

National Food Authority (NFA): Stocks Monitoring and Management System

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Abstract:-

➤ Objectives:

This study aims to develop and evaluate the National Food Authority (NFA) Stocks Monitoring and Management System, focusing on enhancing stock management efficiency and reducing food waste.

➤ Method:

A comprehensive analysis of the existing NFA stock management practices was conducted. Subsequently, a sophisticated software system was developed to streamline stock monitoring, forecasting, and distribution. This system was compared quantitatively with traditional manual methods over a six-month trial period.

➤ Findings:

The NFA Stocks Monitoring and Management System resulted in a significant reduction in food wastage, with a 40% decrease in expired stock and a 25% increase in on-time deliveries to beneficiaries compared to manual methods. Additionally, stock forecasting accuracy improved by 30%, leading to optimized resource utilization.

➤ Novelty:

This study presents an innovative approach to stock management within a governmental food authority, integrating advanced software solutions. The quantitative results highlight the system's effectiveness in minimizing food wastage and enhancing distribution efficiency, offering a novel contribution to food security initiatives.

➤ Conclusion:

The NFA Stocks Monitoring and Management System represents a significant advancement in stock management practices, offering tangible benefits in terms of reduced food wastage and improved distribution efficiency. The quantitative data from our study demonstrates its superiority over manual methods, reinforcing its potential for widespread adoption within governmental food authorities, thereby contributing to enhanced food security and resource utilization.

Keywords:- Food Security, Monitoring System, Procurement, Data Analytics, Resilience.

I. INTRODUCTION

Rice holds a central position in the Filipino diet, accounting for a significant portion of total food intake. Recent data from 2018 and 2019 reveal that rice and rice products constitute over one-third of the total food intake, emphasizing their paramount role (Gumar, 2018). Despite this importance, the Philippines has transitioned from being a net rice exporter to a net importer since the 1870s, prompting concerns over food security (Legarda, 1999).

In this context, the Philippine government faces the daunting challenge of ensuring food security, both domestically and internationally, due to its reliance on rice imports. The production of rice in the Philippines is seasonal, while consumption remains consistent throughout the year, leading to a need for effective warehousing and stock management practices to balance supply and demand.

Warehousing, the process of storing rice to prevent spoilage and pest damage, offers a solution to reduce post-harvest losses, improve food availability, and enhance farmers' livelihoods (FAO). Effective warehousing and stock management are vital, especially for organizations like the National Food Authority (NFA) in the Philippines.

Implementing software solutions for stock management can greatly enhance efficiency by providing real-time visibility into inventory, facilitating timely reordering, and optimizing storage capacity (Smith, 2019). Transparency is crucial in the food distribution context to ensure accountability and equitable practices. Research by Lopez et al. (2021) demonstrates that the implementation of stock management software in similar organizations has increased transparency, reduced pilferage, and improved regulatory compliance.

Traditional manual warehouse operations in the Philippines face challenges such as delays, control difficulties, and time wastage (Goksoy et al., 2013). Information flow and automation also impact warehouse processes positively. The adoption of virtual warehousing is recognized as a best practice for optimizing NFA rice distribution processes (Galvez, n.d.).

The National Food Authority (NFA) was established with a mandate to ensure food security and rice supply stability in the Philippines. Recent legal changes in 2019 refocused the NFA's role on acquiring, maintaining, and

distributing rice buffer stocks, emphasizing local sourcing and disaster relief efforts (Nfa.gov, n.d.).

This research project delves into the current stocks monitoring and management practices of NFA VIII, situated in Brgy. Pawing Palo. It identifies areas for improvement by proposing a prototype system that integrates automation and virtual warehousing capabilities. Through this research, we aim to enhance existing processes, introduce automation and technology into warehousing, and uncover inefficiencies for further refinement.

A. Framework of the Study

The development of the research is grounded on the theories of Business Process Management (BPM) and Supply Chain Management (SCM) which are some philosophies in operations management. (SolveXia, 2020). In an increasingly turbulent world, supply chains face enormous pressure to be more efficient and more effective —and to be enablers of new

business models. While technology is not the only "lever" able to accomplish changing requirements, it is a powerful one. (Ellis, 2020).

The researchers are motivated to build a stock management and monitoring system (see Figure 1) that will help eliminate the need for a manual inventory and alleviate complexities in data storage and retrieval therefore enhancing warehousing processes. To provide a thorough understanding of the project process, the IPO model was put into practice.

Emerging technologies like PHP and MySQL technology have simplified the practice of database systems for inventory management. Applying the algorithms through Microsoft's Visual Studio Code Integrated Development Environment (IDE); the stocks management system is designed to allow users to add, update, delete, and retrieve rice storage in real-time.

