eRiceMillApp: A Cloud-Based Rice Mill Management System For P.M. Asi Rice and Palay Trading

A Capstone/Research Project

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Natalie Nicolle M. Cabatay

Realyn May S. Lopez

John Harvey Miano

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Chapter I

Introduction

In this era where challenges are being faced especially in making an eco- friendly agricultural system that maximizes efficiency of usage to make an effective management practice the researcher has decided to come up with an innovative cloud-based rice mill management solution designed specifically for PM. Asi Palay and Trading. This opportunity can make a unique change by the challenges faced by admin including its inventory management, production tracking, and quality control.

Project Context

The eRiceMillApp from Asi Rice and Palay Trading uses cloud based technology to implement how rice mills operate and provide sustainability and efficiency. This new approach aims to make processes easier, which is important for businesses like P.M. Asi as they adjust to changes in the agriculture industry. With new technology, operations can be enhanced.

The eRiceMillApp will focus on important tasks like tracking production, managing inventory, and ensuring quality. By bringing these tasks together, the app will give stakeholders real-time access to data and analysis, allowing for better control of the rice milling process. This transparency is

essential for increasing productivity and using resources effectively.

One major challenge for P.M. Asi is their reliance on manual record-keeping, which can lead to mistakes and slowdowns. The eRiceMillApp can automate these tasks, greatly reducing errors and speeding up data entry and retrieval. With timely information available, stakeholders will be better equipped to make informed decisions at all levels of the organization.

Sustainability is another important focus for the eRiceMillApp. The software encourages environmentally friendly farming practices by managing resources effectively and reducing waste. By using analytics, P.M. Asi can evaluate its environmental impact and make data-driven decisions that support sustainable agriculture.

The eRiceMillApp is expected to deliver significant benefits, including improved efficiency, lower costs, and greater competitiveness in the rice market. Additionally, its features are designed to enhance customer satisfaction and product quality, ultimately leading to long-term customer loyalty.

Objectives of the study

The general objective of this study is to design and develop eRiceMillApp: A cloud-based management system for P.M Asi Palay and Trading.

Specifically, it aimed to:

1. To provide insights to implement and monitor raw materials and finished products by providing real-time updates to reduce human errors and improving turnover rates.
2. To provide real-time insights into key performance metrics such as inventory levels, sales trends, production efficiency, and customer data.
3. Facilitate real-time order processing, invoicing, and payment tracking to enable seamless transactions with customers, reduce human errors, and improve overall efficiency at the mill and trading points.
4. Design and implement a user friendly website for customers to place orders online for rice and related products.
5. Ensure sensitive data are protected to prevent any inappropriate actions that may cause system downtime.

Scope and Limitation of the Study

The study aims to create a cloud-based rice mill management system called the eRiceMillApp for P.M. Asi Rice and Palay

Trading. This system will focus on efficiently managing important tasks like tracking production, ensuring quality, managing inventory, and data analytics. The user-friendly design will help users access data in real time, allowing them to improve operations and make better decisions.

The eRiceMillApp provides features that includes a dashboard available making it easier to track production, resources usage and inventory status. The scope of the app does not include unrelated agricultural management applications and will not store or manage any confidential or sensitive information outside of what is needed for operations. Additionally, the system will not include features for direct financial management or personnel management.

Significance of the Study

The eRiceMillApp project aims to enhance efficiency in rice mill operations by providing user-friendly features that streamline essential activities, including production tracking, inventory management, and sustainability monitoring.

The study will be considered beneficial to the following:

The Agricultural Industry. By adopting modern digital tools, the eRiceMillApp sets a precedent for improving operational efficiency and sustainability across the rice milling sector.

Future Researchers. This will help explore the benefits and challenges in using technology in agriculture by providing them an enhanced productivity, efficiency, and sustainability in the industry.

P.M. Asi Rice and Palay Trading. The app will enable improved resource management and accurate production tracking, resulting in increased competitiveness and reduced operational costs.

Researchers. By conducting the research, researchers will gain valuable experience in data collection, analysis, and interpretation, helping to build their expertise and capabilities in the field.

Stakeholders. Provide access and facilitate faster decision making between the managers and employees that can help them in their daily interactions.

Conceptual Framework

This section shows the main concept visual format of the input, process, and output of the system's categorized functions.

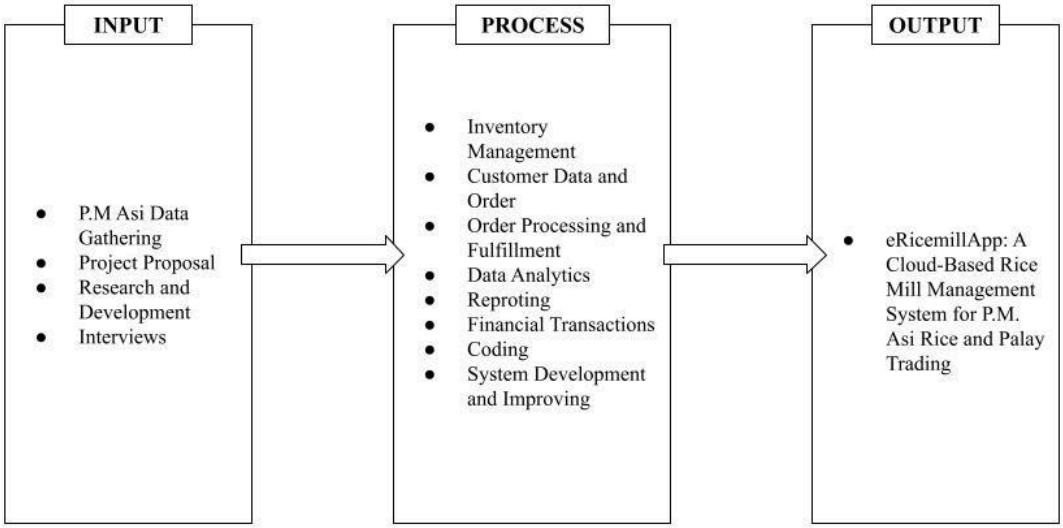

Figure 1. eRiceMillApp Conceptual Framework

Figure 1 shows the conceptual framework for eRiceMillApp. The input includes the features needed to start the system, such as information on raw materials, production steps, and user needs. The development process begins with planning and identifying what the system requires. Next, data is collected and analyzed to understand users' specific needs. Then, the system is designed and tested to make sure it works well and is efficient. The final phase is deploying and evaluating the system to ensure it meets the goals of P.M. Asi Rice and Palay Trading.

Definition of Terms

The study defines terms clearly to ensure that findings are correctly interpreted and communicated, as inconsistent or ambiguous terminology can lead to confusion, misinterpretation, and incorrect conclusions. The following terms are operationally defined:

Analytics. Refers to the systematic computational analysis of data or statistics. It involves using various methods, techniques, and tools to collect, process, and interpret data to discover patterns, trends, and insights.

Automation. The use of technology to perform tasks without human intervention, which in this case reduces manual data entry and speeds up processes.

Cloud-Based System. A system that operates on remote servers accessed via the internet, allowing data to be stored and processed off-site and enabling users to access the system from any location.

Data Analytics. The process of collecting, transforming, and organizing data to draw conclusions, make predictions, and drive informed decision making.

Inventory Management. The process of overseeing and controlling the ordering, storage, and use of raw materials and finished products.

Production Tracking. Monitoring the rice mill's production processes to ensure that operations are running smoothly and outputs meet the required standards.

Quality Control. Procedures implemented to ensure that the final product meets the specified quality criteria, including texture, grain size, and moisture content.

Real-Time Data. Information that is immediately available after collection, enabling instant decision-making and process adjustments.

Sustainability. The practice of using resources in a way that meets current needs without compromising the ability of future generations to meet theirs, including reducing waste and managing resources efficiently.

Chapter II

REVIEW OF RELATED LITERATURE/SYSTEM

This chapter includes a review of relevant literature, which provides the researchers with a solid foundation for the investigation. The researchers gathered data from recognized scholar websites to check the reliability and accuracy of the content obtained. These will pave the path for the researchers to develop a comprehensive and well-structured capstone project based on the objectives of the study.

Related Literature

According to (Rosales, 2022), In the Philippines, rice is already a part of each family meal. The farmers need to use a rice milling machine to separate the husk in the rice, which affects the rice's physical characteristics. Small-scale rice farmers need to use large-scale rice milling machines primarily used by big-scale industries. Otherwise, the traditional rice mills are manually controlled and monitored using diesel as their power source. However, farmers have difficulty operating and monitoring the post-harvest rice, manually tracking the rice milling recovery and information. The solution is to design the internet of a things-based control system for a rice milling machine using electricity as the source of power and provide real-time data of the rice's weight. Furthermore, the system classifies whether the output is brown rice or white rice where the owner can easily monitor the weight of the milled rice and

control it using the web application. The prototype proved that the system successfully provides 95% accuracy.

According to ("Cooperative Re Energizes Solar-Powered Rice Mill With USAID and One Meralco Foundation," 2024), In the same month, the CDP-Philippines team met with representatives from the One Meralco Foundation (OMF) and presented LAMPCO's Kidawa rice milling facility as a potential candidate for its expanded community electrification program. This program grew to include agricultural and livelihood facilities and equipment in rural communities, in addition to public schools, rural health centers, and water access projects. The OMF is the corporate social responsibility arm of Meralco, the largest private-sector electric distribution utility company in the Philippines. The foundation focuses on access to electricity among unenergized families, remote and off-grid public schools, livelihood centers, and health centers. It also helps restore power in communities affected by calamities to assist in their recovery and pave the way for productivity. In a promising development, the OMF assessed LAMPCO's rice mill and committed to launching a pilot project to install a 5.1-kilowatt solar photovoltaic system. This strategic move aimed to ensure the rice mill's uninterrupted operations, enhancing the level of service provided to its customers.With a new solar-powered facility in place, the LAMPCO rice mill can now process 100 sacks per day, more than double its capacity when the facility used an

intermittent power supply. The cooperative also saves PHP 20,000 from electricity consumption per milling cycle and can offer rice farmers a lower rate of PHP 3.00 per kilogram for milling services, including the use of the separator machine.

According to (Ghali & Sabado, 2024), Delmendo Ricemill's journey of innovation began with a simple yet formidable challenge: the drying of newly harvested paddy. Traditionally, the mill employs the method of sun-drying on a concrete pavement, which manifests limitations, especially during the early harvesting season and frequent rains. To overcome these hurdles and maximize efficiency, the rice mill sought to revolutionize its operations by integrating innovative mechanical dryer technology. According to Mr. Delmendo, a friend introduced the programs being offered by the DOST. Upon learning about them, he reached out and was granted financial help after they came to an agreement. "Atoy nga mechanical dryer, ket under ti SETUP program. Ajay SET-UP program, so isu ajay jay ibagbaga mi nga, 'Small Enterprises Technology Upgrading Program' wherein iassist mi agijay firms tapos ket kasla DOST ti manggatang. Ti mangyaryari ket kasla rent to own," John Carlo Lopez, DOST-STII Project Technical Assistant I, said. As the rice mill recognized the need for change, they invested in cutting-edge technology – a Hopper Type Mechanical Dryer paired with a Husk Furnace, complete with a chimney and exchanger. This upgrade has been transformative. The mechanical dryer can handle larger volumes

of wet paddy efficiently, dramatically reducing drying time and ensuring that rice leaves the mill with the ideal moisture content. Post-harvest losses due to high moisture content have become a thing of the past, saving both time and resources.

According to (Homillano, 2023), Food Security has been an elevated challenge in the Philippines since then. In the report of Galang, he noted that the Philippines ranked 64th out of 113 countries in terms of its four dimensions of food security based on The Economist's 2021 Global Food Security Index (GFSI). He added that food security was officially defined and included in government laws, policies, and programs. The United Nations (UN) defines food security as a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. To address the challenges to food security in the Philippines, the Central Bicol State University of Agriculture (CBSUA) is looking into the possibility of offering short-term courses in organic agriculture. As the University takes responsibility and leadership in agriculture and allied technological sciences through Republic Act No. 9717, it envisions being the center of Organic Agriculture that offers agriculture-related development programs for Bicolanos. An approach to this is the creation of short-term courses in organic agriculture. Short-term courses are indeed an approach

to promote and equip the public with the competencies for organic agriculture. Wang further noted that short-term courses allow people to update their skills in a short time, usually for a few weeks to a few months. This program also offers numerous benefits, like improving someone's personal and professional development. Organic Agriculture encouragement is supported by the law and the human desire to lessen conventional agriculture's negative environmental impact. Thus, CBSUA stands to prove its creation is worthy of respect by showing an exemplary curriculum responsive to its charter and relevant to the Bicol Region's needs.

Based on (Facing the Big Challenges in Philippine Agriculture | Official Portal of the Department of Agriculture, 2022), while the country is slowly returning to normalcy after battling the COVID-19 pandemic for more than two years, the current health crisis continues to dampen global goods trade, amplifying job and income losses for most middle- and low-income Filipinos. At the onset of the crisis, food supply chains were shackled, imposing restrictions on the movement of goods as well as people. These protection measures resulted in food price inflation, further increasing hunger and poverty incidences. The DA acted upon this with urgency, employing measures to cushion the pandemic's impact on the already ailing Filipinos. The Department wasted no time in restructuring its public funds and programs, facilitating the movement of agricultural goods,

ensuring access to affordable food, and providing protection and intervention to local farmers and fisherfolk, all to assure food security. Among the DA's interventions are the farmers' and fisherfolk's access to credit and other financing programs and technical support, the establishment of Kadiwa ni Ani at Kita, and the provision and distribution of farm inputs, equipment, and machinery, as well as the promotion of urban farming/gardening, among others, to keep the food production chain going.

As noted by (Balita, 2024), the slow growth of the agricultural sector in the Philippines has been attributed to the rampant conversion of arable lands into residential subdivisions, industrial parks, and resorts. Of the 30 million hectares of land area, only one-third is used for agricultural activities. Furthermore, the country's geographical location makes it vulnerable to natural disasters such as flooding and drought, further contributing to the decrease in production. Investments in technology and innovation are necessary steps to diversify and transform the country's agricultural output, along with increased production support and improved policies that prioritize the needs of farmers. Due to its terrain and tropical climate, farming and fisheries have been the largest agricultural sub-sectors in the Philippines. Crop production, particularly of sugarcane, palay or rice, coconut, and bananas, ranks among the highest nationwide and is also among the top

export products. In recent years, oils, fruits and nuts, along with animal or vegetable fats, have contributed the largest share of total agricultural exports in the Philippines. Meanwhile, for the livestock and poultry sectors, hog, cattle, and chicken are the leading products. Conversely, the fisheries sector, which consists of three subsectors: commercial, municipal, and aquaculture, has shown slow growth in recent years. The export value of principal fishery products from the country has also been declining since 2019 due to fluctuating production volumes. Among the main contributing factors are climate change and the practice of uncontrolled and unsustainable overfishing.

