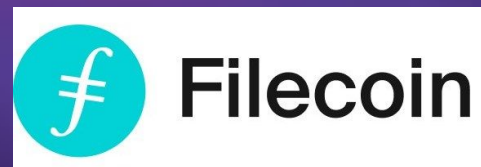
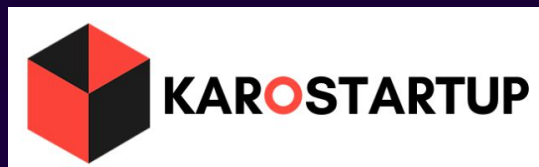


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Basic Details of the team

- ❑ **Idea Title : Inventory Management and Monitoring System**
- ❑ **Team/ Startup name : Stellar**
- ❑ **Team leader : Chanchal Rathad**
- ❑ **Other Team Members : Sahil A. Sawant, Sumitkumar Chandanshive**
- ❑ **Track : Classic Tech Track**

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Problem Statement Details

Businesses of all sizes and industries face significant challenges in managing their inventory effectively. Manual inventory tracking, outdated methods of data collection, and lack of real-time visibility often lead to inefficiencies, errors, and increased costs. Overstocking or stockouts can result in financial losses, decreased customer satisfaction, and hindered business growth. Additionally, maintaining proper storage conditions for sensitive or perishable goods poses a constant challenge, as deviations from optimal conditions can lead to product spoilage, wastage, and regulatory non-compliance.

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Relevance, Significance and Survey

Financial Impact: In a survey conducted by the National Retail Federation (NRF), it was found that inventory shrinkage cost retailers an average of 1.62% of their total sales in 2020. This loss, amounting to over \$61 billion, is attributed to factors such as shoplifting, employee theft, administrative errors, and inaccurate inventory tracking. The implementation of an efficient Inventory Management and Monitoring System can significantly reduce these losses by providing real-time visibility into inventory levels, detecting discrepancies, and facilitating proactive measures to prevent shrinkage. (Source: National Retail Federation, "National Retail Security Survey 2020")

Customer Satisfaction: A survey conducted by IHL Group revealed that 24% of consumers experienced stockouts while shopping in physical stores, and 30% of those customers left the store without making a purchase as a result. Furthermore, 42% of customers said they would not return to a store that caused them to experience a stockout. This underscores the critical link between inventory availability and customer satisfaction. By ensuring accurate inventory monitoring and replenishment through our Inventory Management System, businesses can enhance customer experiences, retain loyalty, and boost revenue. (Source: IHL Group, "Out-of-Stock, Out of Luck 2019")

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Proposed Solution

Our proposed solution is an advanced Inventory Management and Monitoring System that leverages cutting-edge IoT (Internet of Things) technology, automation, and real-time data analysis to effectively solve the challenges associated with traditional inventory management processes. Our approach encompasses the integration of hardware components, software systems, and data analytics to provide a comprehensive and intelligent solution.

Our approach involves the integration of three key stages using embedded systems: Node MCU ESP8266, Raspberry Pi 4B, and Arduino Uno R3. Each stage contributes unique capabilities to the overall system, allowing for real-time inventory monitoring, environmental monitoring, safety control, and automated notifications.

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Unique Selling Points (USPs):

1. **Multi-Stage Integration:** The integration of three different embedded systems platforms allows for a holistic and comprehensive solution that addresses various aspects of inventory management, ensuring accurate monitoring, control, and decision support.
2. **Real-time Monitoring and Analysis:** Our system provides real-time visibility into inventory levels, temperature, and gas conditions. This real-time data enables businesses to make informed decisions, optimize inventory levels, and respond promptly to market demands.
3. **Automation and Efficiency:** The system automates tasks such as quantity calculation, billing, and emailing. This reduces errors, improves accuracy, and enhances operational efficiency, freeing up valuable human resources for more strategic tasks.
4. **Safety and Compliance:** Our system includes environmental monitoring capabilities for temperature and gas levels. This ensures that inventory is stored under optimal conditions, reducing the risk of spoilage, quality deterioration, and regulatory non-compliance.

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Frameworks/Technologies:

1. **IoT Platform:** ThingSpeak for real-time data storage and visualization.
2. **Communication Protocols:** Wi-Fi communication for real-time data exchange.
3. **Programming Languages:** Arduino C++, Python, and relevant libraries for sensor interfacing and control.
4. **Data Analysis:** Basic data analysis using embedded platforms for demand pattern insights.
5. **Wireless Sensor Integration:** Utilizing wireless communication for real-time data exchange, reducing the need for manual data collection.
6. **Environmental Monitoring:** Incorporating gas and temperature sensors to enhance safety and compliance.
7. **Automated Billing:** Implementing an automated billing system based on real-time item quantity measurements.

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Key Feature and Functionality

1. **Real-Time Inventory Monitoring:** The system employs ultrasonic sensors and Node MCU ESP8266 to provide accurate, real-time monitoring of inventory levels. This ensures businesses always have up-to-date information on stock quantities.
2. **Automated Notifications:** When inventory levels reach predefined thresholds, the system sends automated email notifications to relevant stakeholders, prompting timely stock replenishment and minimizing the risk of stockouts.
3. **Environmental Monitoring:** Utilizing Raspberry Pi 4B, the system continuously tracks temperature and gas levels within the storage area. This proactive monitoring ensures optimal storage conditions, reducing the likelihood of product spoilage or damage.
4. **Bill Generation and Emailing:** Raspberry Pi 4B calculates total quantities of items purchased and generates automated bills for customers. The generated bills are then emailed to customers, streamlining the billing process and enhancing customer satisfaction.

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Market Size and Potential for Growth

The global inventory management software market has been steadily growing, driven by the increasing adoption of automation and IoT technologies. The market size is projected to reach USD 4.11 billion by 2027, with a compound annual growth rate (CAGR) of 8.3% during the forecast period. As businesses recognize the importance of streamlined inventory processes, the demand for innovative solutions like ours is expected to grow, especially among small and medium-sized enterprises looking to enhance operational efficiency.

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Competitive Landscape :

Key competitors in the market include established inventory management software providers, as well as emerging IoT-based solutions. While there are several players offering inventory management software, our solution differentiates itself in the following ways:

Real-Time Monitoring and Automation:

Our system offers real-time inventory monitoring using IoT capabilities, enabling businesses to make informed decisions promptly. Unlike traditional software, our solution **automates** notifications for stock replenishment and environmental alerts, reducing manual intervention and minimizing stockouts.

Integration of Multiple Platforms:

Our system leverages the strengths of Node MCU ESP8266, Raspberry Pi 4B, and Arduino Uno R3, combining their capabilities for a comprehensive solution. This unique integration allows for a more holistic approach to inventory management, enabling functionalities such as real-time inventory monitoring, environmental control, and automated billing.

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Financial Projections and Funding Ask:

As of now, it appears that the Prototype is in its development stage and has not yet started generating revenue. Therefore, financial projections would be speculative. However, once the Prototype Model is ready for market launch, we would prepare a detailed financial projections covering sales forecasts, costs, and potential revenue from device sales, subscriptions, and licensing.

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Future Prospects

In the coming years, we envision our inventory management solution evolving into a market leader by scaling its user base, integrating advanced technologies like AI and machine learning, fostering global partnerships, and diversifying revenue streams through data monetization and premium analytics services, all while maintaining a strong focus on sustainability, mobile accessibility, and community engagement to solidify our position as a comprehensive and forward-looking solution for businesses seeking efficient, data-driven inventory management.