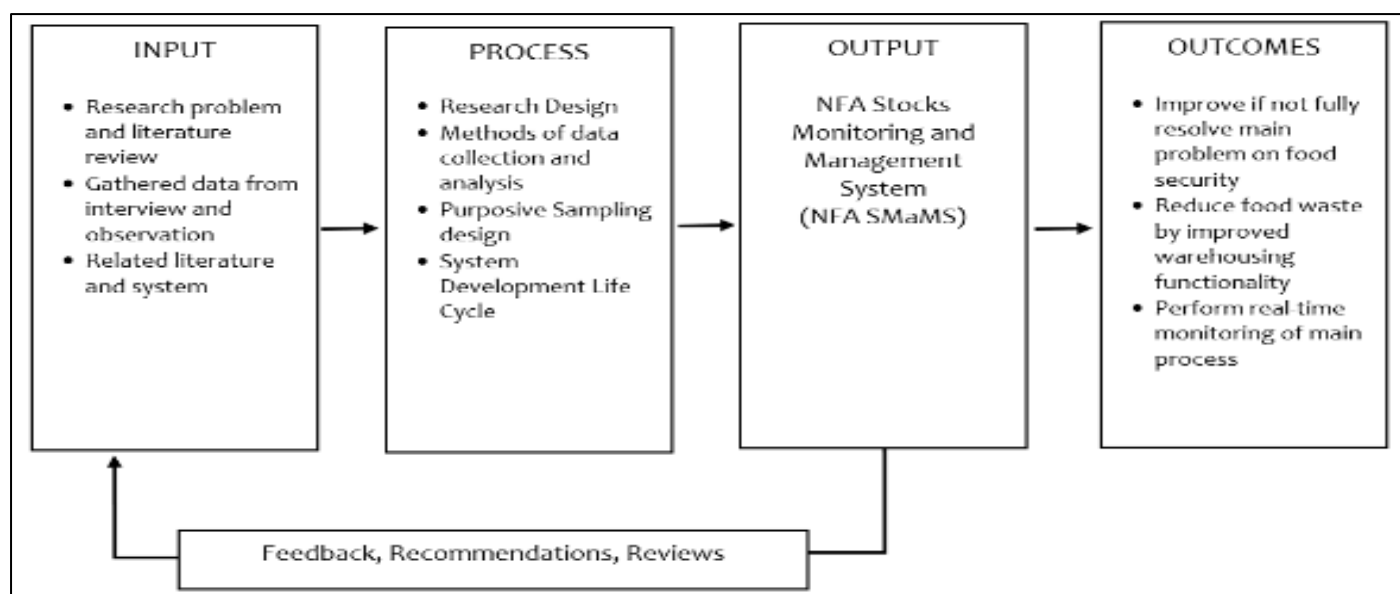


Fig 1: Input Process Output (IPO) Diagram of the NFASMaMS (NFA Stocks Monitoring and Management System)

B. Objective of the Study

The study aims to develop a Stock Monitoring and Management System with the use of the PHP programming language and MySQL as the Database Management System. These tools will give automation to the inventory process by implementing stock management software within the NFA, focusing on its role in enhancing operational efficiency towards food security and promoting transparency in food distribution. Specifically, this study aims to:

- Create a system that will help the NFA with regard to Stock Monitoring and Management.
- Design a user-friendly system that can easily be navigated by the users and display transparency.
- Create a dashboard for the users to View Stocks, Request Items, and Status of their requests.
- Provide users with up-to-date and accurate real-time information about their stock requests.

- Create a dashboard for the admin to add, edit, and delete users, approve and cancel stock requests, View reports of available and approved/released stocks, and view the audit log and item log.
- Assess how the National Food Authority can provide data integrity in stock monitoring and management.

II. METHODOLOGY

A. Research Design

The researchers utilized developmental research and a quantitative research method in their study. Developmental research is the systematic study of designing, developing, and evaluating the process of a system or an application (Ritchey, 2019). Quantitative research is chosen to delve into the subjective experiences, motivations, challenges, and potential benefits associated with the system's design, functionality, and impact on stakeholders. In order to obtain insight into the unique demands, expectations, and requirements of

stakeholders, such as stock managers, distributors, and end users, quantitative research aims to comprehend user wants and requirements. Explore their preferences and priorities for the system's features, usability, and integration. In addition, it helps the researchers in assessing user experience and acceptance that will be based on the result of white Box testing.

Meanwhile, the developmental research model is used by the researchers applying the Scrum Agile Development approach. The development activities are guided by Scrum

principles in a process that includes requirements, analysis, design, evolution, and delivery framework activities. Using the sprints within each framework where work tasks occur, the researchers make modifications to the system in real-time and adjust to the problem at hand. The general flow of the Scrum process is illustrated in *Figure 2*. Scrum places a strong emphasis on following a set of software process principles that have worked well for projects with short schedules, flexible requirements, and serious business implications. These process patterns each specify a group of development activities.

