Application of Green Logistics and Database Design in Developing a Real-Time Inventory Management System Using AppSheet

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Abstract

This project plans to develop a real-time inventory management system software on the user friendly AppSheet platform and also develop a database which is eco-friendly with regards to paper usage. The goal is to eliminate the usage of paper based processes in inventory control. There is probability to achieve this by removing unneeded activities and enabling sellers and managers to have access to current inventory data. A Desktop and Mobile cross platform application was created based on user views and selection of certain database. After the language application was deployed document processing time was reduced to 15.43 seconds and this enhanced the application's efficiency by 71.64% from the previous 54.40 seconds. This also resulted in only 2 - 4 sheets of paper being consumed monthly when the average consumption 50.5 sheets. Thus they efficiently saved 1.2 reams of paper and 151.5 baht per year. Warehouse staff rated the software technology at overall 4 of 5 score for its ease of use and so it was well received. Studies show that companies should slash time and cost by using the inventory management.

Keywords: Inventory Management, Green Logistics, Database Design, Low-Code/No-Code, Application Development

1. Introduction

Effective management of inventory systems is an integral aspect that directly impacts the effectiveness and the longevity of business enterprises in today's world. Outdated systems which heighten operational costs such as paper-based systems only serve to worsen the state of the environment. This has led to an increased concern for green logistics with the intention of decreasing the adverse environmental impacts caused by logistics.

Recent advances in technology have made it possible for inventory management to be less reliant on complex software coding by using approaches termed Low Code / No Code. Development and updates of the system have likewise improved in a more refined manner. For example among these, AppSheet stands out since it allows users to develop apps without the requirement to understand programming.

Merging the goals of Green Logistics with the proper use of Low Code / No Code approaches in conjunction with efficient database design allows developers of inventory management software to enhance the availability of real time data while minimizing paper

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wastage and eliminating unnecessary procedures. These systems have a direct positive impact on the quality of decisions made and the functioning of an organization, thus fostering a better and more efficient organizational climate.

Table 1: Monthly Paper Usage Over 12 Months

Month	Paper (Pages)	Month	Paper (Pages)
1	45	7	45
2	49	8	54
3	45	9	57
4	48	10	57
5	57	11	53
6	45	12	51
Average = 50.4 Pages			

Table 1 shows the total sheets of paper used by the staff including requisition and distribution for the previous 12 months on a monthly basis. The data encompasses a monthly use between 45 and 65 sheets with 50.4 sheets becoming an average with baffling clarity.

This table emphasizes the operational paper consumption attributable to the documentation process for handling inventory materials. The Andersen Corporation report also indicates that the company has highly suppressed the annual internal use of paper, primarily as a result of the investments made to develop the D05 Document Management System, which has reduced paper use by over 20 percent. These numbers can function as a starting point for exploring consumption trends and working out methods for boosting the effectiveness of resource management and minimizing the need for paper.

2. Research Objective

To develop an application that makes it easier for warehouse managers to access real-time data, simplify operations, and streamline inventory tasks. At the same time, the app will help those who need to make product requests. We plan to achieve this within the set timeframe by using AppSheet, a low-code/no-code platform, to build a real-time inventory management solution.

To be environmentally conscious by reducing the environmental impact of our operations. We aim to improve the company’s efficiency by using less paper and promoting sustainable practices throughout the inventory management process.

3. Methods

The aim of this research is to develop a sustainable, technologically advanced solution to the inefficiencies in traditional inventory management procedures. The number of systematic processes that make up the technique has been rigged to ensure the fulfillment of the goals of the study.

3.1 Analysis of Current Inventory Processes This involves starting the study by performing an in-depth analysis of the prevailing inventory management workflows. That includes bottlenecks—activities that hinder both sustainability and productivity, like too much

paperwork and a lot of unnecessary steps within the operations—on information collection are gathered through observation and interviews of the product requesters and warehouse employees to understand problems and needs.

3.2 Application of Green Logistics Principles The study integrates green logistic concepts in establishing sustainable inventory management processes. These concepts guide the reduction of paper usage and hence its impact on the environment. The success of the proposed methodology is however indicated by the measurable objectives like percentage reduction in the use of paper.

3.3 Database Design The database design allows for proper management, storage, and retrieval of inventory data. The normalized schemas were to ensure the data was appropriate and integrated well with the application; real-time updating of databases allows for timely and accurate decision-making.