According to (Facing the Big Challenges in Philippine Agriculture | Official Portal of the Department of Agriculture, 2022), the enactment of the RTL since 2019 is considered the crescendo of the Duterte administration. It has raised many controversies, even leading to accusations of the DA being anti-farmer. Since the 80s, restrictive trade and regulatory policies have stunted the growth of the country's rice industry. For more than 30 years, the National Food Authority (NFA), which held monopoly power over imports and prices, dominated the rice market. As a result, Filipino consumers faced high rice prices, the government continually subsidized NFA losses, while rice farmers remained among the poorest. In 2018, a severe rice shortage became a major driver of inflation, rising by a factor

of 10. Given that the Philippines is a rice-eating country, the effects were disheartening as rice is a basic household expenditure for every Filipino family, rich or poor. The political will of President Duterte led to a significant shift in the rice sector when he signed the RTL into law, replacing rice import quantitative restrictions with tariffs. This resulted in two major outcomes: (1) rice is no longer a main contributor to inflation, benefiting millions of Filipino rice consumers as prices dropped by an average of almost P7/kg, and (2) a P10 billion fund was created to make rice farmers more competitive. “The RTL has increased the purchasing power among the bottom 40 percent of the income groups due to the savings they gained from lower rice prices,” the agriculture chief stated. Furthermore, with the inflow of tariffs, the government established a P10 billion Rice Competitiveness Enhancement Fund (RCEF). Under the RTL, all import duties collected from rice imports will be allocated to RCEF, ultimately benefiting Filipino rice farmers through the provision of quality certified seeds, farm machinery and equipment, financial support, and training.

As stated in (Official Statement of NEDA Secretary Arsenio M. Balisacan: Toward a Food-Secure Philippines and a Stronger Agricultural Sector, 2024), recognizing the pivotal role of the agriculture sector in our economy, the Philippine Development Plan 2023-2028 emphasizes the sector’s transformation through

comprehensive strategies and reforms aimed at increasing productivity and farm incomes. While the government has increasingly provided more resources to support the sector in recent years, challenges persist. Addressing these challenges requires sustained efforts to progressively bridge infrastructure gaps, promote the adoption of modern technologies, improve market and financial access for local producers, and build resilience to climate change. However, realizing the benefits of these interventions may take time. In the meantime, it is important to ensure that there is an adequate supply of necessary food items. Our country has been facing agricultural supply challenges, which have worsened due to global disruptions and domestic policy coordination issues. These challenges have resulted in higher inflation, particularly for food. The Inter-Agency Committee on Inflation and Market Outlook (IAC-IMO) of the Economic Development Group (EDG) aims to manage these risks to enable the government to meet its socioeconomic targets. Thus, as recommended by the IAC-IMO and the EDG, President Ferdinand R. Marcos, Jr. issued Administrative Order (AO) No. 20, s. 2024. AO 20 seeks to enhance the country's agricultural importation policy regime by streamlining administrative processes and removing non-tariff barriers, thereby facilitating the sufficiency and timeliness of imports, especially during periods where domestic supply is inadequate to meet demand at affordable prices. Failing to

augment local production during shortages exacerbates food insecurity and perpetuates poverty. The consequences of insufficient supply extend beyond economic strain, affecting overall price stability and the well-being of Filipino children. High food prices disproportionately affect the poor and contribute to hunger, malnutrition, and stunting, hindering the attainment of our development goals. The National Economic and Development Authority (NEDA) recognizes the concerns of various sectors regarding AO 20, which aims to streamline administrative procedures and policies and eliminate non-tariff barriers to importing agricultural products. We reassure the public that AO 20 is a strategic and necessary measure to ensure our people's food security, particularly in terms of availability and affordability of food, and improve the overall welfare of Filipinos. In conjunction with other initiatives and programs, AO 20 is deployed as a tool that considers the welfare of our farmers and fisherfolk and the vibrancy and potential of our agricultural sector as a growth driver of the economy. It contributes to the Marcos Administration's efforts to shield and protect the poor, the vulnerable, and the youth from hunger, malnutrition, and stunting.

As reported by (Office, 2024), the KADIWA ng Pangulo program will start selling Rice-for-All at a lower price of P43 per kilo in its various outlets starting this week. This initiative is another step toward realizing President Ferdinand

Marcos, Jr.’s goal of making food more affordable for every Filipino family. The Rice-for-All program, spearheaded by Food Terminals Inc., offers well-milled rice at various KADIWA ng Pangulo centers for P45 a kilo. Unlike the subsidized P29 program, which is aimed at vulnerable sectors like indigents and senior citizens, Rice-for-All is available to all consumers in larger volumes. “The vision is to lower the price of this staple food under the Rice-for-All program to the most affordable level possible,” said Agriculture Secretary Francisco P. Tiu Laurel, Jr. “Rice sold under this program will be accessible to more consumers, thanks to our planned expansion of the KADIWA network. We expect to double our KADIWA outlets this weekend as part of a broader goal of reaching 169 stores by the end of the year,” the DA chief added. A total of 20 new KADIWA ng Pangulo stores will open this weekend across Metro Manila and in Laguna.

As explained by (Caringal, 2019), milling is the process wherein the rice grain is transformed into a form suitable for human consumption and must be done with utmost care to prevent breakage of the kernel and improve recovery. Brown rice is milled further to create more visually appealing white rice. After harvesting and drying, the paddy is subjected to the primary milling operation, which includes de-husking and the removal of bran layers (polishing) before it is consumed. The purpose of a rice milling system is to remove the husk and the bran layers from paddy rice to produce whole white rice kernels

that are sufficiently milled, free of impurities, and contain a minimum number of broken kernels (International Rice Research Institute). A rice milling system can be a simple one- or two-step process or a multistage process. In a one-step milling process, husk and bran removal are done in one pass, producing milled or white rice directly from paddy. In a two-step process, removing the husk and removing the bran are done separately, resulting in brown rice as an intermediate product.

As noted by (Hani & Issoufaly, 2023), rice cultivation is the lifeline for billions globally. Its dominance in the global dietary landscape and its cultivation practices have evolved in response to changing environmental and socio-economic drivers. The current rice cultivation paradigm is marked by the extensive use of the green revolution package, while the context of natural resources has radically changed. Originally designed to maximize yield, these seeds are a double-edged sword, as their productivity is linked to a heightened dependence on herbicides, water, chemical fertilizers, and pesticides. While such practices have boosted production figures, they now pose environmental and health challenges that have become priorities over the last decade.

As indicated by (Hani & Issoufaly, 2023), today, most projects related to rice production are either very rare or implemented very slowly and on limited pieces of land. Because of its political dimension, projects related to the rice value

chain usually involve a large number of stakeholders with different interests. It's urgent to establish streamlined implementation processes with quick impacts to encourage smallholder farmers to adopt sustainable Good Agricultural Practices (GAPs) on a larger scale. These sustainable practices will have a tremendous impact due to the sheer number of rice farms around the world. Indeed, over the past 10 years, Alternate Wetting and Drying (AWD) and the System of Rice Intensification (SRI) have been among the most popular and effective production systems, demonstrating positive impacts on water consumption and soil fertility management. However, these systems haven't been widely adopted due to various constraints—awareness, administrative, or operational—that prevent farmers from understanding, owning, adopting, and transferring such low-tech innovations. Even with carbon finance that could accelerate a shift to more sustainable practices, technical and administrative challenges deter most supply chain stakeholders from engaging on a large scale.

As highlighted in (Understanding the Rice Value Chain in the Philippines: Defining the Way Forward for Rice Fortification | World Food Programme, 2023), the Philippines is a lower-middle-income country with a high prevalence of hunger and malnutrition, particularly among the lower-income groups of the population. More than half of the households (54 percent) in the Philippines experience food insecurity. The effects of

malnutrition and diet-related diseases (MNDs) have further burdened the nutritional health of the population. Despite improvements in food availability, the majority of the population suffers from poor diets, largely due to inadequate access to food and high poverty levels, especially in rural areas. High food prices, particularly for staples like rice, further exacerbate the situation. The food consumption pattern is less than ideal, with carbohydrates dominating calorie intake and insufficient vegetable consumption. Most food consumption goes to cereals, primarily rice, followed by meat and fish. The per capita consumption of vegetables averages only 22 kg/year, compared to the FAO recommendation of 146 – 182 kg/year. Some Filipinos view vegetables as the "poor man's diet" and prefer meat and meat-based products. Additionally, packaged and instant foods have become increasingly popular. Such consumption patterns indicate a higher intake of calories, fats, sodium, and food additives, which are relatively low in nutrients. Consequently, the Philippines faces challenges related to MNDs, malnutrition, and a very high prevalence of stunting among children under five years of age. Diversifying food production is essential for supporting nutritional improvement toward more balanced diets. To understand how fortification of food items (particularly rice) can help meet dietary guidelines for better nutrition, it is crucial to examine the situation regarding MNDs in the country and their effects.

As outlined by (Socioeconomic Research Portal for the Philippines, n.d.), using the value chain analysis (VCA) framework, this research analyzed the rice value chain (RVC) in the Philippines, examined the value additions, identified constraints, and proposed upgrading strategies to enhance the competitiveness of the rice industry and specific segments in the RVC. Primary data were derived from key informant interviews with government and non-government agencies (NGOs), as well as surveys from farmers, paddy traders, millers, wholesalers, wholesaler-retailers, and retailers in 20 major rice-producing provinces and demand centers. Stakeholders' workshops were also conducted to validate the preliminary findings and identify upgrading strategies. Descriptive and economic approaches were applied in data analysis. The country's RVC starts with the provision of inputs to produce paddy and ends with the consumption of milled rice. The RVC is dominated by a traditional multi-layered supply chain with interconnected chain actors composed of competing farmers, paddy traders, millers, and rice traders in each segment, often involving brokers in both paddy aggregation and rice distribution, thereby increasing marketing costs. Major constraints identified in the RVC include high production and marketing costs of paddy and rice, attributed to low yield, high labor costs and material inputs, and insufficient crucial infrastructure and market facilities (e.g., modern mills, dryers, cheap transport, and energy), which

result in high domestic paddy and rice prices and low competitiveness of the entire rice value chain. To enhance competitiveness, the rice industry should focus on generating and promoting yield-increasing, postharvest loss-reducing, and cost-minimizing technologies, as well as those that improve overall efficiency in the RVC, such as investments in enabling infrastructure and facilities for transport, handling, storage, drying, and milling.

As reported by (DTI, DA, and NIA Ink Partnership to Ensure Streamlined Rice Supply Chain, Enhance Domestic Rice Market Competitiveness, 2024), the RicetoRisePH initiative targets to facilitate efficient transactions among farmers' cooperatives, irrigators' associations, local government units (LGUs), and institutional buyers. This platform is designed to enhance trade efficiency, reduce logistics costs, and ultimately make rice more affordable and accessible to consumers while ensuring stability for farmers. Moreover, the RicetoRisePH B2B platform was built from the success of the Nueva Vizcaya Agricultural Terminal (NVAT) Fresh. This initiative is the Department's B2B e-commerce project in partnership with the United States Agency for International Development – Strengthening Private Enterprise for the Digital Economy (USAID-SPEED) Project and the NVAT, utilizing InsightSCS's Deliver-E platform to connect farmers with potential buyers. "Under the leadership of President Ferdinand R. Marcos Jr., let us rise to the occasion and work

together to build a more robust, more resilient agricultural sector for the benefit of Filipino farmers and consumers," said Secretary Pascual.

As highlighted by (Ortanez, 2019), the food supply chain is a process in which food travels from producers to consumers, and the impact of losses affects the economic standing of the Philippines' rice production, given that the agricultural sector contributes 14 percent to the country's gross domestic product. Seventeen percent (17%) of rice losses are linked to the absence of adequate post-harvesting facilities and practices (Philippine Star, 2018) and are attributed to factors such as seed type, timely harvest, temperature management, moisture content, and ethylene production. Based on interviews, farmers' lack of experience and knowledge in post-harvesting, along with poor harvesting techniques, leads to losses, such as manual drying that results in grain susceptibility. Additionally, storage losses occur due to rodents and other pests making the rice unfit for consumption. Validating this claim, reports indicate that during the post-harvesting process, about 15% of physical rice losses occur, particularly in the production process, while waste in water, fertilizers, labor, seeds, fuel, and other agricultural inputs also takes place. This results in decreased food availability in the market. An estimated range of 10-37% of post-harvest losses poses a threat to Philippine farmers in terms of agricultural sustainability and food security. Rezaei

and Liu suggested that this may increase food prices and reduce the capacity of low-income consumers to access food. Conclusively, the World Bank reported that the share of agriculture in the country's economy decreased by half, from 24.6% in 1895 to 12.8% in 2011. Given these ratios, the most sustainable alternative for increasing food production is by reducing food loss, as Koga Y. (1982) argued that it is much cheaper to reduce losses than to increase production.

According to (Villaruel, 2019), The RicetoRisePH targets to facilitate efficient transactions among farmers' cooperatives, irrigators' associations, LGUs, and inThe Philippines has a population of 104 million people, and seventy percent (70%) of its people depend on its agricultural sector . Rice is considered to be the most important staple crop in the country with its wide diversity, as eighty-nine percent (89%) of the entire population depends on it. Among the Southeast Asian nations, the Philippines ranked fourth as a rice producer with an estimated yield of 4.08 tons per hectare; however the country is not self-sufficient in its staple food requirements as 16.4 percent loss recorded in the post-harvesting process of rice crops due to the traditional production practiced and lack of proper handling and equipment (Mopera, 2016). The Filipinos recorded a total waste of 987,952 kilograms of rice daily. About one-third of the total food produced goes to waste in both developing and developed countries, equivalent to 1.3 billion

tons of food loss per year, which can feed about 2 billion people each year. This platform is designed to enhance trade efficiency, reduce logistics costs, and ultimately make rice more affordable and accessible to consumers while ensuring stability for farmers. Moreover, the RicetoRisePH B2B platform was built from the success of the Nueva Vizcaya Agricultural Terminal (NVAT) Fresh. This initiative is the Department's B2B e-commerce project in partnership with the United States Agency for International Development – Strengthening Private Enterprise for the Digital Economy (USAID-SPEED) Project and the Nueva Vizcaya Agricultural Terminal (NVAT), utilizing InsightSCS's Deliver-E platform to connect farmers with potential buyers. "Under the leadership of President Ferdinand R. Marcos Jr., let us rise to the occasion and work together to build a more robust, more resilient agricultural sector for the benefit of Filipino farmers and consumers," said Secretary Pascual.

