Paper To Cloud: Digitizing Warehouse Management With A Mobile-Based Solution

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Abstract:

Effective warehouse management is critical for ensuring smooth operations and optimizing resource utilization. Traditional methods often involve manual data entry and are prone to errors, leading to inefficiencies and inaccuracies. This paper presents a case study of leveraging barcode technology through an Appsheet application to streamline warehouse management processes. The application enables users to efficiently handle put-away and picking tasks by simply scanning barcodes associated with materials and locations. Through a user-friendly dashboard interface, users can easily locate items and manage inventory in real-time. This paper discusses the design, implementation, and evaluation of the application, highlighting its effectiveness in improving efficiency, accuracy, and overall warehouse management.

Introduction:

Warehousing plays a pivotal role in the supply chain, serving as a hub for storing, managing, and distributing goods. Efficient warehouse management is essential for meeting customer demands, reducing costs, and enhancing productivity. Traditional warehouse management methods often rely on manual processes, which are labour-intensive and error-prone. With the advent of barcode technology and mobile applications, there is an opportunity to streamline warehouse operations and enhance efficiency. This paper explores the development and implementation of a warehouse management application built using Appsheet, a no-code platform, to illustrate how barcode technology can revolutionize warehouse management.

Literature Review:

The literature review encompasses three studies that investigate challenges and potential solutions in the management of inventory and logistics operations within different industries. Each study emphasizes the need for improvements in efficiency, accuracy, and adaptability through the integration of technological solutions.

Paper 1: Challenges in Small and Medium Transport Companies:

The first paper examines the operational challenges faced by small and medium-sized transport companies compared to larger counterparts. It identifies coordination, truck assignment, availability, and operational planning as key areas requiring improvement. Manual processes using Excel software are common, leading to inefficiencies and delays in planning. The study highlights the need for standardized rules, database design, and user-friendly applications to streamline operations and improve productivity.

Paper 2: Inventory Management in Manufacturing Companies:

The second paper focuses on inventory management practices in a manufacturing company specializing in tinplate production. It identifies issues such as wrong ticketing and shipment errors leading to customer claims. The study emphasizes the importance of accurate inventory tracking and management to ensure product quality and customer satisfaction. It suggests the adoption of digital solutions to address inventory-related challenges and improve warehouse operations.

Paper 3: Aircraft Spares Inventory Management:

The third paper explores the complexities of managing aircraft spares inventory within the Zambia Air Force. It highlights the challenges associated with storing and tracking diverse spare parts using manual systems. The study advocates for the automation of inventory processes using cloud architecture and barcode technology. Barcode technology is preferred for its simplicity, cost-effectiveness, and maturity compared to RFID and NFC technologies. The paper underscores the role of Information and Communication Technology (ICT) in enhancing inventory management efficiency and effectiveness.

Overall, the literature review reveals common themes across the three studies, including the need for technological advancements to overcome operational challenges in inventory management and logistics. While each industry faces unique issues, such as coordination in transport companies, ticketing errors in manufacturing, and tracking small spares in the aviation sector, the underlying recommendation is consistent: the adoption of digital solutions, such as database design, mobile applications, and barcode technology, can significantly improve workflow efficiency, accuracy, and decision-making capabilities.

Design and Development:

The development process encompasses several key aspects, including database design, user interface design, and workflow implementation.

1. Database Design:

- The first step in developing the warehouse management application is to design the database structure. This involves determining the tables, fields, and relationships necessary to store and manage data effectively.

Move In	Release	Move Out	Status	Stock
• Shipper code • Location • Move In ID • Batch • Move-in Date	• Shipper Code • Move Out Date	• Shipper Code • Location • Batch • Move Out Date	• Batch • In hand Qty.	Warehouse Status Batch In Qty Out Qty Total Qty Search Location Out Date

- This database include tables for materials, locations, inventory transactions. Each table will have specific fields to capture relevant data, such as item codes, descriptions, and storage locations.

- Relationships between tables has been established to ensure data integrity and enable seamless retrieval of information during operations.