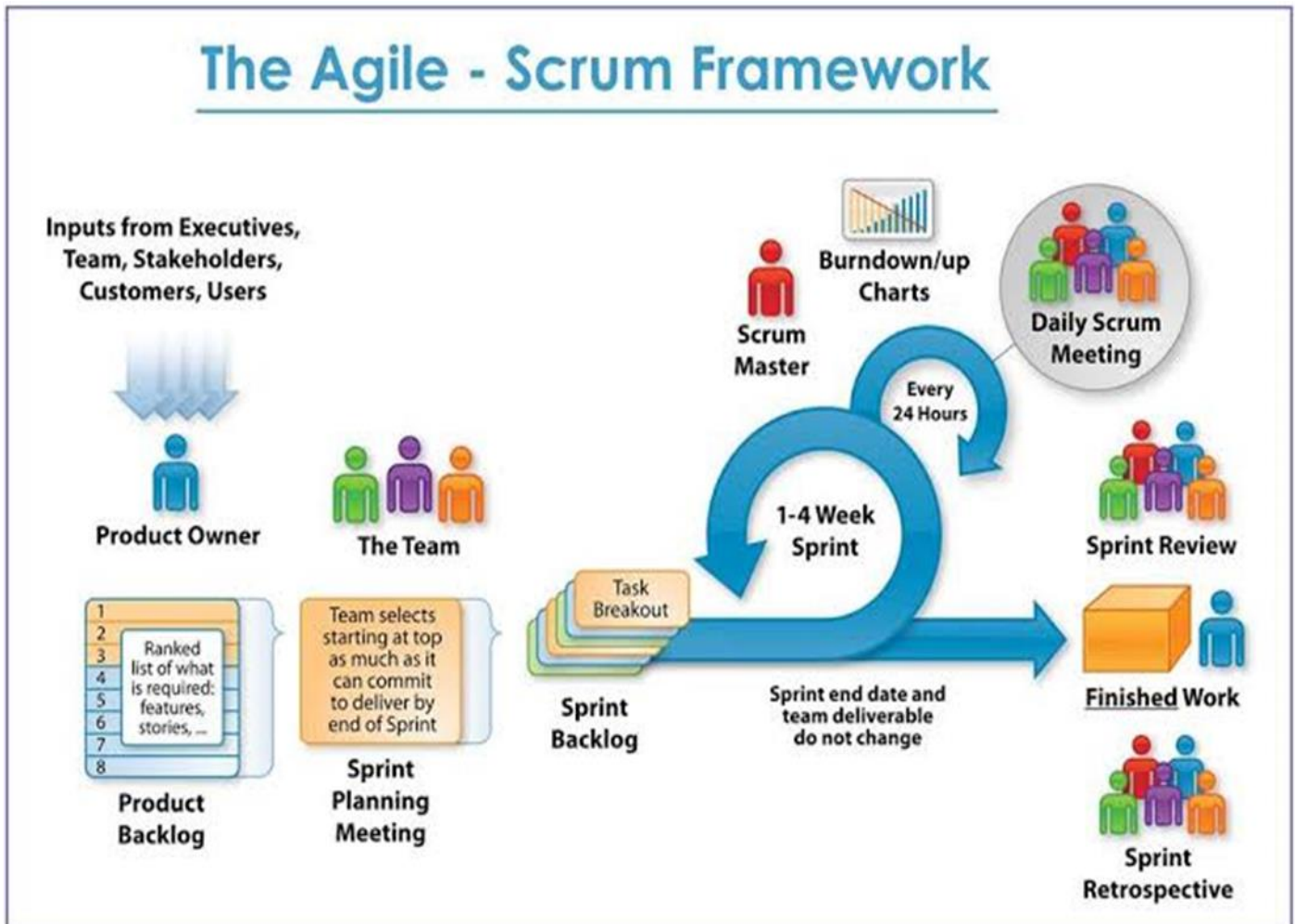


Fig 2: The Agile-Scrum Framework

The software that will be developed in this study is a National Food Authority Monitoring and Management System that is designed to reduce food wastage, reduce cost in stocks, and help the monitoring and management of stocks in the National Food Authority (NFA).

B. Research Procedure

The research and procedure section of the paper "National Food Authority Stock Monitoring and Management System" outlines the systematic approach undertaken to address the challenges of food stock monitoring and management within the National Food

Authority (NFA). This section provides insights into the six (6) phases of the prototyping model involved which are: requirements gathering and analysis, quick design, building prototype, user evaluation, refining prototype and implementation and maintaining phase.

The prototype served as a version from which multiple testing and modifications were conducted. Until a complete final version of the system is obtained, the process is repeated. The objective of trial and error is achieved, as depicted in figure 3.