As noted by (Flores, 2020), the rice value chain (RVC) in the Philippines examined value additions, identified constraints, and proposed upgrading strategies to enhance the competitiveness of the rice industry and specific segments in the RVC. Primary data were derived from key informant interviews in government and non-government agencies, along with surveys from farmers, paddy traders, millers, wholesalers, wholesaler-retailers, and retailers in 20 major rice-producing provinces and demand centers. Stakeholders' workshops were also

conducted to validate the preliminary findings and identify upgrading strategies. Descriptive and economic approaches were applied in data analysis. The country's RVC begins with the provision of inputs to produce paddy and concludes with the consumption of milled rice. The RVC is dominated by a traditional multi-layered supply chain with interconnected chain actors, including competing farmers, paddy traders, millers, and rice traders in each segment, often involving brokers in both paddy aggregation and rice distribution, which increases marketing costs. Major constraints identified in the RVC included high production and marketing costs of paddy and rice, attributed to low yield, high labor costs and material inputs, and insufficient crucial infrastructure and market facilities (e.g., modern mills, dryers, cheap transport, and energy). These factors result in high domestic paddy and rice prices and low competitiveness of the entire rice value chain. To enhance competitiveness, the rice industry should focus on generating and promoting yield-increasing, postharvest loss-reducing, and cost-minimizing technologies, as well as those that improve overall efficiency in the RVC, such as investments in enabling infrastructure and facilities for transport, handling, storage, drying, and milling.

As indicated by (Lacatan, 2020), agriculture plays a dominant role in the economic development of the Philippines, generating more than 6% of its total exports. While 25% of total

agricultural land is constraint-free, about 75% of the areas face various soil problems, including steep slopes, poor drainage, coarse texture soils, heavy cracking clays, severe fertility limitations, acid sulfate soils, peat soils, mine tailings, and polluted lands. This paper aims to develop a low-cost, portable cloud-based dashboard connected to a gateway via the Internet of Things (IoT) for monitoring real-time measurements, providing local farmers and concerned government agencies in the Philippines with a modern framework for smart farming that analyzes crop production suitability based on edaphic and climatic factors for each locality. The integration of Wireless Sensor Network (WSN) technology is required to measure moisture content, humidity, temperature, and pH level of the soil while pinpointing actual geographic locations using Global Positioning System (GPS) in three dimensions (3D) and a three-hundred-sixty-degree (360°) street view satellite map.

As reported by (Taer, 2024), the Philippines is an agricultural country, with the sector accounting for nearly 10% of the national GDP and employing over 25% of the total labor force. However, outdated techniques, climate change impacts, food security challenges, and resource limitations have plagued the industry over the past decades. In light of this, harnessing innovation becomes imperative to drive agricultural transformation. Consequently, recent years have seen extensive research efforts focused on advancing diverse innovations,

including precision agriculture, novel equipment, sustainable practices, imaging techniques, and decision support systems. However, a quantitative review synthesizing these advancements is lacking, particularly in analyzing distributions, adoption levels, emerging technologies, geographical differences, active contributors, and critical gaps.

As highlighted by (Cordero, 2024), Agriculture 4.0 has paved the way for Philippine agriculture through the One Department of Agriculture (One DA) Agenda. The government is gradually progressing towards Agriculture 4.0 with the support of collaborating countries and agencies. Increasing digital integration and advanced technologies emphasizing precision farming have contributed to the industry's growth. The agriculture, forestry, and fishing sectors contributed 8.9% to the Philippines' GDP. Agriculture 4.0 has also led to an increase in the farm mechanization level of the country, rising from 2.31 horsepower per hectare (hp/ha) in 2013 to 2.679 hp/ha. The government has recently developed a more straightforward approach to farming problems, such as monitoring farm activity through drones, remote sensing, and satellite technologies. Farmers can now access real-time updates on infrastructure and machinery projects from proposal to completion through ABEMIS. Utilizing remote sensing and data analytics has become a game changer in agriculture, especially for weather prediction, forecasting future yields, disaster assessment, and access to

insurance schemes available through PRiSM and RICE projects. The use of drones for various applications has been strengthened by policies set by the Department of Agriculture. Continuous research for development and technology transfer with local government units through province-led agriculture and fisheries extension systems supports the government's efforts to promote digital transformation in agriculture. Indeed, Agriculture 4.0 represents the future of global agriculture and serves as the engine of agricultural modernization in the Philippines.

According to (*Data Dashboard on PH Rice Industry, Farmers Now Accessible Online | PRRI*, 2022), The website presents data on rice area, production, yield per hectare, characteristics of rice farmers, farming methods and technologies used by Filipino farmers, and status of rice industry at the national, regional, and provincial levels. Before the development of the RiceLytics website, such data were released through published briefers, infographics, books, and slide presentations. Atty. Rhaegee Tamana, Sen. Cynthia Villar's chief of staff, said that the dashboard is helpful as its contents are presented in a comprehensive and easy-to-grasp manner. Villar chairs the Senate Committee on Agriculture and Food. "I am happy that RiceLytics is now available for us to know the situation of the Philippine rice industry. This will help us improve and make our programs under RCEF responsive," Tamana said. The project is funded by

the DOST – Philippine Council for Industry, Energy, and Emerging Technology R&D.

Recent research has shown that the high demand coupled with unstable supply has been the cause of frequent fluctuation in the market price of palay

Related System

Svitla (2023) highlights that with nearly 7.8 billion people on Earth enjoying diverse cuisines, it’s essential to find ways to meet rising food demand. Estimates suggest that food demand could increase by 59% to 98% by 2050, yet farming land is limited. Consequently, agriculture companies must innovate to maximize output from available land. Without cloud solutions, establishing a robust IT infrastructure is challenging. Instead of creating their own systems from scratch, agricultural companies can leverage cloud technology to streamline operations. For instance, farm vehicles like tractors may soon operate autonomously with GPS and cloud support. When discussing cloud computing in agriculture, precision agriculture emerges as a key concept, utilizing technology to optimize everything from tools to soil. Cloud computing is crucial for data collection, analysis, and storage in agriculture, with wireless sensors gathering real-time information to enhance crop management.

Yang (2018) notes that in China, a clear trend is emerging from fragmented smallholder farming to large-scale intensive

farms, facilitated by farmland circulation. Increasingly, farms are adopting standards to improve food quality, often utilizing piecework systems for efficiency. However, the scattered farmland structure results in smaller operational scales compared to developed nations. Smallholders dominate agricultural production and management, facing numerous challenges, particularly with diverse crops being cultivated simultaneously. The production process for vegetables involves numerous activities, and many farms still rely on paper records, leading to delays in data analysis and hindering real-time supervision.

Elbaze (n.d.) describes the Rice Mill Management System (RMMS) as a sophisticated solution for optimizing rice milling operations. This integrated system consolidates key functions like inventory management, production tracking, and quality control into a cohesive web platform. By utilizing modern front-end technologies such as HTML, CSS, and JavaScript, RMMS offers an intuitive user interface. Its back-end employs Node.js, Express.js, and MongoDB for a secure, scalable infrastructure, facilitating real-time data processing. This system automates many manual processes, reducing errors and operational costs while enhancing decision-making through advanced data analytics.

Katz (2024) emphasizes that the integration of full-stack web development in RMMS marks a significant advancement over

traditional systems. Literature on full-stack development underscores its advantages in creating dynamic and interactive applications. Front-end technologies like HTML, CSS, and JavaScript are recognized for providing user-friendly interfaces, while back-end solutions such as Node.js and MongoDB ensure robust data management and security. Studies indicate that these technologies collectively enhance management system performance and scalability.

Dolfi (2021) argues that rice is a strategic food commodity crucial for all Indonesian citizens, receiving high priority from the government for national food security. The Malind district is significant for rice cultivation, covering 551.24 km^2 with fourteen milling facilities. Farmers often struggle to obtain timely information about milling operations and grain stock quotas, requiring physical visits to mills. This inefficient process highlights the need for improved information technology to support rice milling management.

Rachmat (2019) discusses how an imbalance between rice planting areas and milling units leads to intense competition, resulting in low productivity and profitability. The study aims to compare the rice industries of Indonesia and Korea, recommending strategies for stabilizing paddy supply in Indonesia based on lessons learned from Korea's experiences. Methodologies included discussions, field observations, and data

analysis to formulate recommendations for enhancing the rice processing industry.

Farooq (2023) points out that rice is a major global food crop, affecting human health and spawning a variety of products. The rice supply chain has gained attention due to food safety concerns, with issues such as malpractices impacting farmers' revenues and causing economic losses for governments. This research proposes a secure, blockchain-based framework for traceability in the rice supply chain, introducing a new crypto token, Rice Coin (RC), to facilitate transaction tracking and improve transparency.

Sawmong (2020) indicates that Thailand is a major rice grower and exporter, recognized for high-quality rice. The study focuses on farmers' needs for innovative rice milling solutions. It aims to develop a household rice mill while assessing user satisfaction, employing a survey with validated reliability. The study found that organic farmers prioritize features such as size, mobility, and cost-effectiveness in innovative rice mill products.

Purwandoko (2023) highlights the importance of rice as a staple food in Indonesia, which accounts for 80% of carbohydrate intake. To ensure quality products, a management system is needed for monitoring throughout the rice supply chain. Traceability is essential for risk management and quality

control, providing critical information on the history and movement of rice.

Development of a Smart Traceability System for the Rice Agroindustry Supply Chain in Indonesia (2019) explains that agricultural supply chains face various risks, including food contamination. Implementing a traceability information system is crucial for ensuring food quality and safety. This system captures and transmits relevant information along the supply chain, allowing stakeholders to track food from production to consumption.

Hashiim (2024) discusses the significant socio-economic impact of rice and the necessity for sustainable practices. This review examines smart farming applications in rice production, highlighting yield estimation, smart irrigation, and disease monitoring. Various technological advancements, especially in IoT and AI, have facilitated smart farming implementation, promising a transformative future for rice production.

Ali Chandio (2022) reveals that global rice production has dramatically increased, necessitating further growth to meet rising demand. With major producers like China and India, rice remains a staple in many countries, emphasizing the importance of maintaining domestic strategic reserves for food security. The top rice producers worldwide in 2022 were China, India, Bangladesh, Indonesia, Vietnam, Thailand, Myanmar, the Philippines, Cambodia, and Pakistan (Table 1). China achieved

the highest total rice production in 2020, with 2.08 × 108 t, followed by India and Bangladesh, with 1.96 × 108 and 5.71 × 107 t, respectively. In several countries, such as the United Republic of Tanzania, Madagascar, Peru, Colombia, Mali, and Guinea, rice production was on par with some Asian countries, such as Laos, Malaysia, Korea, and Sri Lanka. The production quantities of rice are expected to rise significantly in the coming years. This is vital as rice production quantities are important for maintaining per capita rice consumption worldwide. Asian countries will likely continue to dominate rice demand in the future due to factors including population expansion, dietary changes, and increased yields from land intensification. Given that rice remains the primary staple in leading producing nations, the establishment of domestic strategic reserves holds paramount significance for ensuring food security.

Design, Development and Performance Evaluations of Mini Rice Mill for Domestic Purpose (2014) states that rice is India's staple food, making its production vital. The evolution of mini rice mills aims to reduce costs by minimizing fuel and electricity needs, utilizing simple mechanical systems. This innovation enhances efficiency in rice processing.

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Atif (2021) notes that India is the second-largest rice producer, contributing about 20% of global output. Despite improvements, productivity levels remain low compared to other nations. The adoption of hybrid rice technologies and improved practices is crucial for enhancing rice production efficiency.

According to (Pervez, 2019), Increases in rice production since 1960 have helped many developing countries keep food production above the rate of population growth. But 'second generation' losses, those associated with postharvest drying, processing, and storage, may amount to about 7% of total rice production, and may reach as high as 26%. Several international aid agencies and developing countries have mounted programmes to reduce postharvest losses. This book explains rice handling, transport, drying, cleaning, storage, parboiling, and milling. For each postharvest step, discusses not only appropriate equipment, but also performance and design criteria. It spells out the engineering principles that design engineers, manufacturers, construction personnel, and technicians should consider in the design and operation of paddy processing facilities in developing countries.

According to (Kamala, 2021), In India rice is grown in 43.86 million ha, the production level is 104.80 million tones and the productivity is about 2390 kg/ha (Agricultural

Statistics at a glance- 2015). It is grown under diverse soil and climatic conditions the productivity level of rice is low compared to the productivity levels of many countries in the world. Also about 90 % of the cultivated land belongs to Marginal, Small and Medium farmers which is another constrain in increasing the productivity of rice in the country. It is, therefore, there is ample scope to increase the productivity of rice in the country. The highest productivity is 6710kg per ha of China followed by Vietnam (5573 kg /ha), Indonesia (5152 kg/ha), Bangladesh (4375 kg/ha) etc There are improved technologies and various interventions which could be adapted to increase the productivity in the country. Cultivation of hybrid rice has potential to increase productivity and needs to be promoted. Total production of Rice during 2019-20 is estimated at record 117.94 million tonnes. It is higher by 8.17 million tonnes than the five years' average production of 109.77 million tonnes.

According to (Murali Mohan, 2021), identified the marketing problems of the agro based industries in Chittoor district. Agro based industry is regarded as the sunrise sector of Indian economy. Approximately 14% of the total workforce is engaged in agro processing sector directly and indirectly. Especially in rural based industries it has been served that rice mill industry in Patiala district is in the crisis and facing the various marketing problems regarding lack of financial

assistance, improper marketing channel, high degree of breakdown of finished products and non-availability of research lab for quality control. In this study using primary data covers 218 small and medium agro based units. In the study it is identified the problems like competition, high cost production, credit sale, lack of brand good will, inadequate irregular supply of power, low demand, heavy taxes etc. The objective of the study was to analyze the impact of marketing practices followed by agro based units by the industrial units.

Gopinatan (2021) stated that many past studies have reported that the overall supply of rice could be significantly increased through the modernization of existing paddy processing techniques. The Thrissur district is one of the major rice zones in Kerala, ranking third in terms of area under cultivation and production of paddy in the state. The Paddy Marketing and Processing Cooperative Society Limited, established in 1993, aims to protect farmers from exploitation by middlemen, millers, and their agents in paddy marketing, ensuring a remunerative price for growers during harvest seasons. The study found that the hulling to milling ratio analysis indicated reasons for the poor performance of existing plants. Modernization of the current facilities was suggested to improve the organizational performance of rice mills.

Magdalinos (2019) highlighted that recent technological advances have paved the way for developing and offering advanced

services for stakeholders in the agricultural sector. A paradigm shift is underway from proprietary and monolithic tools to Internet-based, cloud-hosted, open systems that enable more effective collaboration between stakeholders. This new paradigm includes the technological support of application developers to create specialized services that seamlessly interoperate, thus creating a sophisticated and customizable working environment for end users. The implementation of an open architecture based on a set of domain-independent software tools called "generic enablers," developed in the context of the FI-WARE project, exemplifies this approach. The implementation validates several innovative concepts for the agricultural sector, such as the idea of a services marketplace and the system's adaptation to network failures. During the design and implementation phases, the system was evaluated by end users, providing valuable feedback. The results of the evaluation process validate the acceptance of such a system and the need for farmers to access sophisticated services at affordable prices.

Synthesis

The Rice Mill Management System is a very important component of today's agricultural sector, influencing the country's economy and food security for everyone's safety and daily needs. These studies emphasize the complexities and challenges including high production and marketing cost. Building interaction between farmers, the government and any

inspiring digital companies are essential and a need in every rice industry's success and sustainability.