2. User Interface Design:
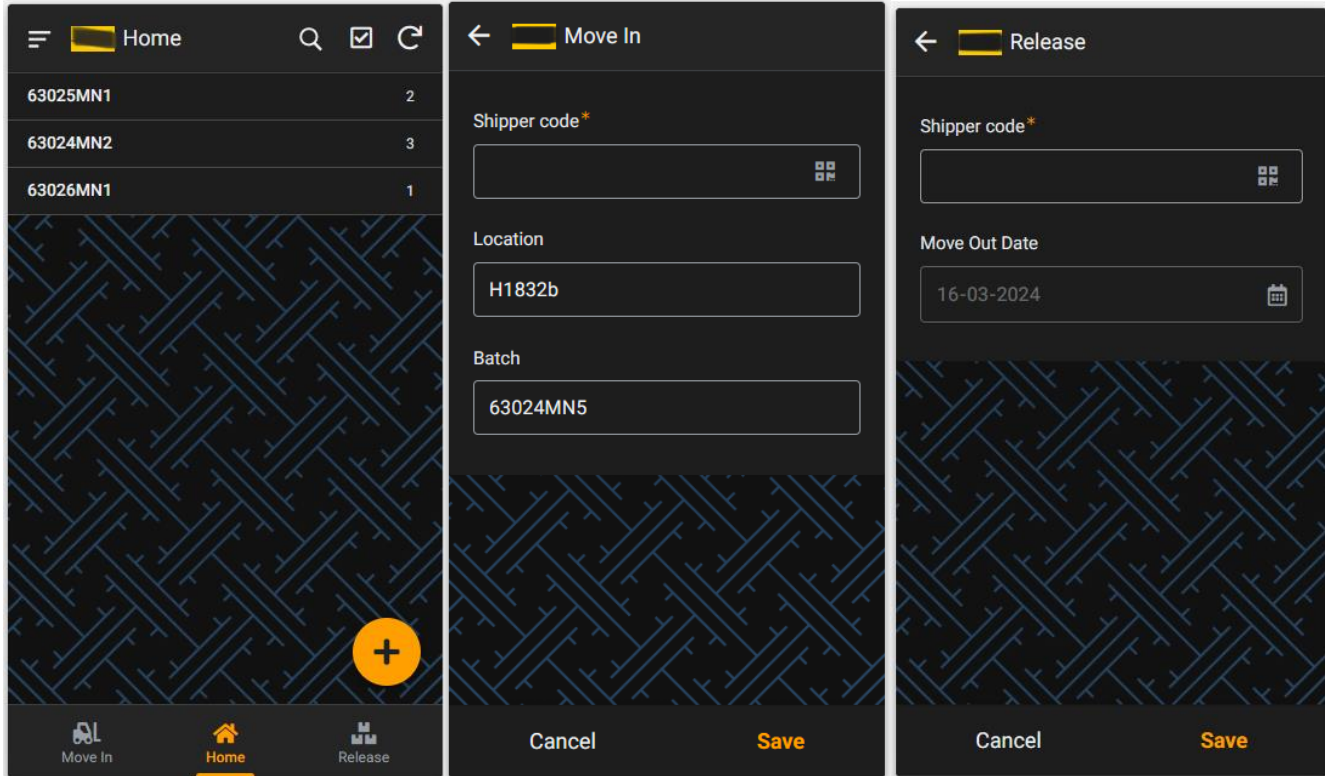
(Figure 1: This shows all the tabs of application. Where Shipper code are barcode based scan and fill.)

4. Workflow Implementation:

- The workflow of the application encompass various tasks and processes involved in warehouse management, such as put-away, picking, inventory adjustments, and stock transfers.

- It start with Put-away where worker can scan the barcode and fill the location and the data base is updated.

- As per operation planning the material list is generated and location is provided along with the list to worker.

- Worker pick the material and confirm by releasing and data base is updated. (rack is empty)

5. Application Architecture and Workflow Diagrams:

- Diagrams illustrating the application architecture and workflow included to provide a visual representation of how the system operates.