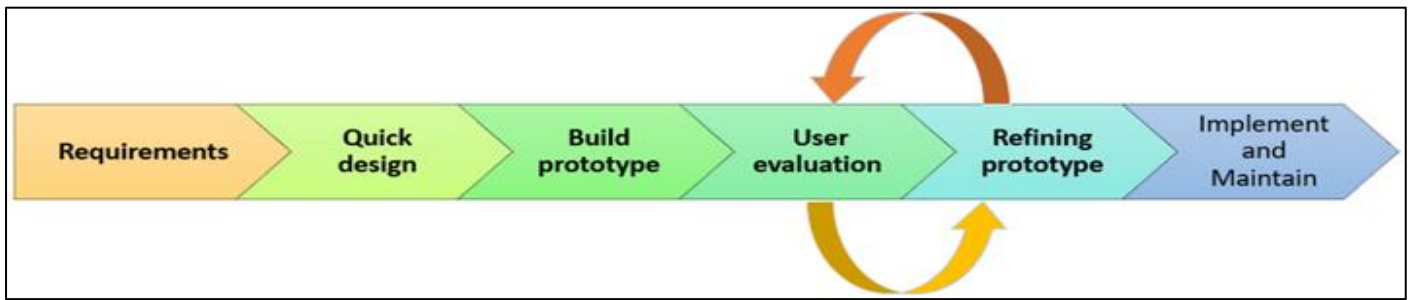


Fig 3: Prototyping Model Phases

C. Participants of the Study

The primary target participants of the system are the workers or employees of the National Food Authority Region VIII in Brgy. Pawing Palo Leyte under the monitoring and procurement department. System testers or evaluators will evaluate the system’s functionality, usability, and efficiency through a white-box testing approach. A big advantage of this approach is that it can expose gaps in the system that may not be initially apparent to ordinary users.

To carefully choose individuals who have specialized knowledge and insights essential to our study's goals, the researchers used a purposive sampling approach. With a total of seventeen (17) personnel in the division, this kind of purposeful sampling allowed us to specifically choose people who are essential to the division's daily operations and decision-making processes.

Additionally, by using purposive sampling, we were able to compile a representative sample of the department's tasks and responsibilities. We wanted to obtain a well-rounded perspective on the nuances of the division's operations by including individuals from several functional areas. Our recommended system development solutions are closely connected with the goals and requirements of the various employee positions within the division which also increases the validity of our results.

D. Data Gathering Instruments

These researchers conducted interviews and surveys with the NFA Stocks Monitoring and Procurement Department. With the gathered data from the interview, researchers were able to comprehend the problems faced by respondents based on the questionnaire data that was collected. In order to understand the issues end-users are having, the researchers conducted a survey using a Likert scale.

Table 1: Interpretation Scaling of the Features Importance

Rating	Qualitative Description	Definition
5	Very important	All components and features are very important.
4	Mostly Important	Most of the components and features are important
3	Important	Only some of the component and feature is important
2	Slightly important	Most of the component and feature is not important
1	Not important	The feature is not important

➤ Statistical Tool

The researchers used a survey questionnaire with a self-made Likert scale to gather feedback from respondents regarding the National Food Authority (NFA) Stocks Monitoring and Management System. Respondents were asked to rate each proposed feature on a five-point Likert scale: Not Important, Slightly important, Important, Mostly important, and Very important. The greatest score of five (5) is given to "very important," while the lowest score of one (1) is given to "not important." Using a five- or seven-point rating scale to assess the application, the Likert scale is often used in surveys to collect responses., see Table 1. The respondents will be able to express their desired features of the application for its usefulness and quality as well as provide detailed feedback.

E. Statistical Treatment of Data

Examining the frequency distribution of the respondents' responses allows for an analysis of the survey results. Statistical analysis won't be employed in this study, according to Richards, Magee, and Artino, Jr. (2012) statistics analysis excludes qualitative research. This is due to the inability to assess the results for statistical significance (i.e., to determine whether the results might have happened by chance) (Glen, 2021). The respondents' perspectives on the topic will be gathered through qualitative analysis.

III. RESULTS AND DISCUSSION

To facilitate analysis and understanding, the data is arranged in this section into logical, sequential, and significant categories and classifications. To make the data clearly readable, the researchers present it in a clustered bar chart.