Chapter III

Methodology

This chapter outlines the methods and strategies employed in this study to create an approach that aligns with its goals. Various processes, specifications, analyses, data collection tools, and evaluations were utilized to help the researchers effectively manage and oversee the research.

Development Method

In the fast-changing world of digital solutions, successful project development using the Agile method needs a clear and flexible approach. This process includes several important steps: gathering requirements, designing, developing, testing, deploying, and reviewing. Each step is repeated in cycles, allowing the team to improve the product based on feedback from stakeholders. Working closely with stakeholders ensures that the project meets their needs, stays high quality, and provides real value to users. This Agile roadmap helps the development team create and improve a strong digital solution while being open to changes along the way.

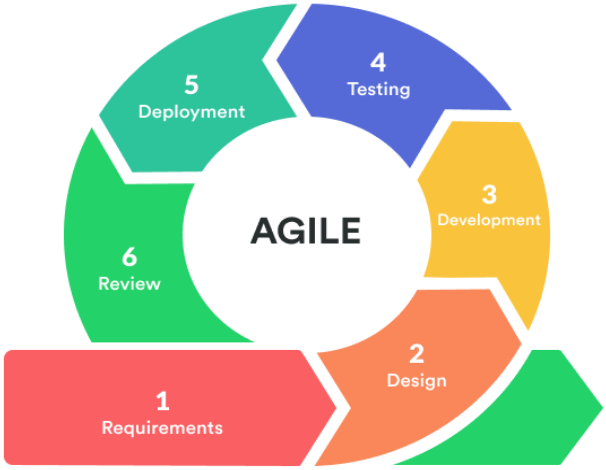


Figure 2. Agile Methodology

Figure 2 illustrates the Agile methodology used to develop the eRiceMillApp, focusing on flexibility and iterative improvement. This methodology promotes ongoing collaboration, incremental enhancements, and adaptability throughout the lifecycle. By breaking down the project into stages, the researchers can prioritize continuous feedback and refinement, aligning the final product more closely with user needs and organizational goals.

1. **Requirements**

The process starts with clear planning, the researchers set goals, outline requirements, and establish timelines. During this stage, researchers work with stakeholders to define the project scope and allocate resources to keep everything aligned from the beginning.

2. Design

In the design stage, the project begins to take shape. The team develops the layout, user interface, and overall system structure. Researchers create wireframes and prototypes, focusing on user experience, scalability, and a strong system design.

3.**Development**

With a solid plan and design, researchers move into the development phase, where coding and building the solution happen. Developers follow best practices and coding standards to ensure good teamwork and quality control through code reviews and version management.

4.Testing

Thorough testing is vital for delivering a dependable product. This phase includes unit testing, integration testing, and system testing to find and fix any problems. Making sure everything works together and meets requirements is a top priority.

5.Deployment

Once development and testing are complete, researchers will develop the solution in its intended environment. This may involve a staged release to ensure a seamless rollout and minimize disruptions, with a strong emphasis on quality assurance.

6.Review

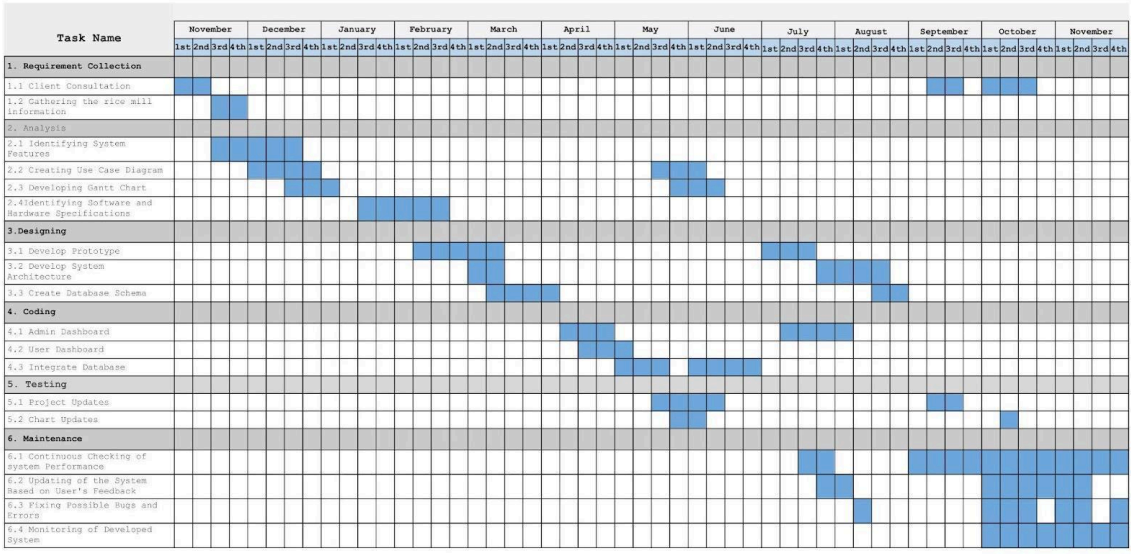
After deployment, researchers analyze user feedback,

performance data, and other important metrics. This review process is key for addressing any issues and continuously improving the solution based on real-world experiences.

Gantt chart

In this section, a Gantt chart is presented to show the plans and schedules of the project timeline. All the development stages up to the completion of the project were documented in this chart. This helps the researchers to know the deadlines needed to accomplish and show breakthroughs in various tasks.

Table 1. Gantt chart



Legend: ■ = Done

Table 1 presents the project's Gantt Chart, detailing the stages involved in the development process and tracking weekly progress. It outlines the preparation and key activities for planning, development, testing, deployment, and maintenance. The requirements phase is scheduled to start in the fourth week of

November 2023, while the final testing, deployment, and maintenance phases are expected to wrap up by the second week of December 2023. Each task within the chart is essential to systematically build and refine the system.

Requirements Specification

These specifications include important features like analytics, inventory management, point of sales, e- commerce website and a secure website. The requirements also cover the admin panel, which includes centralized dashboards, user management, communication tools, and data analysis. This document serves as a clear guide for the development team, helping them meet the expectations of stakeholders and the specific needs of customers and administrators of P.M. Asi Rice and Palay Trading.

Functional Requirements

Functional requirements define the operations and processes supported by the system for both administrators and end-users. Core functionalities include real-time crop monitoring, task management, and crop information databases, alongside essential administrative tools like centralized dashboards, user management, communication tools, and data analytics.

Table 2. Functional Requirements

Features	**Description**

1. Data analytics and reporting	Admins will be able to generate detailed reports on sales performance, including revenue and number of orders. Reports will allow for the breakdown of data by product categories. Reports will be exportable using PDF format.
2. E- Commerce Website	Admins will have full access to the platform, including the ability to manage products (add, edit, delete), set pricing, adjust inventory, and oversee order processing. They will also handle user accounts and set up payment transactions. Customers will be able to browse the product catalog, add items to the cart, and complete the checkout process. They will have access to personalized features such as managing their profile, viewing order history, and tracking current orders.

3. User Management	Customers can create accounts using email or social media logins and manage their profiles, including personal details and order history. Admins will have full control over user accounts, with the ability to view, modify, or delete customer information as necessary. The platform will support multi-factor authentication for admins to enhance security.
4. Real Time Data Management	Admins will be able to track the real-time status of all orders, including their shipping and delivery stages. The platform will provide real-time notifications and alerts for low stock levels, product availability, and any issues with orders.

Table 2 outlines the key functional requirements for the cloud-based e-commerce system. It includes features for admins to generate sales reports, manage products, pricing, inventory,

and user accounts, while enabling customers to browse products, complete purchases, and manage profiles. User management allows secure account creation and control, with multi-factor authentication for admins. Real-time data management ensures admins can track orders, inventory, and receive alerts on issues, ensuring smooth platform operation for both customers and administrators.

User Interface

P.M. Asi Palay and Trading: A Cloud-Based Rice Mill Management System is designed to improve productivity and simplify processes in rice milling businesses. The user interface (UI) is easy to use and intuitive. It begins with a secure login page to ensure that only authorized users can access the system. Once logged in, users see a dashboard that shows important company metrics and real-time updates on ongoing operations. Key indicators are displayed in a visually appealing way with charts and summaries, including client order statuses and current inventory levels of both raw and processed rice.

The UI includes specific modules for managing important business processes like order handling, inventory management, and distribution. Users can track the progress of rice batches from the husking stage to the final drying stage. The system also sends alerts for any delays or equipment problems. The Inventory Module allows accurate tracking of stock levels,

ensuring effective management of both raw materials and finished products.

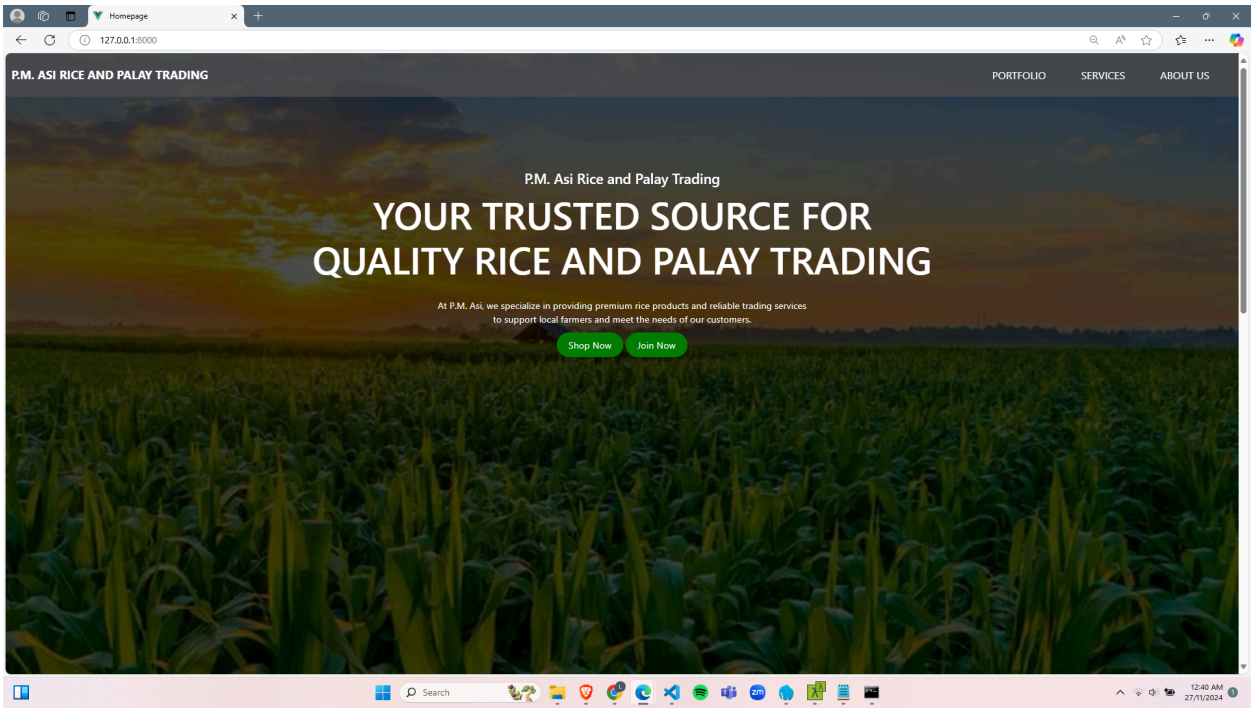


Figure 3. User Interface

The user interface has distinct modules that manage key business activities, such as processing orders, overseeing inventory, and handling deliveries. Users can track the live status of rice batches during delivery, from husking to drying. The system sends alerts for any delays or equipment issues. The Inventory Module allows precise tracking of stock levels, ensuring effective management of both raw materials and finished products. This well-designed technology gives rice mill operators better control over their operations, improving

overall business performance while maintaining a clear and organized workflow.

Hardware Interface

A cloud based management system is designed to be accessible via web browsers and mobile applications. The hardware interface for the cloud-based management system is designed to facilitate smooth interaction between end-user devices and the backend infrastructure. Users can access the platform through a variety of devices, including desktops, laptops, smartphones, and tablets, using input methods like keyboards and mouse. These devices will connect via wired options (USB, Ethernet) or wireless technologies (Wi-Fi, 4G/5G). On the backend, the system will be supported by powerful servers with multi-core processors, ample storage, and high-speed internet connections to manage increasing user traffic and data demands. Cloud storage solutions will offer redundancy and quick data access, with additional external storage for backups and disaster recovery.

Software Interface

The software interface for the cloud-based management system will be hosted on platforms like Hostinger for scalability and high availability. It will use cloud-based databases such as MySQL or PHPMyAdmin for storing user, product, and transaction data. Payment gateways like Gcash will ensure

secure transactions, while shipping services will be provided by P.M ASI depending on the customer needs. Security will be enforced with two-factor authentication for admins and users.

Security Requirements

The cloud based management system will implement a comprehensive security management approach to ensure the safety of sensitive data and financial transactions. Sensitive payment information will never be stored on the platform, minimizing the risk of data breaches. Transactions will be processed using strong encryption and tokenization methods such as QR code to protect financial data. All sensitive data, including customer information, payment details, and order history, will be encrypted ensuring protection from unauthorized access. The system will also provide a two - factor authentication for admin and users accounts to enhance login security. Customers will have secure login options, including password hashing and the ability to log in via social media accounts (Gmail, Facebook). Additionally, security patches will be applied automatically where possible, with manual updates scheduled during low-traffic periods to minimize disruption and maintain system security.

Technical Background

In order for students to create a website connected to their chosen topic research, they must have a knowledge background which means being skilled in their course related subjects such as coding, debugging, grasping how software is

built, development process and being aware with the tools and technologies to be used. As this knowledge is essential for providing the beneficiaries features with the system connected with user interfaces, security systems and database connections that are required to create a successful farm monitoring solution.

Hardware Specifications

Table 3. Hardware Specifications

Quantity	Unit	Item	Minimum Specifications	Recommended Specifications
1	PC	Laptop /desktop	cpu - 1.67 GHz clock rate ram - 1gb storage - 5mb	cpu - 2.4 GHz clock rate ram - 8gb storage - 250gb

Table 3 shows all the specific information used including the unit, item and size of each component and the amount of storage and RAM available.

Software Specifications

The software specifications act like a detailed guide for the development team, helping them navigate the design, implementation, and testing of the digital solution. They ensure that all the software elements function smoothly together to address the specific needs of farmers and administrators while staying aligned with the goals of the PM ASI Rice and Palayan project.