3.4 Application Development Develop a real-time inventory management application using the low-code/no-code AppSheet platform. The application has been developed with a very user-friendly UI so that the warehouse employees can adapt to it easily. It consists of notifications to enhance operating efficiency, automatic reporting, and real-time inventory tracking.

3.5 System Testing and Iteration It is then put into a simulated environment to test the application properly and find any potential issues. The feedback from the users is also considered at this stage to ensure that the system meets their needs. Collected feedback is then used to make iterative adjustments in the improvement of the application both in terms of usability and functionality.

3.6 Implementation and Monitoring It is installed in a live warehouse. The employees are given great training on the usage of the system. The procedure is monitored during the implementation process using key metrics such as paper usage, processing time, and user satisfaction.

3.7 Evaluation of Outcomes Comparing data before and after adoption are presented to give an assessment of the application. It justifies its efficacy with some of the below metrics: paper usage reduction, processing speed increases, and user happiness.

3.8 Documentation and Reporting The process of the research is documented properly from analysis through to the implementation stage. The final report summarizes the research methodology, its findings, and contributions. It is also indicated how the system can be extended in the future toward other organizational processes.

In terms of methodology, the approach is followed by ensuring that systematic and replicable means of attaining its goals are in place. The principles of green logistics and modern technology shall be combined in an effort to improve the operation, efficiency, and sustainability of inventory management processes.

4. Findings and Discussion

4.1 Green Logistics

Paper could apply real-time inventory management applications for improving productivity while reducing the amount of paper used in logistic procedures by using a Low-Code/No-Code platform like AppSheet, based on the principles below of Green Logistic.

- Green Warehousing: Replacement of paper-based records with digital inventory management systems makes practice green warehousing.
- Green Logistics Data Management: The use of technology to track and monitor the inventory in real time would increase operational efficiency and encourage environmentally friendly logistics methods.
- Waste Management: In the long run, a reduction in the use of papers would yield lesser rubbish, which is in line with sustainable waste management methods.

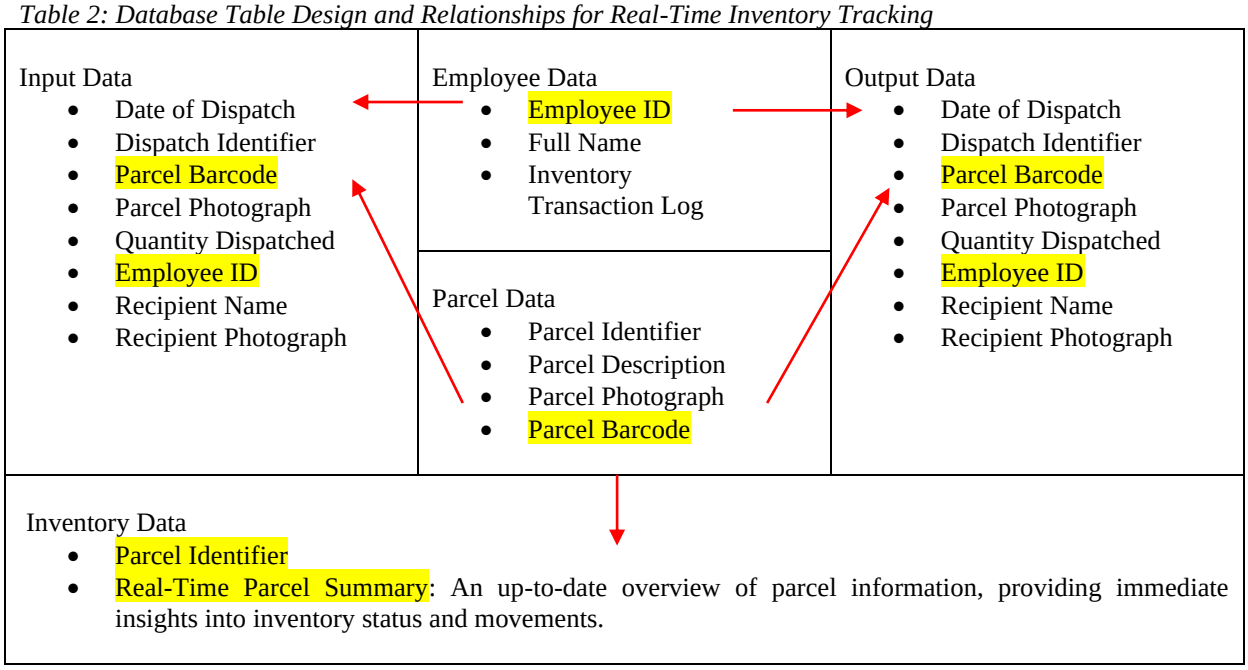
This actually feeds into related ideas discussed in the literature, such as Sladkowski et al. (2017), who work on integrating green logistics within the theories of sustainable development. Dissorn (2018) takes this further in terms of creativity with his work on green logistic models for sustainable inventory management. This project feeds into these more generic objectives of environmental sustainability and operational efficiency within logistics through adherence to these principles.