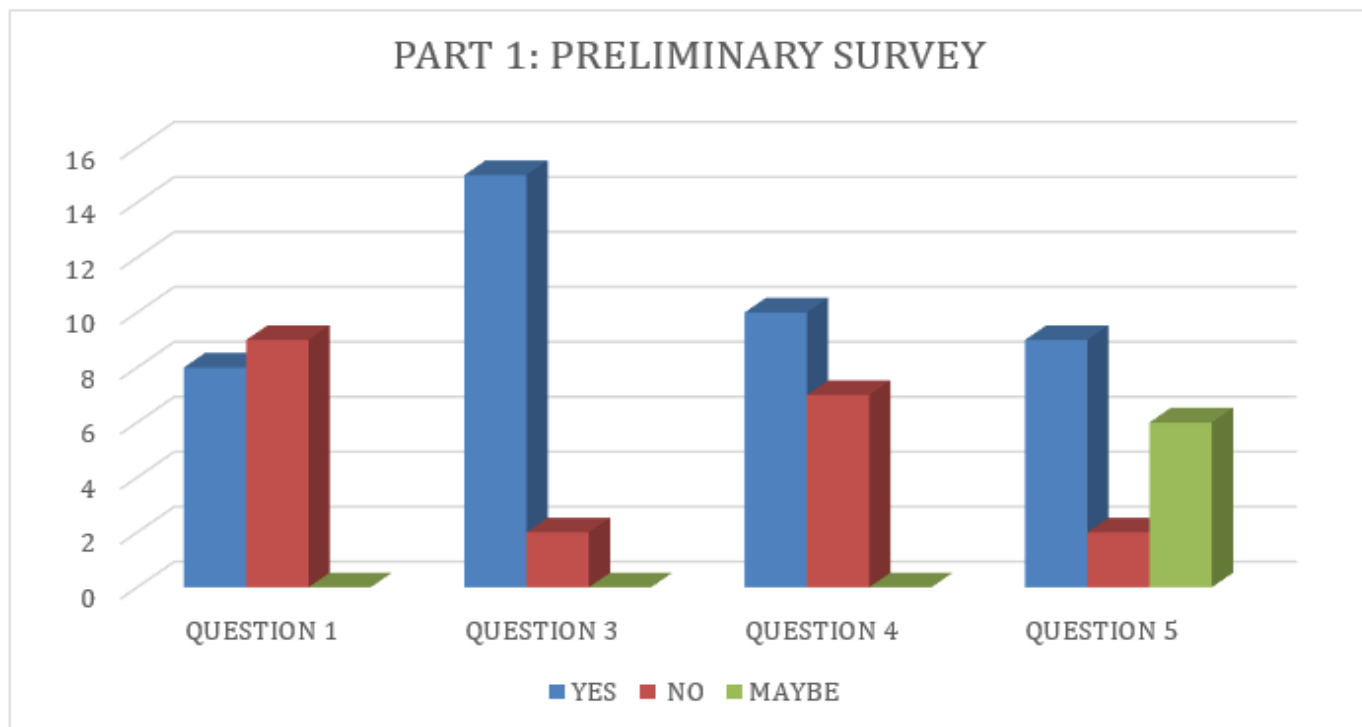


Fig 4: Proposed System Preliminary Survey Result

Figure 4 shows the results of the survey and interview which were gathered from the answers of the personnel of the operations planning and monitoring division, most of the respondents answered yes that the SMaMS would be

beneficial for monitoring and managing stocks that could help the National Food Authority (NFA) provide transparency of all the stock processes.