- The application architecture diagram will depict the components and layers of the application, including the front-end interface, back-end database.
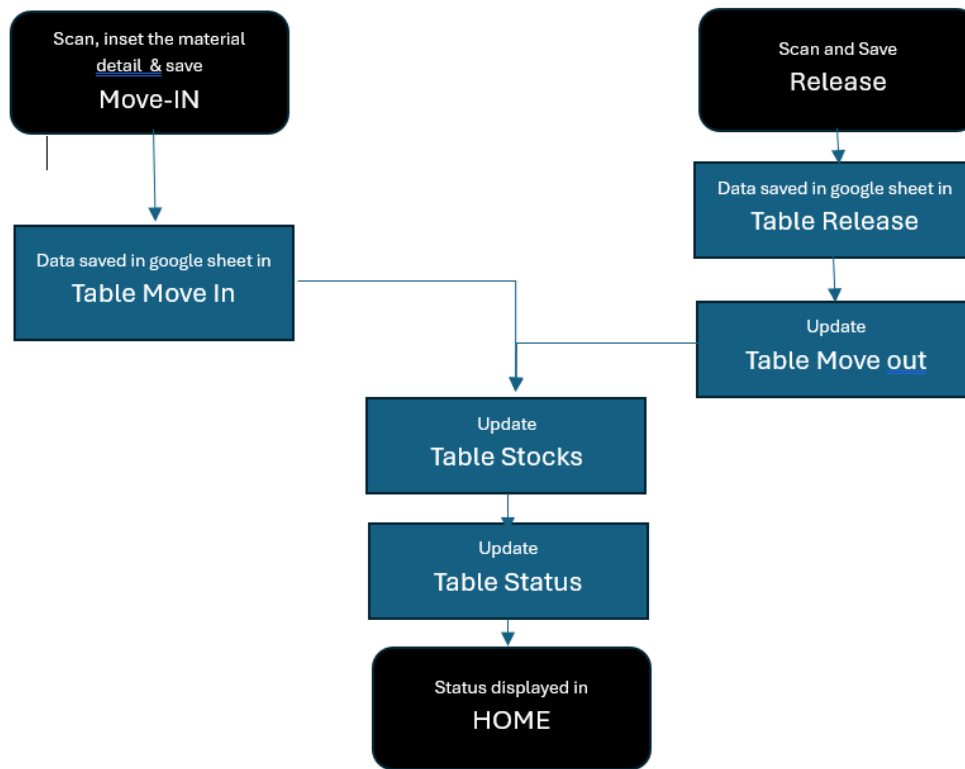
(Figure 2: Application Architecture and Workflow Diagram. Where Black colour is for application UI tabs and the Blue coloured is Tables from google sheet where data is been stored)

Implementation:

The implementation or deploying the warehouse management application in a real-world warehouse setting. It elucidates the training process undertaken for users, the integration with existing systems, and any customization or modifications made to adapt to specific warehouse requirements.

- • Data Migration and Validation: Prior to full deployment, a comprehensive data migration process was undertaken to transfer existing warehouse data into the new application. Data validation procedures were implemented to ensure the accuracy and integrity of the migrated data, minimizing the risk of errors during transition.

- • Performance Testing and Optimization: Rigorous performance testing was conducted to assess the application's responsiveness, scalability, and reliability under various load conditions. Performance optimization techniques were applied to address any bottlenecks and enhance the application's efficiency, particularly during peak usage periods.

- • Continuous Monitoring and Support: Following deployment, ongoing monitoring and support mechanisms were established to ensure the smooth operation of the warehouse management application. This involved proactive monitoring of system performance, troubleshooting of any issues or errors encountered by users, and providing timely software updates and patches to address vulnerabilities and enhance functionality.

- User Feedback and Iterative Improvement: A feedback mechanism was incorporated into the application to solicit input from users regarding their experiences, challenges, and suggestions for improvement. Regular feedback sessions and surveys were conducted to gather insights into user satisfaction and identify areas for further enhancement. This iterative approach allowed for continuous improvement and refinement of the application based on user feedback and evolving business requirements.

- By addressing these additional aspects during the implementation process, ABC Warehouse was able to ensure a seamless transition to the new mobile-based warehouse management solution, maximizing its effectiveness and value in improving operational efficiency and productivity.

Case Study:

- Company Background: ABC Warehouse is a large-sized third-party warehouse management company based in Ankleshwer, India. With a diverse range of products and a growing customer base, efficient warehouse management is crucial for the company's success. However, they don't want to expend money as all the warehouse is serving different company (customer), so product and process both are different and same time traditional manual processes were leading to inefficiencies, errors, and delays in operations.

- Implementation of Mobile-Based Solution: Recognizing the need for technological advancement, ABC Warehouse decided to implement a mobile-based warehouse management solution built using Appsheet. The solution leveraged barcode technology to streamline key warehouse processes such as put-away, picking, inventory adjustments, and stock transfers.

- Training Process for Users: Prior to implementation, comprehensive training sessions were conducted for warehouse personnel. Hands-on training ensured that employees were proficient in navigating the application, scanning barcodes, and performing inventory transactions efficiently.