Table 4. Software Specification

Component	Minimum Specifications	Recommended Specification
Operating System	64-bit OS (e.g., Windows 8, macOS 10.14+)	64-bit OS (e.g., Windows 11, macOS 12+)
Development Environment	Local development environment (e.g., XAMPP, Laragon)	Local development environment with latest version (e.g., Laragon, Docker)
Code Editor	Code editor (e.g., Visual Studio Code 1.x,Notepad, Sublime Text)	Latest code editor (e.g., Visual Studio Code 1.85+, Sublime Text)
Database	Relational or NoSQL database (e.g., MySQL, PostgreSQL)	Latest version of relational or NoSQL database (e.g., MySQL, PostgreSQL, MongoDB)
Web browser	Modern web browser (e.g., Chrome, Firefox)	Latest version of modern web browsers (Chrome, Firefox, Safari, Edge)

Table 4 outlines the software specifications for the cloud-based management system, detailing both minimum and recommended requirements. The minimum specifications ensure the system operates on basic hardware and software, while the recommended specs provide optimal performance. Key components include a 64-bit operating system, a modern code editor (like Visual Studio Code), and a database (e.g., MySQL, PostgreSQL). The recommended environment includes the latest versions of

these components for improved performance, security, and compatibility. Users should access the system via up-to-date browsers like Chrome or Firefox.

System Analysis and Design

Gathering information from discussions with stakeholders and reviewing documents is a key part of analyzing P.M. Asi Rice and Palayan's Digital Management Solution. Important features, such as data analysis,inventory management, and privacy and security are identified for both administrators and users. To create a user-friendly experience, this study examines different types of data, the system's structure, security measures, and usability. It also looks at risks, cost benefits, environmental impacts, and technical feasibility to help with decision-making. This phase lays a strong foundation for a system that is secure, flexible, and easy to use, meeting the needs of stakeholders and addressing potential challenges.

System Overview

EriCeMillApp is a cloud-based management system designed to streamline e-commerce operations while providing an intuitive experience for both administrators and customers. The platform enables customers to browse products and complete secure transactions, with support for multiple payment options and encrypted payment processing. Admins have comprehensive tools to manage product listings, pricing, inventory, and order processing, along with

real-time analytics and sales reports. Hosted on a scalable cloud infrastructure such as Hostinger, the system ensures high availability, data redundancy, and disaster recovery. Real-time data management features notify admins of low stock levels, order updates, and customer interactions. Security is prioritized with encrypted connections and two-factor authentication for admin and user accounts. With a responsive design, EriCeMillApp ensures a seamless user experience across devices, making it a secure, efficient, and scalable solution for businesses and customers alike.

System Architecture

Cloud-based rice mill management system architecture serves as a blueprint, depicting the organization and information flow within the system.

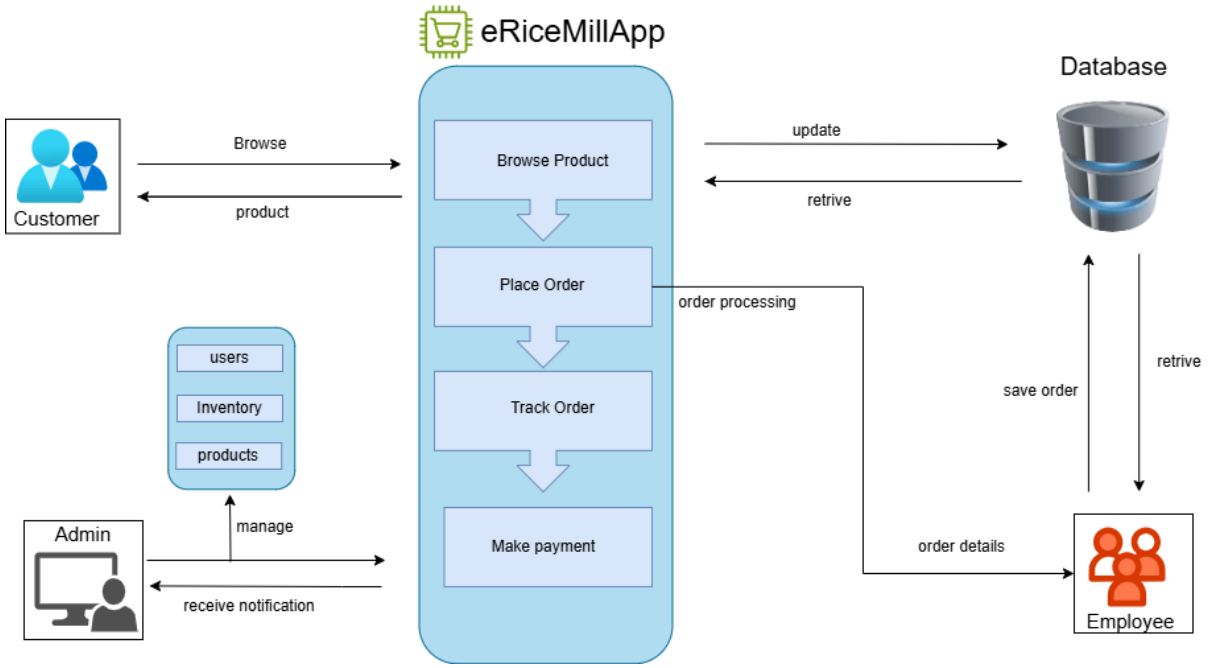


Figure 4. System Architecture of A Cloud-Based Rice Mill Management system

The visual representation in figure 4 shows the eRiceMillApp system, where customers can browse products, place orders, track them, and make payments. Admins manage users, inventory, and products while receiving notifications. Employees process orders and interact with the database, which stores and retrieves data like products, inventory, and orders. The app serves as the central platform connecting customers, admins, employees, and the database.

Use Case Diagram

A use case diagram visually represents how users interact with a system, showing the different actions they perform. It outlines the system's functionality, highlighting user roles and

their interactions. This diagram is a concise tool for understanding and communicating the scope and requirements of the system.

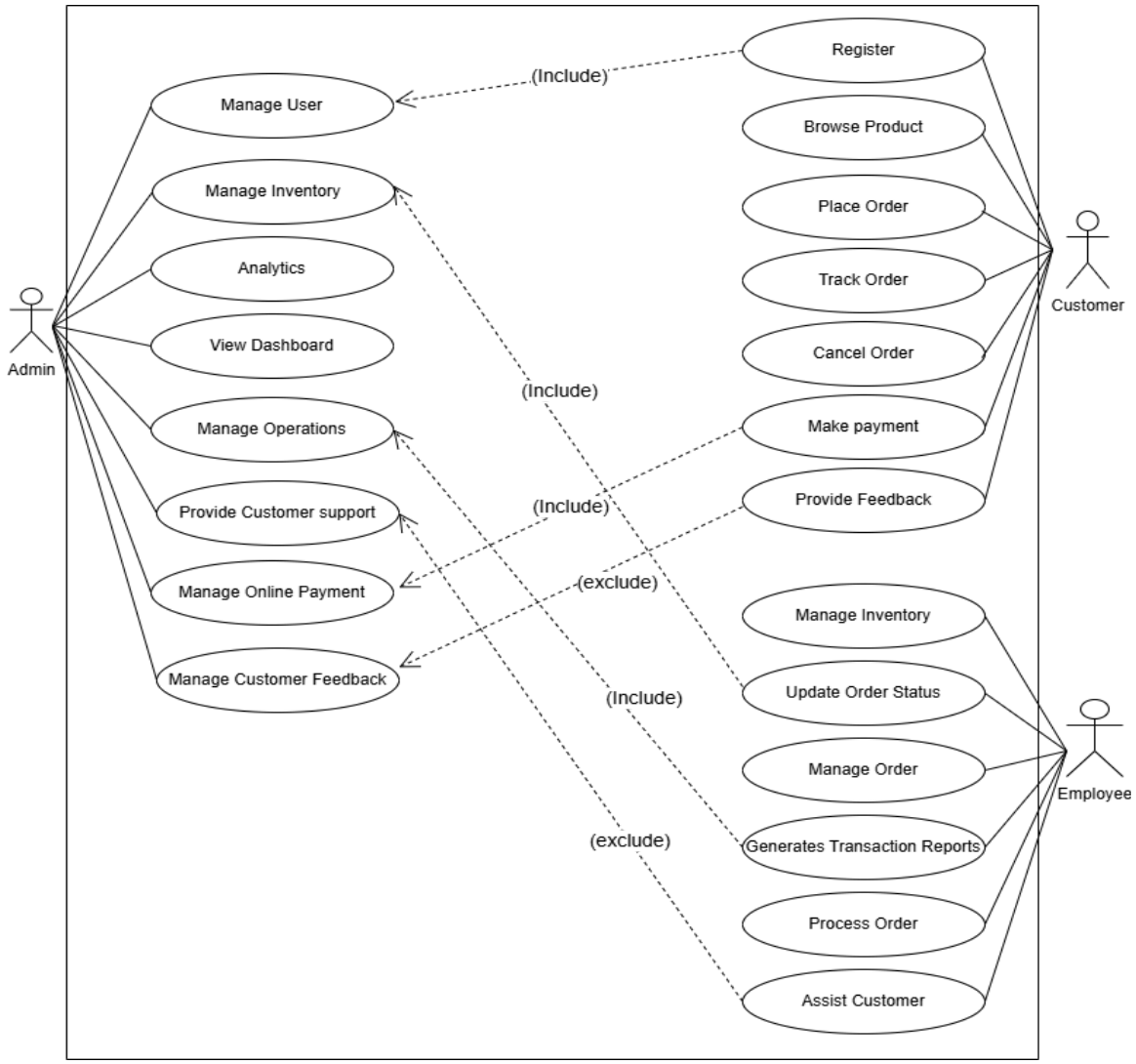


Figure 5. Use case of A Cloud-Based Rice Mill Management system

A cloud-based Rice mill Management system has three users: Admin, Customer, and the Employee. Users of the developed system must follow the steps shown in figure 5. This view reveals the perspectives of users regarding the features that the project's proponents have provided.

Activity Diagram

This part of the document presents the project flow using an object-oriented programming flowchart.

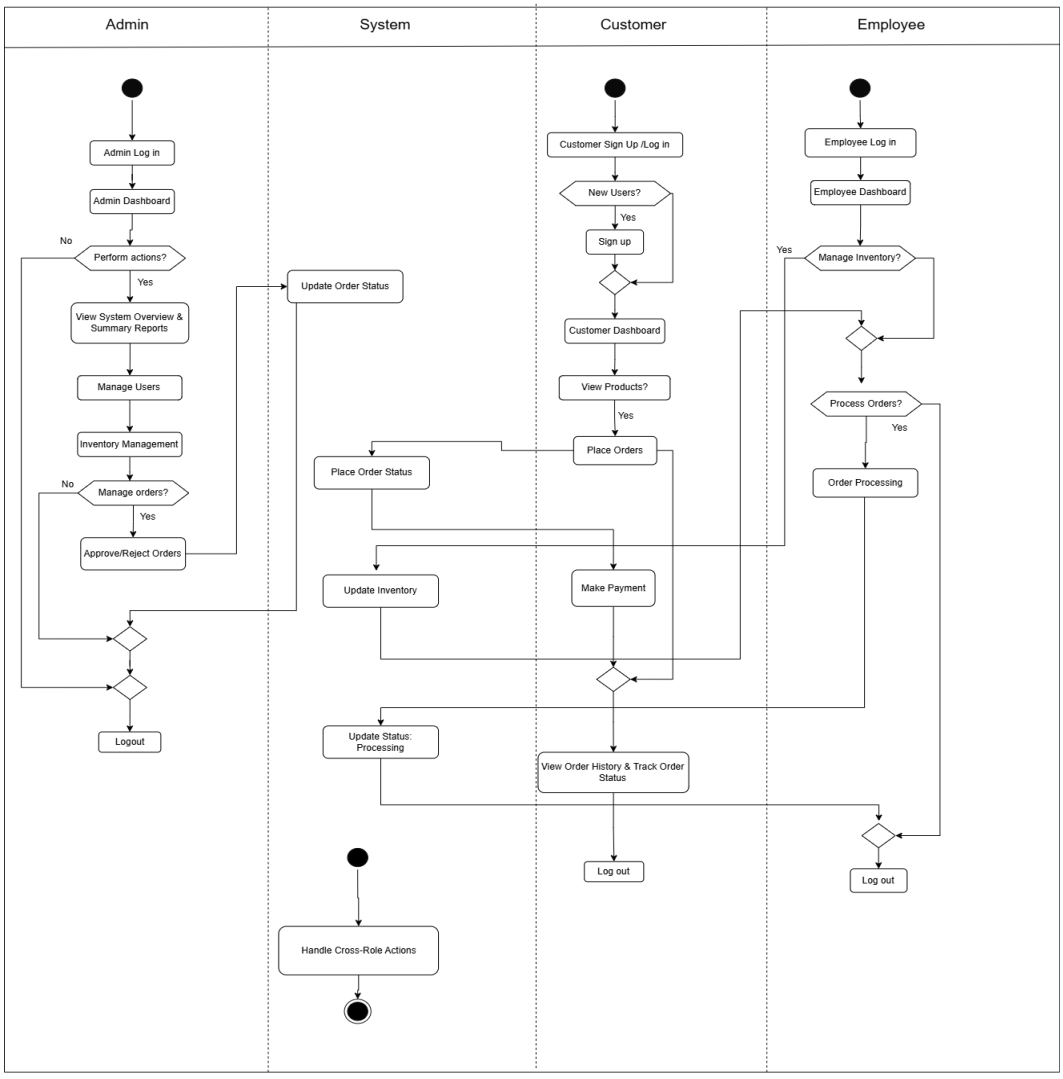


Figure 6. Activity Diagram

Figure 6 shows the activity diagram of A Cloud - Based Rice Mill Management system. The intended activities of the admin and members are presented above.

Data Flow Diagram (DFD)

The researchers studied how the current manual process works at PM Asi Rice and Palay Trading to see where the

eRiceMillApp could improve it. Data Flow Diagrams (DFDs) help show how information moves through different parts of the eRiceMillApp, making it easier to understand each step of the process.

Context Diagram

This section provides an overview of the analyzed system or process. The way the end users use the system is explained.