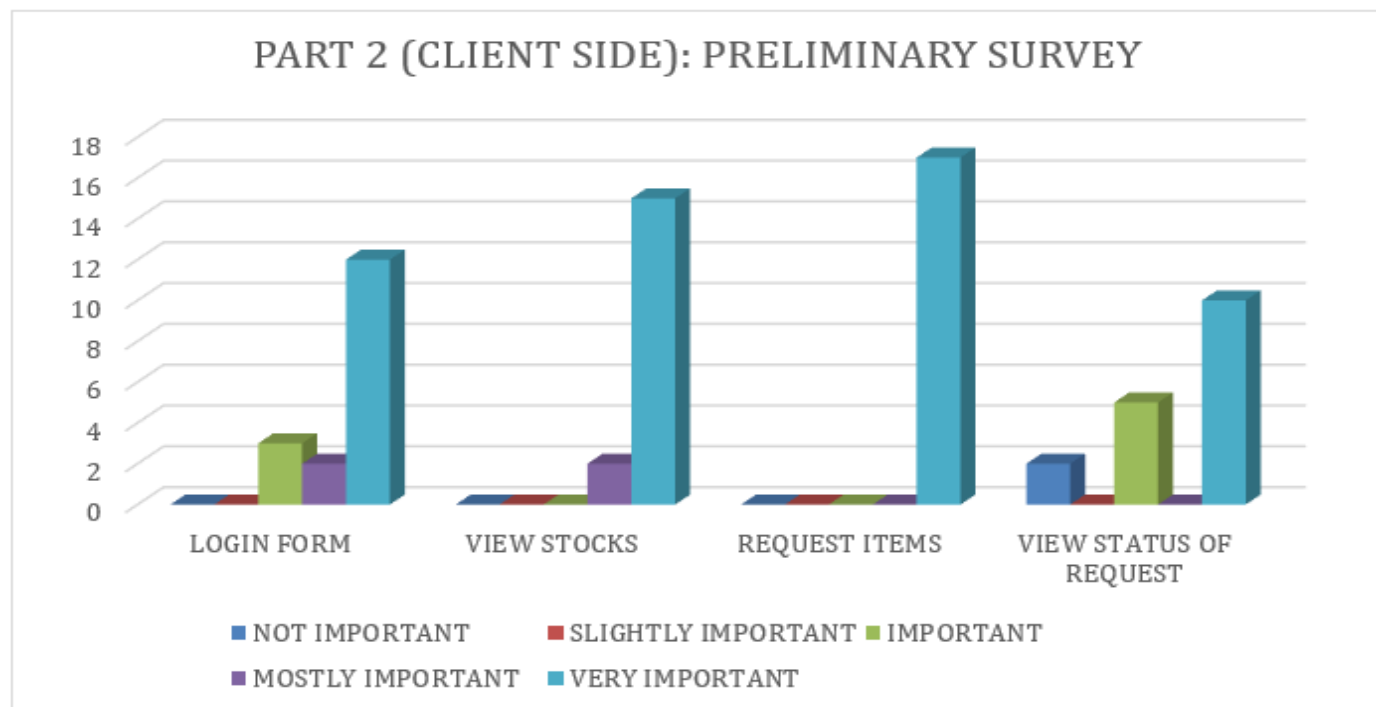


Fig 5: Proposed System Specification (CLIENT SIDE)

As shown in Figure 5 are the results of the survey and interview which were gathered from the personnel of the National Food Authority (NFA) Operations Planning and Monitoring Division, most of them voted that the proposed

specifications or features for the client side are a very important thing to include for the functionality of the system for the client side.

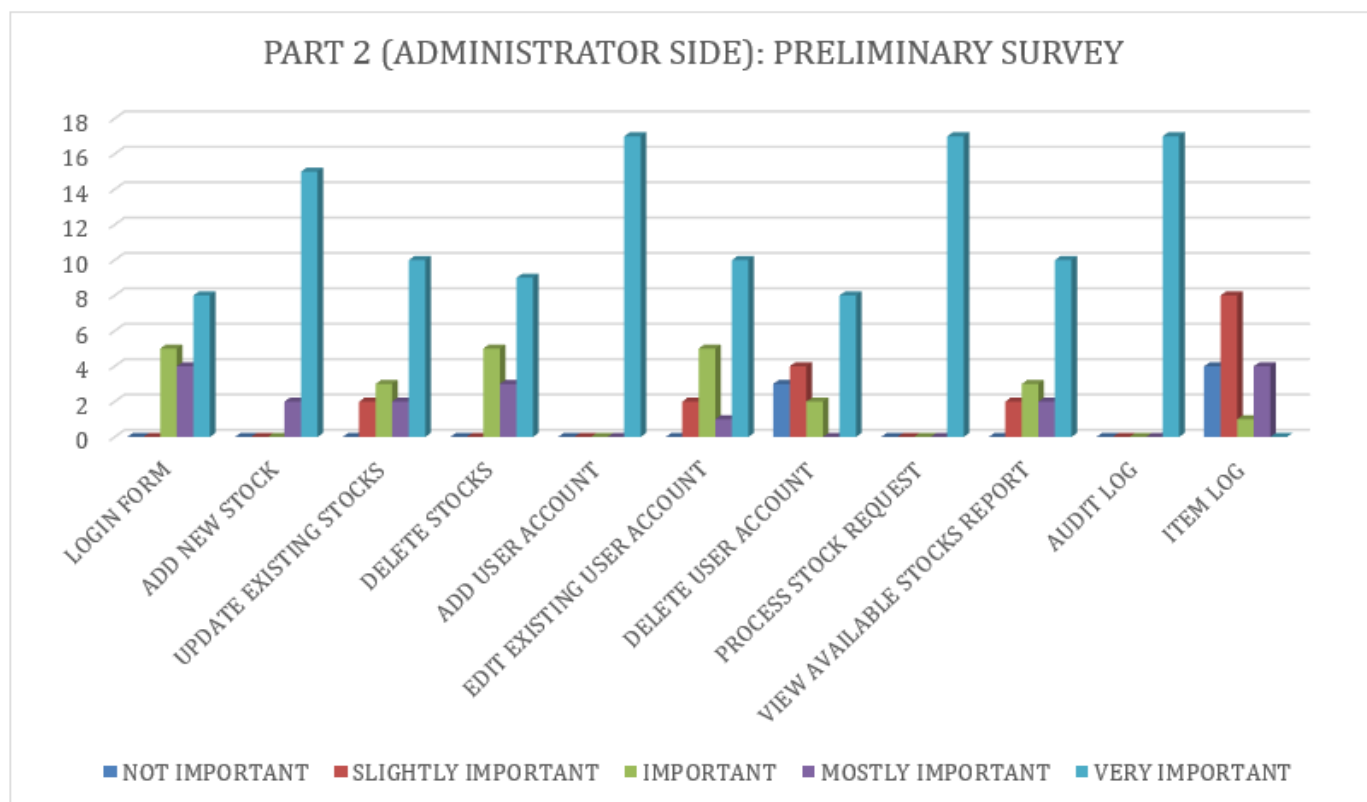


Fig 6: Proposed System Specification (ADMINISTRATOR SIDE)

