFCS) aims to be a complete digital answer that brings together all the key parts of running a factory in one place. CFCS uses modern tech like Python to process data and MySQL to store it. This setup allows factories to see what's happening right now, makes everything clearer, and cuts down on manual work. As a result, factory owners can make better choices. This paper Nikhil Sawant Department of Information Technology Finolex Academy of Management and Technology Ratnagiri , India nikhilsawant6008@gmail.com

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puts forward CFCS as an organized, database-powered tool to boost cashew factory management. By logging activities , watching processes in real time, and showing data , the system tries to make things run smoother, cut down on mistakes, and give factory owners useful information to control their operations better.

II. LITERATURE REVIEW

Research points out the absence of a unified approach to link small-scale producers, suppliers, and distributors. This leads to waste in inventory and processing. Old-school systems depend on scattered record-keeping without central coordination. CFCS tackles this issue by merging cashew processing, inventory tracking, and client management into one platform. This ensures data sharing in real-time and boosts operational productivity [1].

Studies on supply chain performance often focus on economic measures while ignoring sustainability and operational efficiency. Many evaluation techniques don't track resource use and environmental effects in real time. CFCS uses sustainability-focused analytics and automatic data gathering to optimize resources, cut down on waste, and boost both economic and environmental sustainability[2].

Factory studies show that automation and real-time monitoring are crucial to increase productivity and improve decision-making. Old-school factory management depends on manual oversight, which creates inefficiencies. CFCS uses automation, procedure based tracking, and data operations and analytics to make workflow management smoother allowing for quick decisions and clear operations[3].

Financial limitations and lack of stakeholder participation have been identified as potential barriers to the adoption of eco-friendly practices in agro-processing industries.Generally, due to poor management systems, a large number of processing units are unable to optimally utilize their resources. CFCS uses automation tracking and more sustainable efficient workflows to find resource savings to engage funders through a single platform and promote production responsibly[4].

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Smart manufacturing systems rarely get integrated into smaller agricultural sectors such as cashew processing generally. Tiny farms might gain from savvy factory automation yet fragmented supply chains labor intensive processes and local production hinder them. CFCS bridges this gap applying smart factory principles seamlessly integrating real-time data tracking and automating cashew production[5].

Digital transformation in supply chains gets emphasized heavily yet smaller rural enterprises such as cashew processors usually falter digitally because of severe infrastructure deficits. It lacks depth in agricultural processing industries where traditional supply chain models are fragmented so CFCS offers a digital solution for smallscale cashew processors with inventory production and client management features[6].

Study largely ignores agro-processing industries dealing with highly perishable goods such as cashews in fairly rural areas. Sustainable practices in agro-processing remain largely unexamined regarding efficient resource utilization and waste reduction. CFCS tackles this shortfall streamlining cashew production with a system that minimizes waste , optimizes resources effectively for greater efficiency[7].

This study investigates on digitalisation but is predominantly stiff on megascale businesses, discarding small businesses claiming procedures that makes little use of engineering. The paper cannot cover the operational aspects in small cashew factories (such as manual inventory and production tracking).CFCS is all about providing digital tools to smaller cashew processing factories, ensuring that their production, inventory and workforce is completely coordinated, tracked and managed digitally and ensuring that the vision of smaller Industry Transformation to Digital is achieved[8].

Although the paper deals with smart manufacturing, it does not give attention to challenges in small manufacturing plants, including issues like lack of resources and their old operational systems. Agro-processing as many factories such as cashew production facilities have infrastructure to include advanced proper no technologies.CFCS bridges this gap by offering easy-to-use intelligent automation tech centered on cashew processing. This helps traditional agro-processing operations embrace digital tech without needing costly infrastructure[9]. The bulk of this research looks at how larger more advanced manufacturing settings take up Industry 4.0 technology. It does not answer questions of how those technologies can be translated to the agricultural sector, which is still in the nascent stage of automation and smart technologies. CFCS can improve supply chain performance and sustainability and facilitate access to technologies and systems for smaller-scale agro-processing industries by applying Industry 4.0 principles to the cashew production process (real-time data management, process automation and resource optimization, etc.)[10].

III. PROPOSED SYSTEM

The Cashew Factory Coordination System is an automation system of cashew processing factory. The system streamlines cashew processing, employee management, and financial monitoring features, reducing manual processes and increasing overall efficiency. Factory administrators can conveniently handle cashew processing details, manage employee records, keep track of expenses, and store client information in one place using a well-designed Admin Dashboard. It allows for greater coordination and operational control since all the necessary data is readily available and accessible.

The system carefully tracks all details for splitting cashews, organizing type heads, and processing to streamline the cashew processing workflow and provides real-time updates on production activity management. With its usability in attendance tracking, overtime calculations, and salary processing, the Employee Management module serves for smooth workforce administration. Both the initial project and the Expense Management feature contributes to more effective financial planning for factory operations and accountability. This module allows companies to have a well-organized database of clients, which in turn helps facilitate better communication and easier order processing.