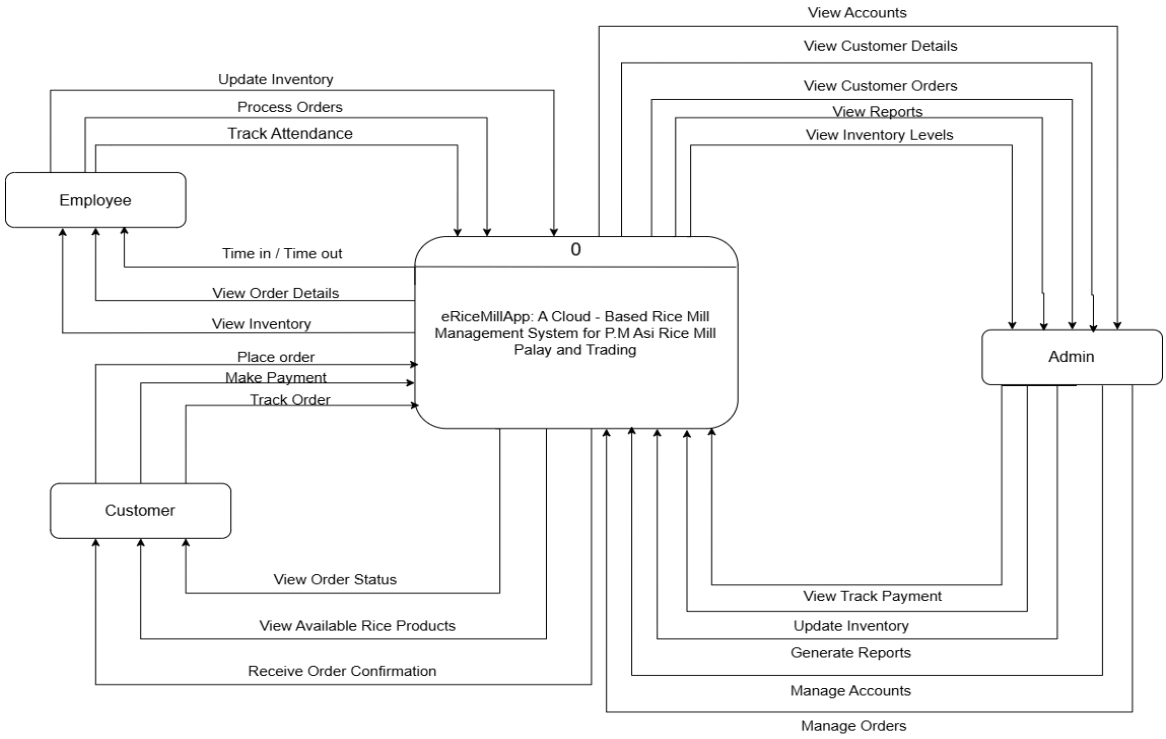


Figure 7. Context Diagram

Figure 7 shows the context diagram for the eRiceMillApp system. In this system, the Admin manages users, inventory, and transactions, ensuring smooth operations within the eRiceMillApp. By registering and

managing users, the Admin grants employees access to the features they need within the system. The Customer interacts with eRiceMillApp to browse products, place orders, track orders, and provide feedback. The central eRiceMill System connects the Admin and Customer, facilitating efficient inventory control, order processing, and transaction management for PM Asi Rice and Palay Trading.

Diagram 0

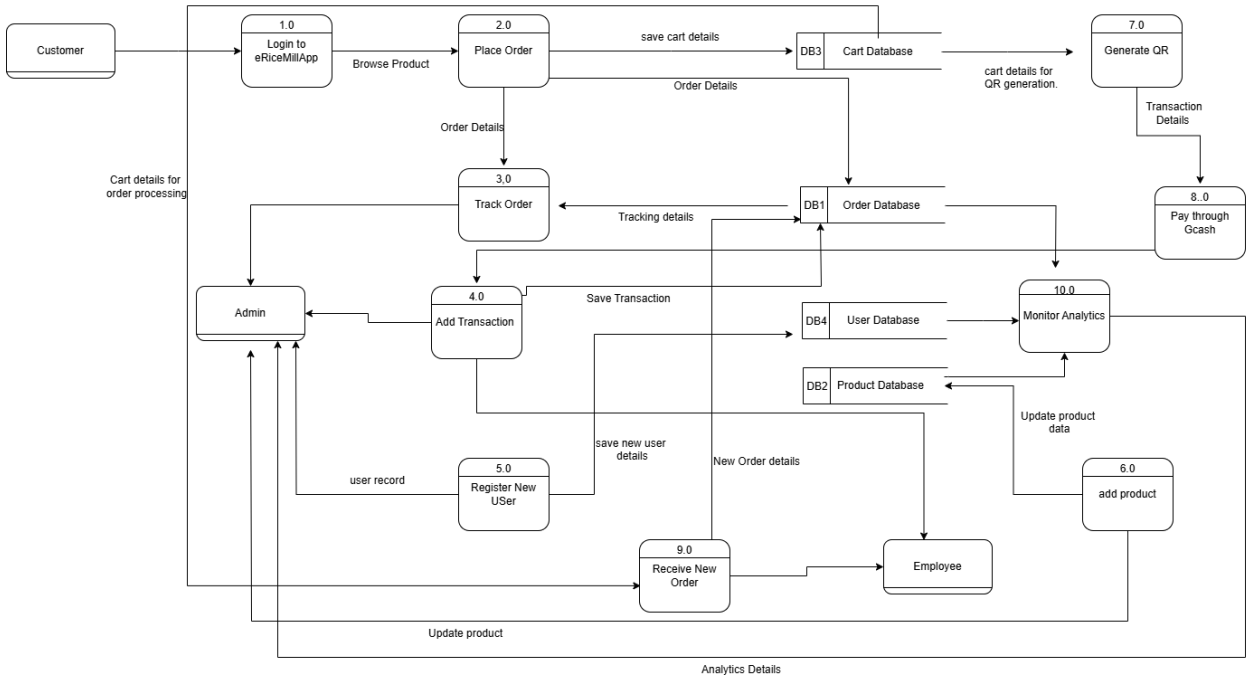


Figure 8. Diagram 0 of eRicemillApp

Diagram 0 breaks down the context diagram into more detailed components, displaying the saved or entered data of users and how the system manipulates it.

Database Schema

The entities found in the system are shown in the table below.

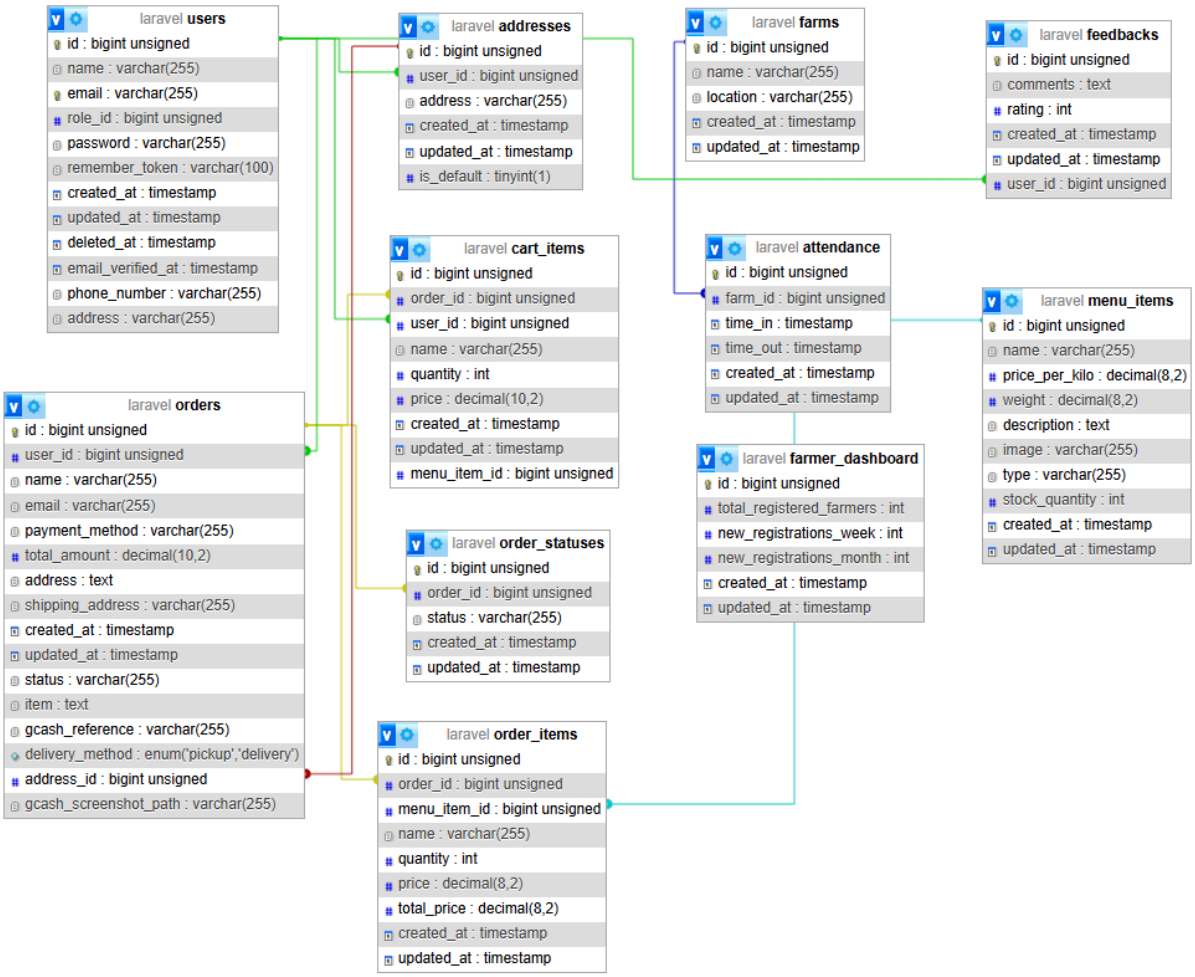


Figure 9. Database schema

Figure 9 demonstrates the multiple interconnected tables designed to manage relationships between these tables, highlighting the flow of data across key areas such as user management, e-commerce transactions, and data analytics.

Testing and Evaluation

This is the type of task that has to be executed so that all portions of the system can be evaluated, and so that the

system can be efficiently deployed into the production line. More modifications have been integrated into the system in an attempt to enhance its service delivery. We also make sure that the system is usable and functional.

Participants of the Study

The respondents to the study were composed of the farmers, the Manager of PM Asi, the staff, customers, and IT Experts.

Table 5. Respondents of the study

Respondents	Number of Respondents	Percentage
Manager	1	2%
Employee	22	44%
Customer	22	44%
IT Experts	5	10%
TOTAL	50	100%

Table 5 Shows the respondents of the study, including the number of each category of respondents. The respondents feedback depends on how well the system is functioning.

Data Gathering Instrument

For the purpose of the study, the researchers provided questionnaires that were answered by the respondents of the study. The acquired data of the respondents would validate to formulate the needed information for the website. The

researchers used the rating scale questionnaire as an instrument and used the Likert scale to get information from the respondents. Researchers distributed 50 questionnaires to respondents to have accurate data.

Table 6. Five- Point Likert Scale-type

Scale	Range	Verbal Interpretation
5	4.50 - 5.00	Excellent
4	3.49 - 4.49	Very Good
3	2.50 - 3.49	Satisfactory
2	1.50- - 2.49	Fair
1	1.00 - 1.49	Poor

The statistical values used to assess respondents' satisfaction levels are displayed in the table that is provided. It contains a range of numerical ratings as a quantitative measure of respondents' contentment. These values offer a clear framework for the analysis and interpretation of data, making it possible to conduct a thorough satisfaction assessment. This scale makes it simpler to properly assess the data in the context of the respondents' remarks by providing a brief summary of the satisfaction levels.

Implementation Plan

If the proposed system is adopted, the researchers have developed an implementation plan. This plan includes handing over the system and its documentation to the client, serving as a guide for managing updates and maintenance. A letter of agreement will state that the system is given to the user for free and that the researchers are not responsible for future updates and maintenance. If the project is approved, the researchers plan to carry out various strategies.

Table 7. Implementation Plan

Activities	No. of Days Complete	Start Date	End Date
Meetings with the client	10	November 5, 2023	November 14, 2023
Data Gathering	15	November 15, 2023	November 30,2023
Planning	25 days	November 30, 2023	January 4, 2024
System Development	150 days	February 16, 2024	July 15, 2024

Testing	25 days	July 15, 2024	August 9, 2024
Implementation	75 days	August 10, 2024	October 23, 2024
System Finalization	30 days	October 23, 2024	November 22, 2024

The implementation plan begins with 10 meetings with the client, scheduled to take place from November 5 to November 14, 2023. Following this, a 15-day data gathering phase will occur from November 15 to November 30, 2023. This will be followed by a 25-day planning phase, which will set the groundwork for the 150-day system development stage, running from February 16, 2024, to July 15, 2024.

After development, a 25-day testing period will take place from July 15, 2024 to August 9, 2024, ensuring the system's robustness. A 75-day system implementation phase will run from August 10, 2024 to October 23, 2024, allowing for any necessary refinements before the project completion. Last, the system finalization that will take 30 days starting from October 23, 2024 - November 22, 2024.

Chapter IV

RESULTS AND DISCUSSION

The research results are compiled and assessed in this chapter. It answers the research questions, gives a summary of the data collected, and analyzes it using statistical methods.

Presentation of System Output

This section highlights the output presentation of the system, similar to how crucial the user interface is when building a website. The results are presented through summaries and images to guarantee accessibility and facilitate stakeholders' further analysis or well-informed decision-making.

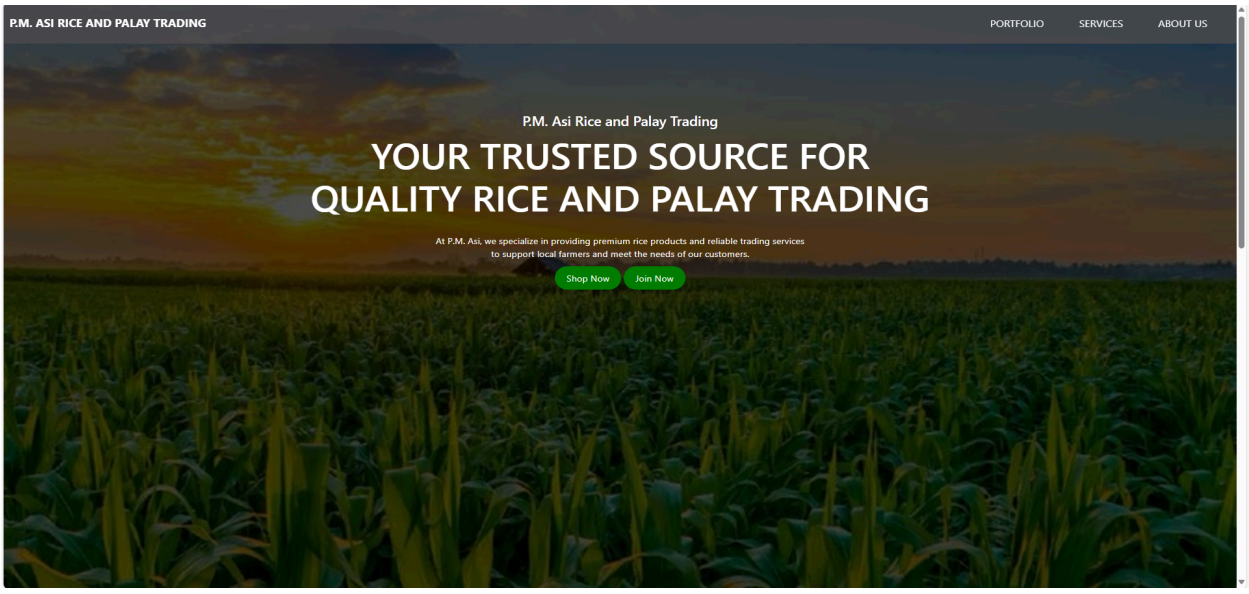


Figure 10. Home Page

This figure shows the home page of eRiceMillApp, designed exclusively for administrators and customers. Here they can sign in or sign up using their information.

Admin Side

The following screenshots show the user interface that was created with administrators in mind. This interface gives administrators complete control and management power over the system. Since administrators have full access, they can coordinate and monitor different parts of the system with maximum power.