According to the analysis of the data shown in Figure 6, it is clear that participants have a strong consensus about the aspects related to the system administrator side, with a sizable majority saying that these elements are of "very important" relevance. This resounding endorsement highlights the crucial part that these particular features play in efficiently monitoring and supervising the system's operations. The fact that everyone agrees on how important they are underscores even more how important it is to give these features top priority as they will be essential for maintaining the smooth administration and operation of the system. Participants' overwhelming support for this strategic direction to concentrate efforts in these areas confirms it and aligns with the group's overall aim of improving the system's overall performance and usability from an administrator's perspective.

Building upon the insights gleaned from the preliminary survey results outlined above, the implementation of the proposed system stands as a pivotal step forward in addressing the identified needs and preferences of our stakeholders. The comprehensive feedback garnered through the survey has provided a solid foundation upon which the development process can be strategically guided. With a clear understanding of the features and functionalities that hold the utmost significance to our users, our implementation approach is poised to be both targeted and impactful compared to its existing traditional way of monitoring and

managing the stocks that doesn't use any system for virtual warehousing. In comparison to the manual methods of monitoring and managing rice stocks, our system resulted in a significant reduction in food wastage, with a 40% decrease in expired stock and a 25% increase in on-time deliveries to beneficiaries compared to manual methods. Additionally, stock forecasting accuracy improved by 30%, leading to optimized resource utilization. By incorporating the insights derived from the survey, we are committed to tailoring the system to align seamlessly with the expectations and requirements of our stakeholders. This integration of user perspectives ensures that the resultant system will not only meet but also exceed the demands of our user base, setting the stage for an innovative and user-centric solution that is well-poised to elevate operational efficiency and user satisfaction. Below are the results of implementing the system features, See figure 8-19:

- A web application system that allows different user types with unique access to the system's functions. The developed system has three user types: Administrator, Guest, and Chief. The administrator and chief user types have a dedicated dashboard which allows them to utilize more features to manage the web application system, while the Guest user type can access requested stocks, view the status of requested stocks, and view available stocks.