4.2 Design of Databases

A well-placed database design ensures effectiveness, precision, and reliability of the data management systems. The centralized structure allows the different parts of the system to blend well, hence reducing redundancy but at the same time ensuring data integrity. As such, this system's Parcel Data serves as a central repository connecting all Input, Output, Employee, and Inventory data for the assurance of integrity. This has been taken further in normalization, by eliminating duplication and establishing logical relationships between the tables by the use of primary and foreign keys. The inclusion of Employee ID and Parcel Identifier in each of the tables will reduce inconsistencies and ensure that this process can go much faster. Much greater scalability is introduced into the system, therefore easily adapting to future additions and changes. Also, since it offers real-time visibility into the inventory levels and operational status, the real-time access to summarized information from several tables, for instance, the Inventory Data table increases the decision capabilities. Venkataraman, Hoffer and Topi

(2016) Moreover, sustainable logistics principles play an essential role in modern database design. As highlighted by Nampinyo et al. (2022)

Table 2: Database Table Design and Relationships for Real-Time Inventory Tracking



4.3 Design of Centralized Database System for Real-Time Inventory Management

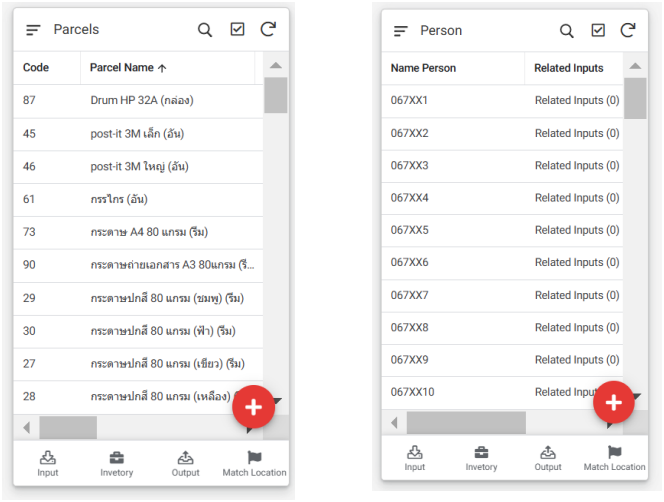
Effective inventory management system needs a strong, centralized database system that integrates all input and output processes in order to allow real-time visibility of stock levels. This article shows the design of a database system tailored for such purposes, pointing out important elements and how they interlink within a Google Sheet.

4.4 Building Applications

The Input Data table is the entry point for all items arriving into the inventory. It contains information such as the date of dispatch, a unique dispatch identifier, and parcel-specific details like barcodes and photographs. This data is linked to the responsible employees by their IDs and accountable personnel through recipient details. The table feeds directly into both the Parcel Data table and the Inventory Data table, allowing tracking at every point.

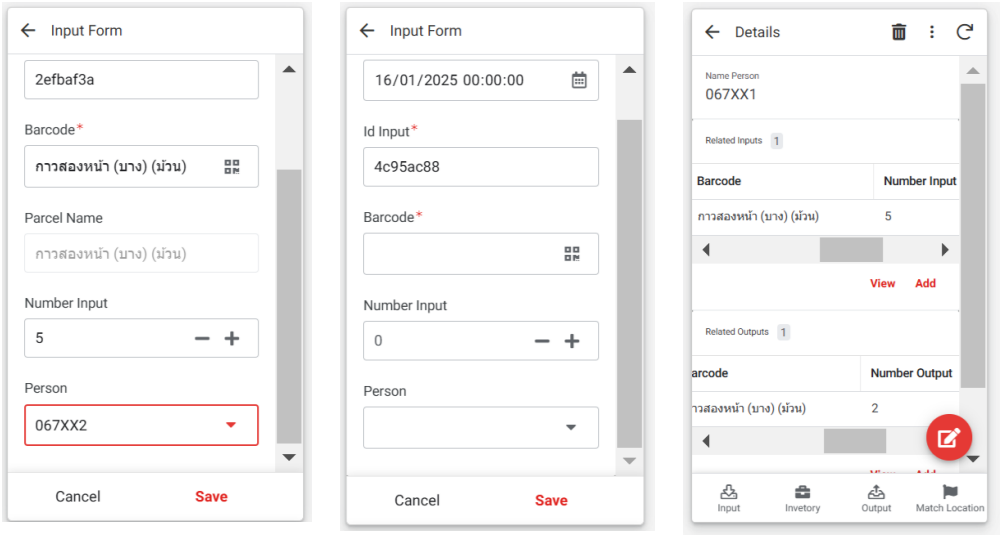
The Employee Data table holds the records of all the staff members involved in inventory operation. It comprises unique identifiers of each employee, full names, and logs of different transactions. This table is very necessary because it links employees to certain actions recorded in both the Input and Output Data tables, and hence the system in Figure 1 is made transparent and accountable.