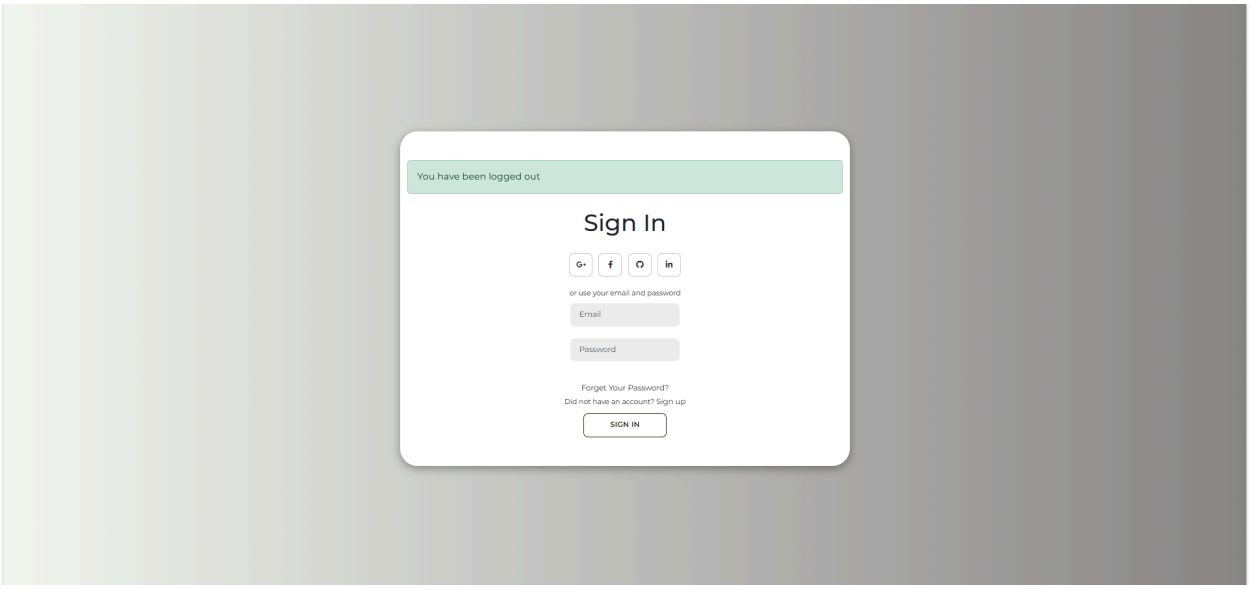


Figure 11. Login Page

This figure shows the login page of eRiceMillApp, designed exclusively for administrators, serves as a secure gateway,

ensuring authenticated access and providing comprehensive functionalities for overseeing library operations.

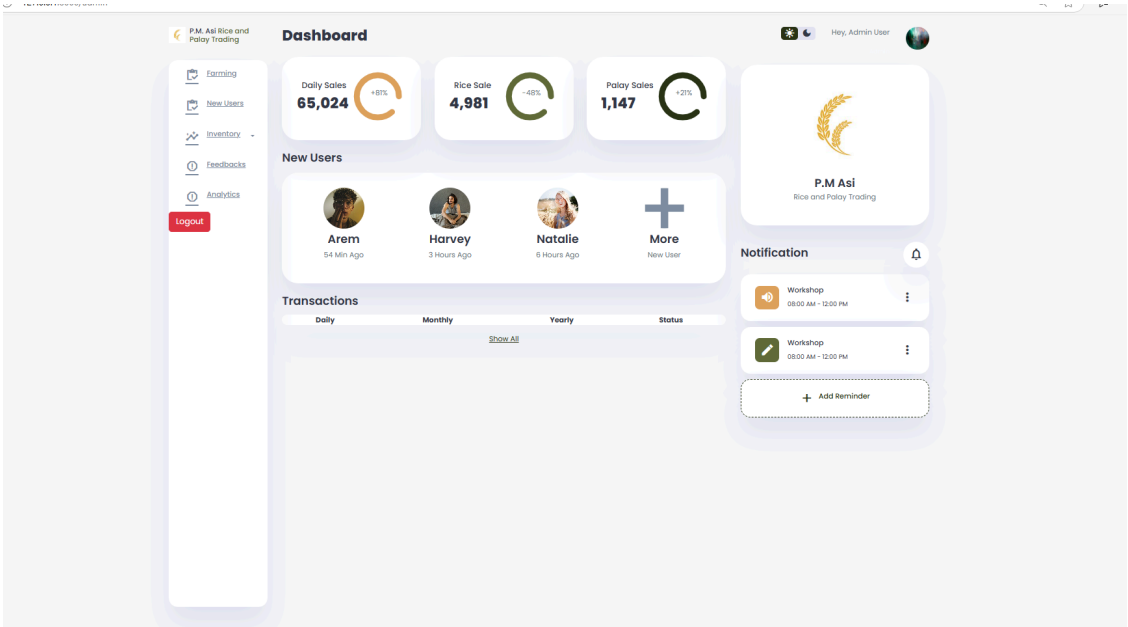


Figure 12. Admin Dashboard

The admin dashboard, accessible post-login, serves as a centralized hub for administrators, streamlining a cloud based management by providing efficient control over critical features. It facilitates tasks such as data analytics and inventory management.

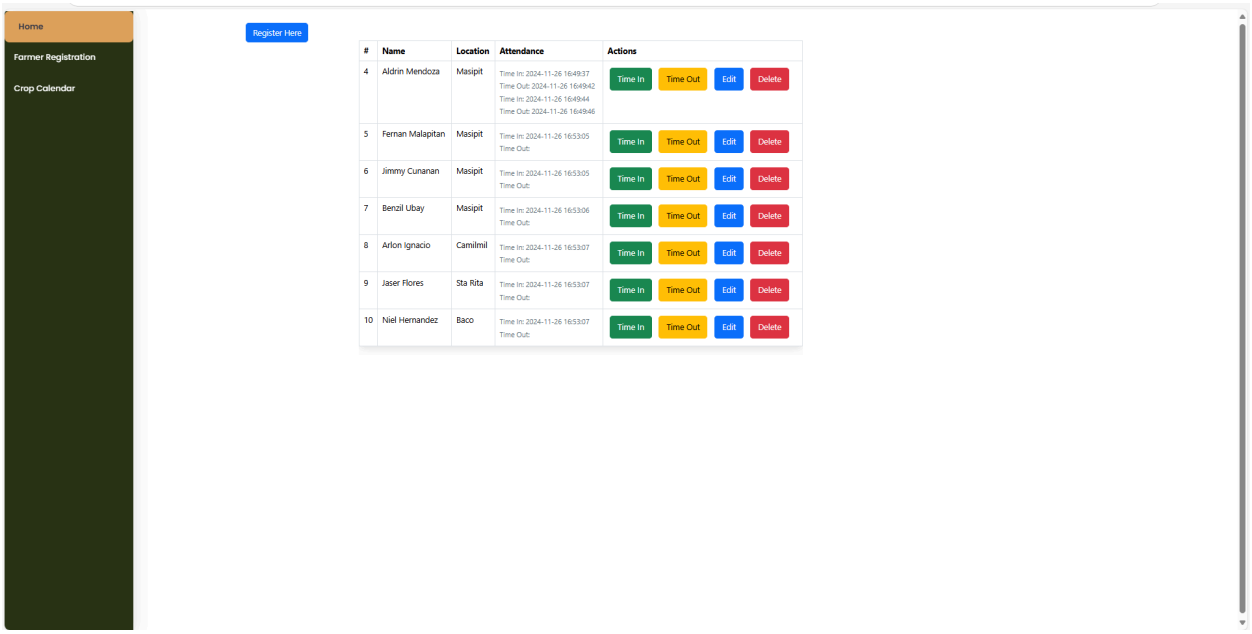


Figure 13. Registered Users

In this figure the "Registered Users" figure represents individuals who have created an account, enabling them to access personalized features and exclusive content.

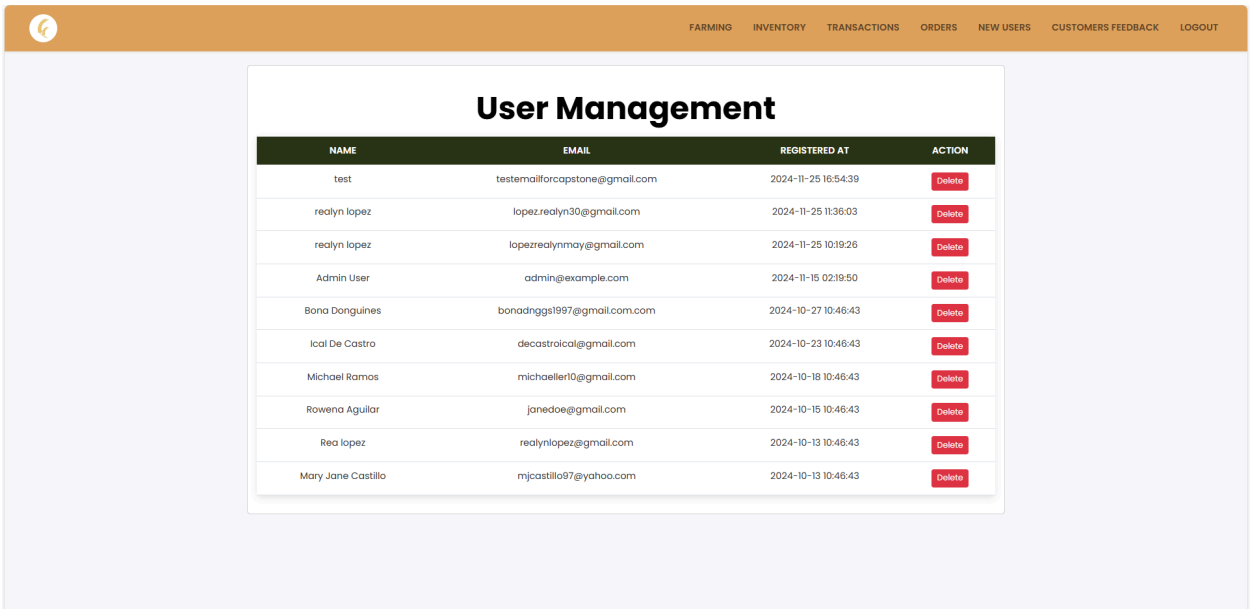


Figure 14. User Management

Figure 14 depicts the User Management module, which enables administrators to create, modify, and delete user accounts while assigning roles and permissions.

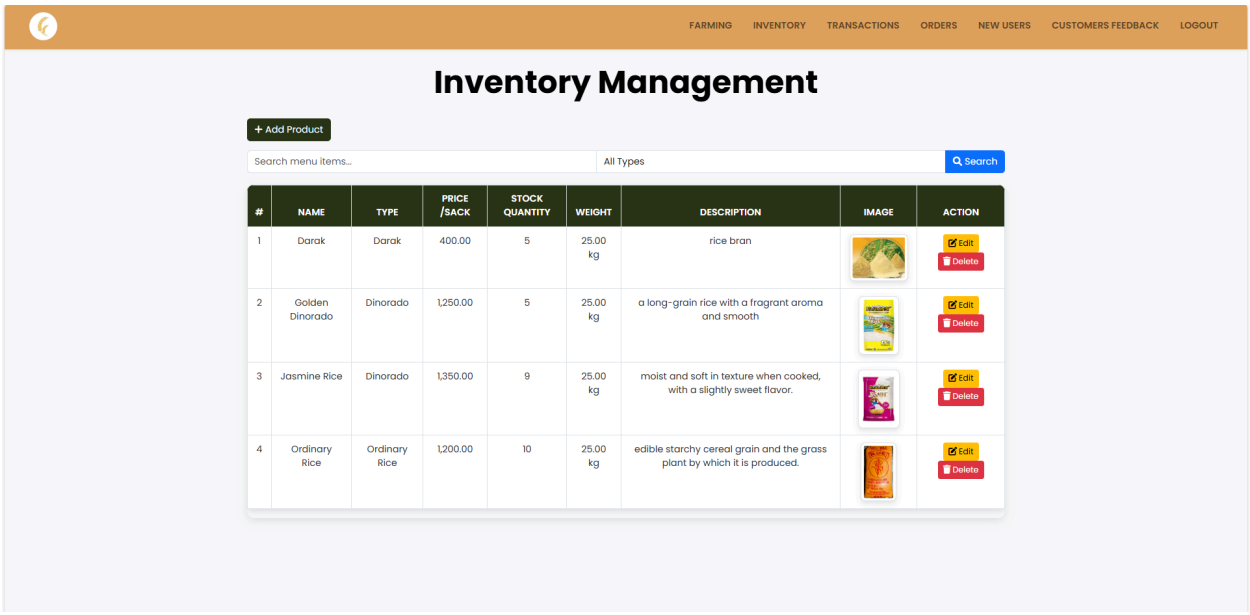


Figure 15. Inventory Management

Figure 15 illustrates the Inventory Management, which allows users to track and manage product stock levels. It supports features such as adding, updating, and removing inventory items, along with monitoring stock quantities. The system ensures efficient inventory control, reducing the risk of shortages or overstocking, and provides real-time updates for accurate tracking and reporting.

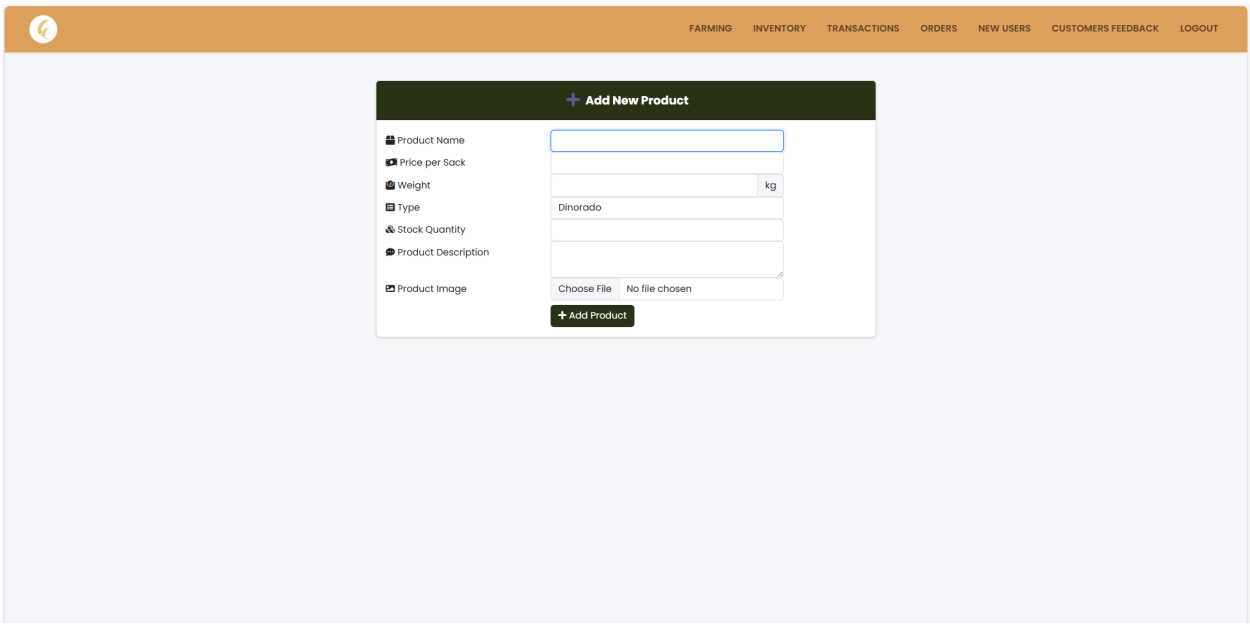


Figure 16. Adding of Product

Figure 16 shows the process of adding a product to the system, allowing users to input key details such as product name, description, price, and stock quantity.