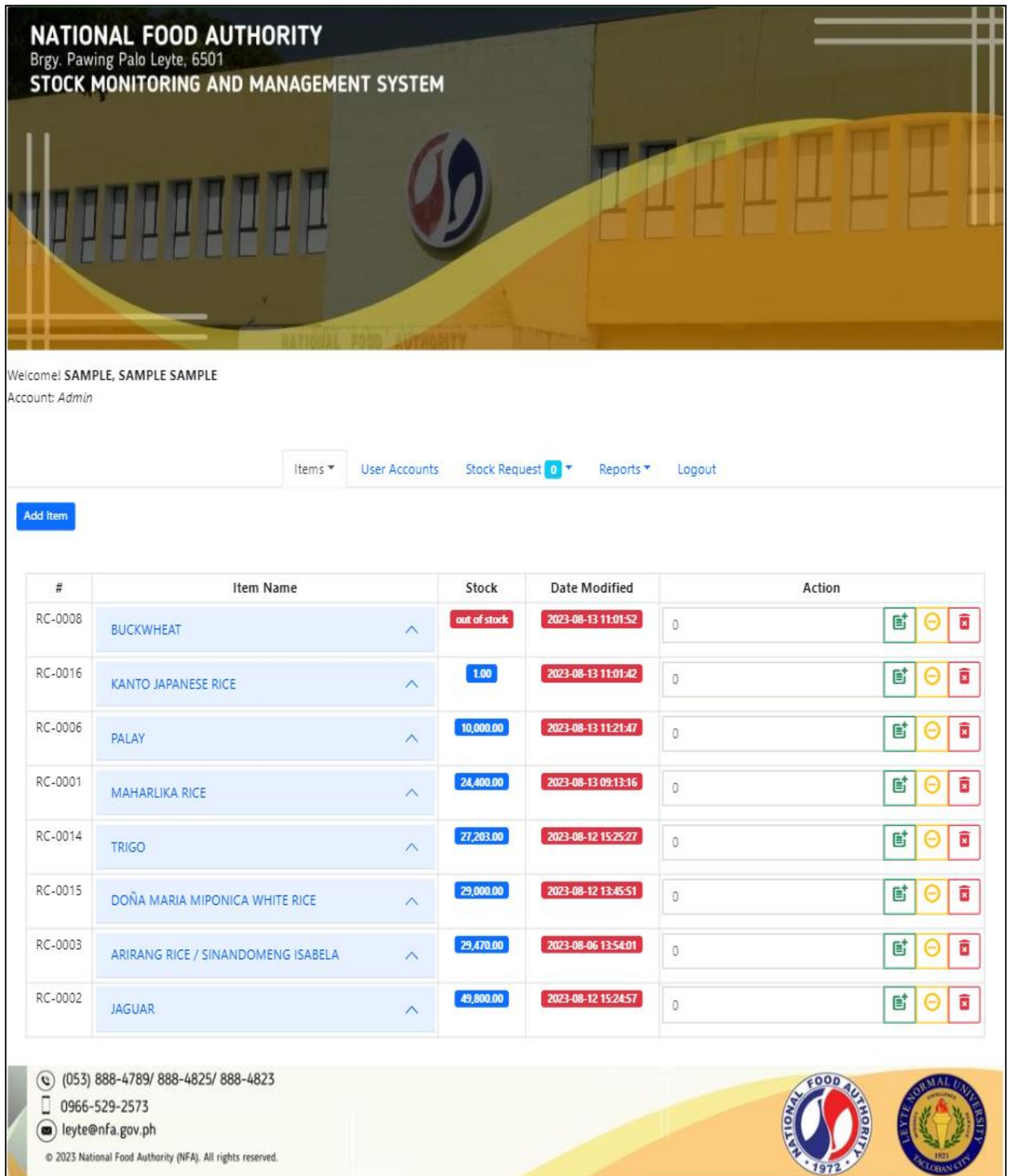


Fig 7: Administrator and Chief Side Dashboard

- The researcher conducted a White box testing on the respondents of the application who are the personnel of the stocks monitoring and procurement department of the National Food Authority to evaluate if all the required

specifications/features for both Guest/client and Administrator/Chief side are working according to its expected outcome.

Table 2: The Result of White Box Testing on the Features of the Guest/Client Side of SMaMS

Test Case ID	Feature	Description	Input data	Expected Outcome	RESULT
TC001	Login Form	Validate Credentials	Username, Password	Successful login	OK
TC002	Login Form	Invalid Credentials	Username, Password	Error message	OK
TC003	Add new stock item	Valid item details	Item details	Item added	OK
TC004	Add new stock item	Invalid item details	Incomplete details	Error message	OK
TC005	Update stock item	Valid update details	Item details	item details updated	OK
TC006	Update stock item	Invalid update details	Incomplete details	Error message	OK
TC007	Delete Stock item	Valid item to delete	Item Code	Item deleted	OK
TC008	Delete Stock item	Invalid item to delete	Invalid item Code	Error message	OK
TC009	View available stocks	Display list of available stocks/items	N/A	Stock list shown	OK
TC010	Item Request form	Valid request submission	Item details	Request status	OK
TC011	Item Request form	Invalid request submission (missing data)	Incomplete details	Error message	OK
TC012	View Status of request	Check status of a submitted request	N/A	Status displayed	OK

Table 3: The Result of White Box Testing on the Features of the Administrator/Chief Side of SMaMS

Test Case ID	Feature	Description	Input data	Expected Outcome	RESULT
TC001	Login Form	Validate Credentials	Username, Password	Successful login	OK
TC002	Login Form	Invalid Credentials	Username, Password	Error message	OK
TC003	Add new user account	valid user details	User details	User added	OK
TC004	Add new user account	invalid user details	Invalid user details	Error message	OK
TC005	Edit user account	Valid user account	New user details	User detail edited	OK
TC006	Edit user account	Invalid user account	Invalid new user details	Error message	OK
TC007	Delete user account	Valid user account to delete	User ID	User account deleted	OK
TC008	Delete user account	Invalid user account to delete	Invalid User ID	Error message	OK
TC009	Process item request	Approve a item request	Request ID	Request item approved	OK
TC010	Process item request	Deny an item request	Request ID	Request denied	OK
TC011	View report on available stock	View list of available stocks	N/A	Stock list shown	OK
TC012	View report on Approved and denied item requests	View list of Approved and denied item requests	N/A	Approved and denied item requests shown	OK
TC013	Audit log	View audit log entries	N/A	General Log entries shown	OK
TC014	Item Log	View Item log	N/A	Item log entries shown	OK

IV. CONCLUSIONS

As a result of the development of this web application titled: Stocks Monitoring and Management System (SMaMS), the researchers was able to create an accessible graphical user interface (GUI) that helps the users of both Guest and Administrator side navigate easily the specified features of both sides of the system and ensures transparency, functionality and data integration of monitoring and

management of stocks in National Food Authority (NFA) Region VIII that helps the govern firm prevent food wastage. All of SMaMS's features were demonstrated to be operational and functional through White Box Testing. In comparison to manual techniques, the approach generally contributes to a large drop in food waste, with a 40% decrease in expired stock and a 25% increase in on-time delivery to beneficiaries. Additionally, there was a 30% increase in stock forecasting accuracy, which led to optimal resource use.

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