The system ensure data integrity and security by implementing Authentication & Role-Based Access Control (RBAC), limiting access to data solely to authorized personnel. The system also features Reports which are saved on their cloud for easy access from any location they are present & Insights that provide detailed analytics on cashew production, employee performance, and financial outlays to enable data-driven decisions. With the incorporation of these advanced traits, the Cashew Factory Coordination System upgrades operational efficiency while also minimizing human errors, leading to better management of the factory.

IV. SYSTEM REQUIREMENTS

The system is a desktop application and for its smooth functioning , following computing environments should be considered :

- Compatibility with Windows, Linux , or macOS machine.
- Python 3.8 configuration and above with necessary dependencies as discussed in the system architecture section.
- Database System as MySQL 8.0 and above.

V. SYSTEM ARCHITECTURE

The system consists of several components, as depicted diagrammatically, and delivers an easy-to-use interface, efficient processing, and effective data management. The architecture is a logical segregation of the front end facilitating user interface, the backend managing key functionality and business logic, and the database implementing secure and effective data persistence, thus maximizing performance and reliability.

The system uses Python, a high-level objectoriented script language. The backend processing and the GUI handling of the system is done through Python as well, making it a seamless experience in terms of data processing



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- 1) Python Libraries Used -
 - A. Tkinter (GUI Development) The default Python GUI and it is used to develop an interactive and user-friendly interface to the Cashew Factory Coordination System.It uses a quick and easy approach to design forms, buttons and dashboards also making it suitable for factory operation management.
 - B. Pip (Package Management) To install the packages required by Python to integrate dependency required as part of the system.
 - C. Pillow (Image Processing) Enables the system to process image-batch images for cashew or store records with scanned documents.
 - D. Google Drive API (File Upload) Enables the system user to connect to the drive cloud and store their data files there securely by authenticating their drive credentials and by providing automation.
 - E. Python SQL Libraries Used for the interaction with MySQL to perform their respective CRUD (Create, Read, Update, Delete) operation.
- 2) Database (MySQL) Used as a RDBMS to maintain all data related to cashew processing, employee attendance, salaries, and clients and all the simultaneous details.It makes the system scalable and maintainable by ensuring optimized storage, retrieval, and manipulation of data through a structured schema.
- Authentication and Security Factory admins can only add/update data as it sensitive for any industry operations. To ensure data integrity and security, user authentication is carried out in the Python backend.



Figure 1. Hierarchical Process Flow Diagram of System



Figure 2. Data Flow Diagram (DFD) – Level 1 of System

This layered modular architecture provides an abstraction layer towards the frontend interface as well as a backend processing layer which will allow completion and automation of the key factory operations. This design allows communication among for efficient user interface components, backend logic, and database layer, enabling realtime tracking of cashew processing, employee records, expenses, and client information. A scalable design leveraging structured data integration with authentication support, ensures optimal processing flow for the cashew industry, thus guaranteeing improved operations with better data management and results.

VI. RESULTS

The Cashew Factory Coordination System developed has following core functionalities:



Figure 3. Login Page

The login page provides security ensuring only authorized admin or user can access the system.





Figure 4. Home Page

The home page of system displays the details of what were the last day expenses in factory, the last day sales of cashews and the amount of payment pending from the clients of the factory managed by the system. The home page updates automatically the data once the details are entered into the system as suppose no sales were done last day and no expenses were done on previous day so it does not show the details and the payment pending displayed if once paid the details showed would be cleared at the home page.



Figure 5. Stock Maintenance Page

The stock maintenance page displays the initial table of cashews stock as described in Figure 5 where the admin can enter the details of each type of cashew and its region as how many cashews are available with them and likewise update the stock details. In the "All Changes" table as described in Figure 5 the changes are recorded with the timestamp as for every transaction like if the current table data of stock is changed by admin it shows its old as well as new value and if sales occur of a particular cashew then its stock gets subtracted from previous stocks and if production of cashews are done it gets add to the current stocks and likewise the stocks data changes dynamically.



Figure 6. Reports Page

The Reports page of the system shows the detailed data into the system based on sales , raw materials , production and the stock changes happened month wise. As shown in Figure 6 the Sales data for the month of March and its details are fetched and this report in form of excel file is stored on the admin or user drive providing automation as admin can access it from anywhere, anytime without checking in by logging into the system and can use it for graph generation if needed.

VII. CONCLUSION AND FUTURE SCOPE

The Cashew Factory System aims to create an automated platform with GUI built using Python that will facilitate the co-ordination of cashew processing, employee records, salary calculation, expenses and client management. It improves industrial works due to its ability to reduce manual work, this factor also enhances efficiency, accuracy, and better coordination of factory operations. It also allows generating reports and accessing them from any location or time that help the administrators to follow and evaluate the most important processes in the factory.

It helps to manage factories in a structured manner giving more context to the data collected which will improve data accuracy, data transparency and workflow. The combination of report generation in cloud and real-time tracking makes decision-making easy for administrators, resulting in improved resource management and operational control.

In context of future scope and work the system can use Artificial Intelligence and Machine Learning insights for Improved production planning, advanced cloud deployed insights and Multi-Language Support capabilities.

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