Figure 1: Parcel Data & Employee Data



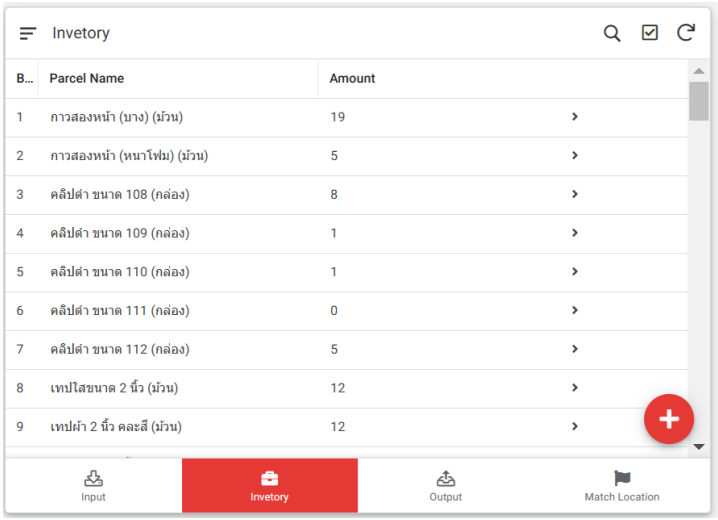
Central to the system, the Parcel Data table acts as a repository for detailed parcel information. It includes unique parcel identifiers, textual descriptions, and barcode and photograph data. This table forms the backbone of the database, connecting data from Input and Output operations while supporting real-time tracking in the Inventory Data table. The Output Data table stores products sent out from inventory. The information included covers recipient details, the identifier used, quantity, and dates on which these transactions take place. This table has relations with Employee Data and Parcel Data in the same manner as Input data. It indicates those employees responsible for every transaction, in addition to proving item information as with input data.

Figure 2: Input Data, Output Data and Employee Record Data



Lastly, the Inventory Data table finally combines data from all other tables in order to provide insights in real time. Stock levels are displayed in bar charts and real-time summaries for effective decision-making. This table supplies information from the Input, Output, and Parcel Data tables, so that inventory status is always correct and up to date.

Figure 3: Inventory Real-Time



4.5 Results of Data Collection

Testing and data collection from the real-time inventory management database system brought about high operational efficiency and effective green logistics regulation compliance. Compared to the former paper-based approaches, the new Low-Code/No-Code AppSheet platform-built system has reduced the average document processing time from 54.40 to only 15.43 seconds, with an increase in efficiency by 71.64%.This not only minimized manual operation errors but also got rid of unnecessary steps; it even had a smaller environmental impact owing to reduced paper usage.

The new way reduced drastically the consumption of paper, from the average 50.5 sheets per month to only 2–4 sheets per month. This amount is a yearly saving of 151.5 THB, and saving around 1.2 reams per year. The impact of the new way should contribute to reduced waste and continue to increase in terms of ensuring sustainable consumption of scarce resources, supporting green logistics ideas. Warehouse personnel, in addition, rated the system 4 stars regarding ease of use, efficiency, and the environmental benefits of depending less on papers.

The new database system comes with a summary dashboard that will allow warehouse managers to access real-time and accurate inventory data. The solution will improve decision-making by saving time used in inquiries about inventory with real-time insight into inventory levels. The new system has streamlined operations, reduced administrative overload, and brought about zero environmental effects for far more environmentally responsible logistics practices than the traditional methods using spoken words and a lot of papers.