- Integration with Existing Systems: Efforts were made to seamlessly integrate the new warehouse management application with ABC Warehouse's existing systems, including their ERP software. Compatibility checks and data synchronization mechanisms were put in place to facilitate smooth communication between different platforms.

- Customization and Modifications: The mobile-based solution was customized to meet the specific requirements of ABC Warehouse. User roles and permissions were configured to control access to sensitive data, while custom workflows were designed to align with the company's operational processes. Continuous feedback from users was used to make further improvements and enhancements to the application.

- Results and Benefits:

1. The implementation of the mobile-based warehouse management solution yielded significant benefits for ABC Warehouse:

2. Improved Efficiency: Warehouse processes were streamlined, leading to faster put-away and picking operations. Barcode scanning reduced manual errors and minimized the time required to locate items within the warehouse.

3. Enhanced Accuracy: Real-time inventory tracking provided greater visibility into stock levels and locations. This reduced instances of stockouts, overstocking, and inventory discrepancies, improving overall accuracy in inventory management.

4. Increased Productivity: With simplified workflows and user-friendly interfaces, warehouse personnel were able to complete tasks more efficiently. This resulted in higher productivity levels and reduced operational costs for the company.

5. Empowered Decision-Making: The availability of real-time data allowed managers to make informed decisions regarding inventory allocation, replenishment, and resource utilization. This enhanced decision-making capabilities contributed to better overall warehouse management.

Discussion: Discussion:

The case study of ABC Warehouse vividly demonstrates how the integration of mobile-based warehouse management solutions can revolutionize conventional warehouse operations. Through the adoption of barcode technology and the implementation of mobile applications, companies can witness profound enhancements in operational efficiency, accuracy, and overall productivity.

Implications for Warehouse Management Practices: The discussion delves the implications of the warehouse management application on improving efficiency, accuracy, and productivity in warehouse operations. It explores how the adoption of barcode technology and mobile-based solutions can streamline processes, enhance inventory visibility, and empower warehouse personnel to make informed decisions in real-time.

Limitations and Future Research: While the implementation of the application yielded positive outcomes, certain limitations were identified during the process. These may include technical constraints, user adoption challenges, or constraints imposed by the existing infrastructure. The discussion will offer insights into addressing these limitations and suggest avenues for future research to further optimize warehouse management practices.

Conclusion:

In conclusion, the case study underscores the paramount importance of embracing technological advancements in the realm of warehouse management. By digitizing processes and harnessing the potential of mobile-based solutions, companies like ABC Warehouse can successfully navigate through traditional hurdles, elevate operational efficiency, and foster sustainable growth amidst the ever-evolving landscape of modern business competition.

7 References:**

- Frusman, Pengky and Wibisono, Dermawan (2014) Design and implementation of warehouse management improvement strategy using barcode system approch at PT Latinusa Tbk. In: 4th International Conference on Technology and Operations Management (ICTOM04), 18-19 August 2014, Kuala Lumpur, Malaysia.

- THE DEVELOPMENT OF APP SHEETS FOR DATABASE DESIGN TO APPLY TRANSPORT PLANNING APPLICATION THE DEVELOPMENT OF APP SHEETS FOR DATABASE DESIGN TO APPLY TRANSPORT PLANNING APPLICATION | INTERNATIONAL ACADEMIC MULTIDISCIPLINARY RESEARCH CONFERENCE IN SEOUL 2023 (ssru.ac.th)

- A Web based Inventory Control System using Cloud Architecture and Barcode Technology for Zambia Air Force A Web based Inventory Control System using Cloud Architecture and Barcode Technology for Zambia Air Force (semanticscholar.org)

- Andrey Borodina, Evgenia Prokofievab, Vitaly Panina & Alexander Erofeev (2020), ‖ Hybrid Intelligent Systems of Cooperative Transportation Planning ‖, Transportation Research Procedia, Vol. 54, Pp. 92–103.

- Dumrongrit Chantra (2021), ‖AppSheets Application Program Application Development for Physical Education Teaching in Volleyball Subject of Referee's Symbol ‖, Sisaket Rajabhat University Journal, Vol. 14, No. 1, Pp. 83–94.

- Schmidt, Thorsten, 2006, Warehouse Management: Automation and Organisation of Warehouse and Order Picking Systems, Springer

- A. Chandrasekharan et al., "Barcode Enabled Event Management System for Logistics and Consumables Management," International Journal of Advanced Research in Computer and Communication Engineering, vol. 2, no. 11, pp. 4273-4277, November 2013.