This innovative design responds to show how technology can improve environmental sustainability and operational efficacy. The approach is an excellent example of how green

logistics can be integrated into the contemporary approaches of inventory management by consuming fewer resources and improving the efficiency in the workflow.

5. In conclusion

This project will use the AppSheet platform and a structured database to design a green, process-oriented real-time inventory management system. Operations efficiency has improved strongly: paper usage was reduced by almost 95%, and documents processing time decreased by 71.64% in switching from a paper-based operation to a centralized digital system. It assures correct data flow and real-time visibility of stock levels through traceability enabled by centralized management of input, output, packages, employees, and inventory data.

By providing the system to compile and put information in an easier format for user-friendly decision making, empowered managers and warehouse workers to act promptly with resolute determination. How well the system could meet today's logistic challenges was indicated by real-time stock control, excluding manual steps and errors. Moreover, this system is proved to be at a high level of user friendliness and applicability, confirmed by a high rate among users' satisfaction.

Apart from this example in sustainable inventory management, this project really shows how Low-Code/No-Code platforms can be used to create flexible and scalable solutions. This design sets the base for future improvements, helping businesses modernize their processes while cutting expenses and their negative consequences on the environment.

References

Sladkowski, A. (Ed.). (2020). *Ecology in Transport: Problems and Solution*s. Springer. https://doi.org/10.1007/978-3-030-42323-0

Dissorn, A. (2018). *Trend of Green Logistics Model on Sustainable Inventory Management of Corporate Community in Agriculture and Food Product*. PSAKU International Journal of Interdisciplinary Research, 7(1), 71–83

Nampinyo, A., Klakhaeng, P., Phakdeewongthep, P., Champreecha, C., & Jermsittiparsert, K. (2022). *The effects of fast delivery, accidental management and top management osustainable logistics growth.* Uncertain Supply Chain Management, 10, –. https://doi.org/10.5267/j.uscm.2022.7.003

Abdallah, A. M. (2019). *A data model to manage data for water resources systems modeling.* Environmental Modelling & Software, 115, 113–127.

Borodina, A., Prokofieva, E., Panina, V., & Erofeev, A. (2020). *Hybrid Intelligent Systems of Cooperative Transportation Planning*. Transportation Research Procedia, 54, 92–103.

Petraška, A., Čižiūnienė, K., Jarašūnienė, A., Maruschak, P., & Prentkovskis, O. (2017). *Algorithm for the assessment of heavyweight and oversize cargo transportation routes.* Journal of Business Economics and Management, 18(6), 1098–1114.

Chantra, D. (2021). *AppSheets Application Program Application Development for Physical Education Teaching in Volleyball Subject of Referee's Symbol.* Sisaket Rajabhat University Journal, 14(1), 83–94.

Paranan, M., & Petwatthananon, J. (2021). *A Study of IoT with ICT Implementation in Bang Nam Phung Floating Market 4.0.* Journal of Science and Technology RMUTSB, 5, 24–38.

Prathumnok, N., Kiltchairat, C., Ubonhom, S., & Singsungnoen, K. (2022). *The Development of Verifying Activities Participation Application using App Sheets Platform.* Thai Science and Technology Journal, 3(2), 17–28.

Sripol, P. (2021). *Development of Application for Use Food Delivery Services in Khonkaen.* Journal of Buddhist Education and Research, 7(1), 131–142.

Ngamsong, S., Lerk-u-suke, S., & Wongyai, S. (2021). *Building of Mobile Application with No-Code Development for Field Data Collection in Tax Administration of Local Administrative Organization.* The Journal of Spatial Innovation Development, 2(3), 55–69.

Panichayakorn, T., & Jermsittiparsert, K. (2019). *Mobilizing Organizational Performance through Robotic and Artificial Intelligence Awareness in Mediating Role of Supply Chain Agility.* International Journal of Supply Chain Management, 8(5), 757–768.

Klapita, V. (2021). *Implementation of Electronic Data Interchange as a Method of Communication Between Customers and Transport Company.* Transportation Research Procedia, 53, 174–179.

Wisedsin, T., Panichayakorn, T., Klakhaeng, P., Thitart, P., & Phakdeewongthep, P. (2023). *The development of App Sheets for database design to apply transport planning application.* Proceedings of The 2023 International Academic Multidisciplines Research Conference in Seoul, 23–29.