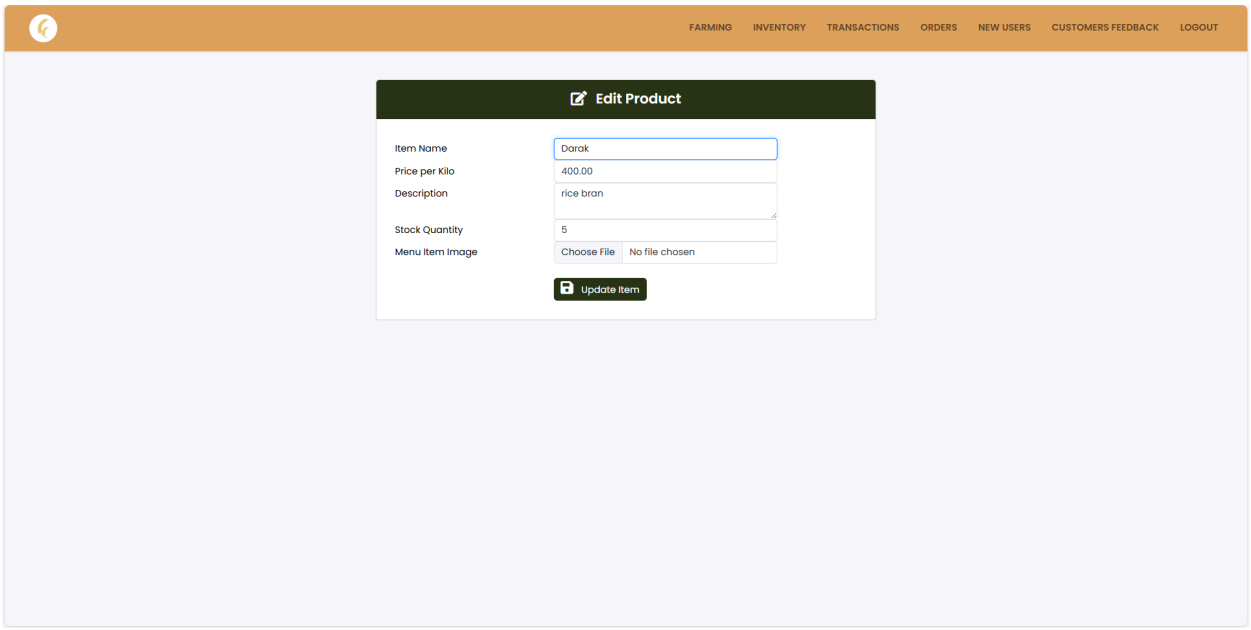


Figure 17. Editing of Product

Figure 17 illustrates the product editing process, enabling users to modify details such as product name, description, price, stock quantity, and category. The interface allows for quick updates and ensures that changes are reflected in real-time across the system, maintaining accurate inventory records and product information.

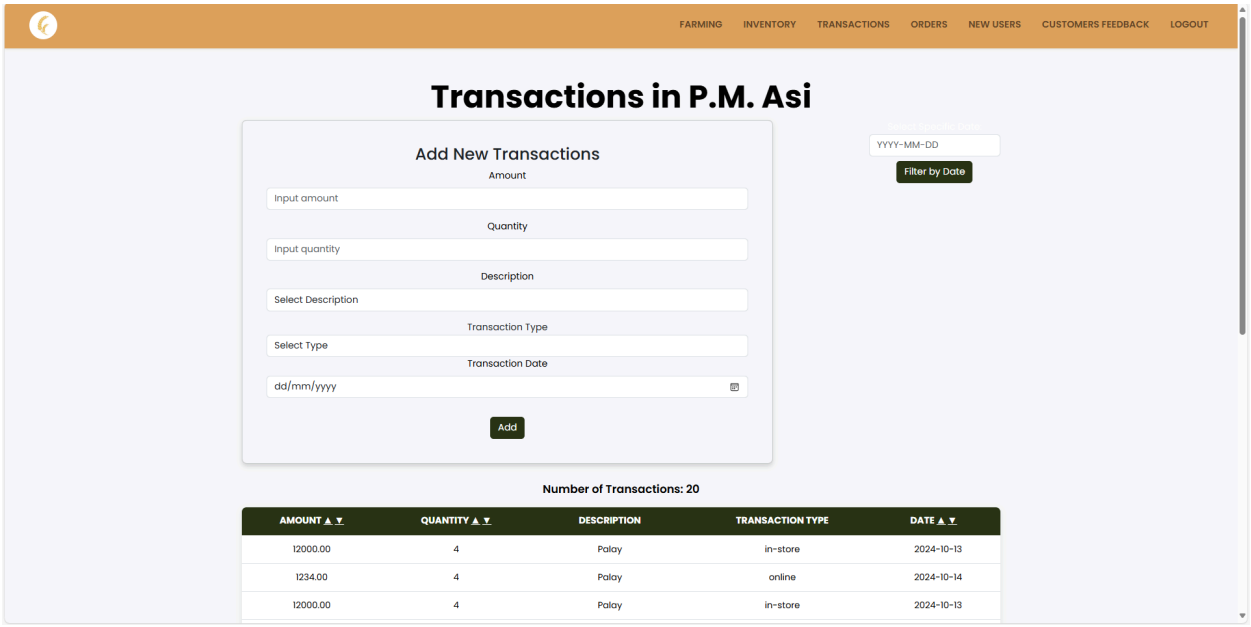


Figure 18. Transactions

Figure 18 depicts the Transactions, which records and manages all product purchases, sales, and returns. It tracks transaction details such as dates, quantities, prices, and customer information, ensuring accurate financial and inventory records. The system enables users to view transaction history, generate receipts, and update stock levels in real-time, providing a seamless process for managing business operations.

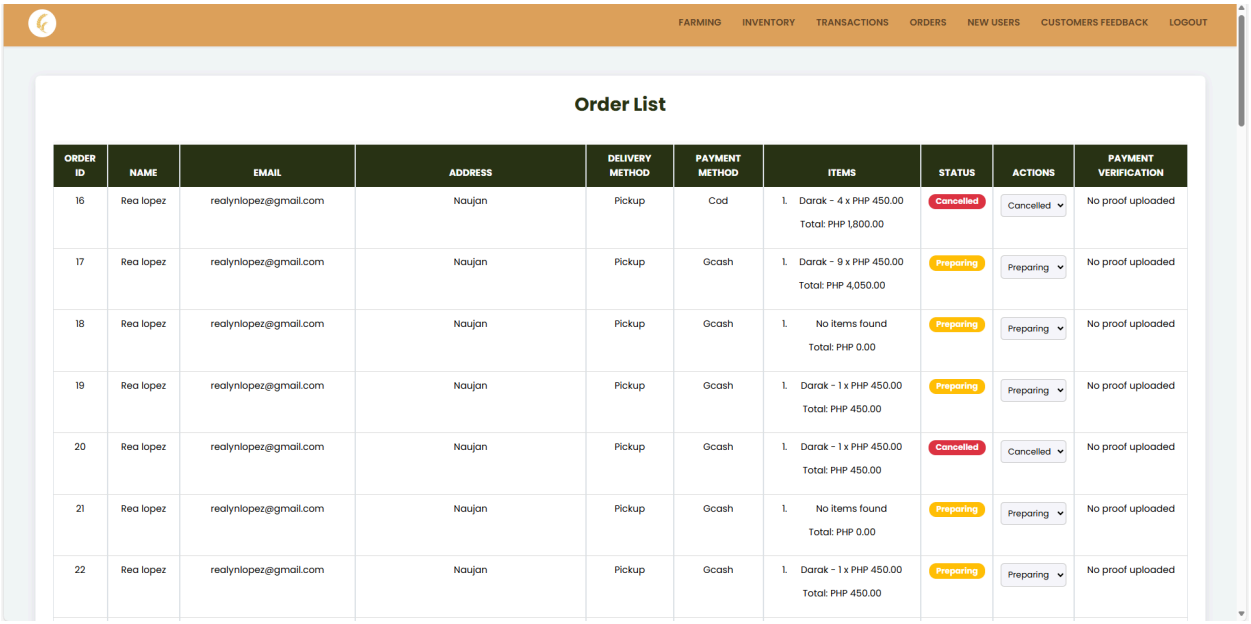


Figure 19. Order List

Figure 19 illustrates the Order List, which displays all customer orders in the system. It provides a comprehensive view of order details, including product names, quantities, customer information, and order status. The interface allows users to track, update, and manage orders efficiently, ensuring smooth order processing.

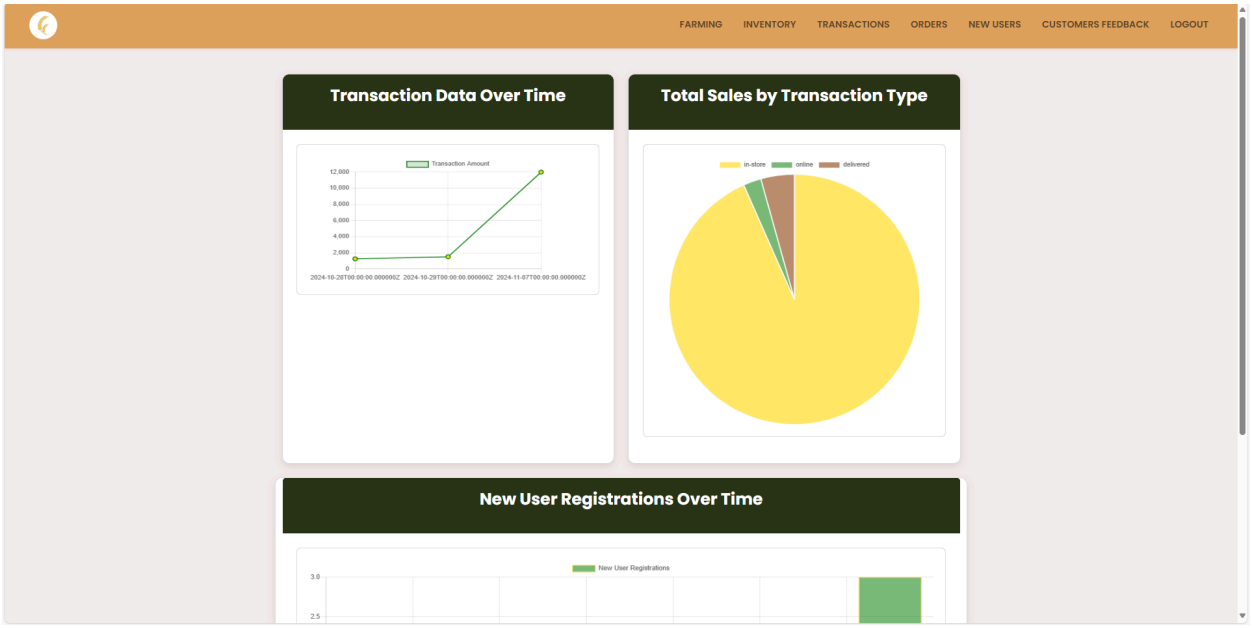


Figure 20. Data Analytics

Figure 20 illustrates Data Analytics , which provides insights into system performance through visualizations of key metrics. It tracks transaction data over time, categorizing transactions by type (e.g., purchases, delivery, etc.) to analyze trends. Additionally, it provides analytics on registered users, offering details on user growth and activity patterns.

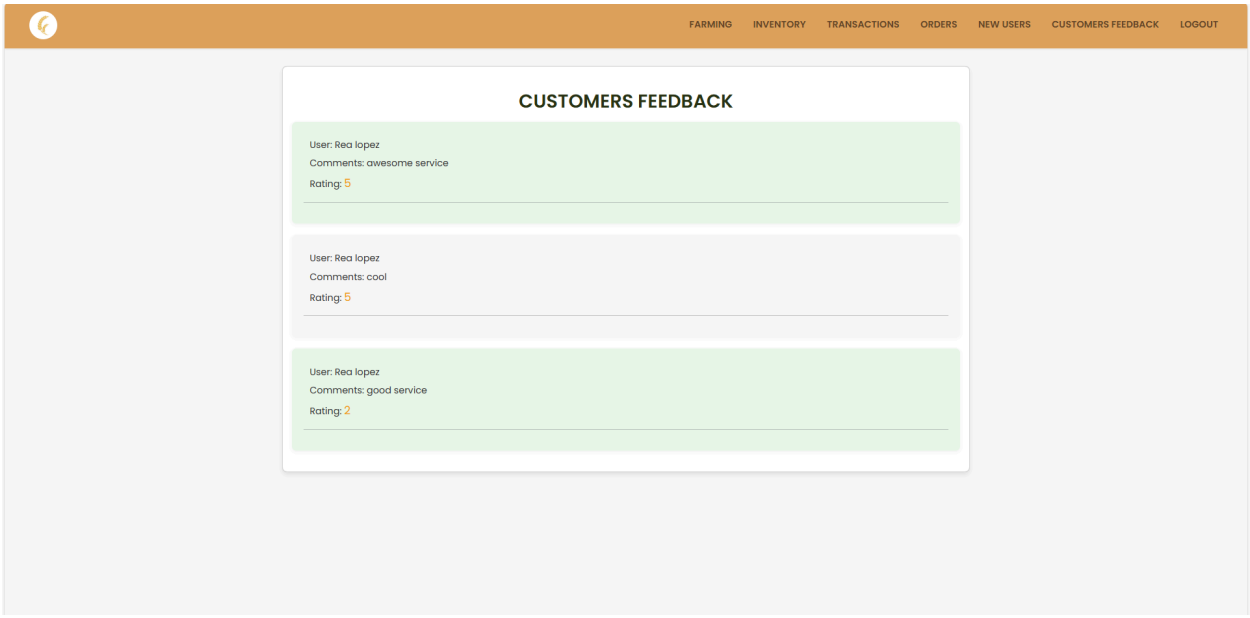


Figure 21. Admin's Customer's Feedback

Figure 21 showcases the Customer Feedback, which collects and displays customer reviews and ratings for products and services. Administrators can monitor and analyze feedback to identify areas for improvement and enhance customer experience. The system ensures that feedback is easily accessible and actionable for ongoing service optimization.

User Side

The user interface of the system, including its features, is solely accessible to users and customers, as depicted in the figures below.

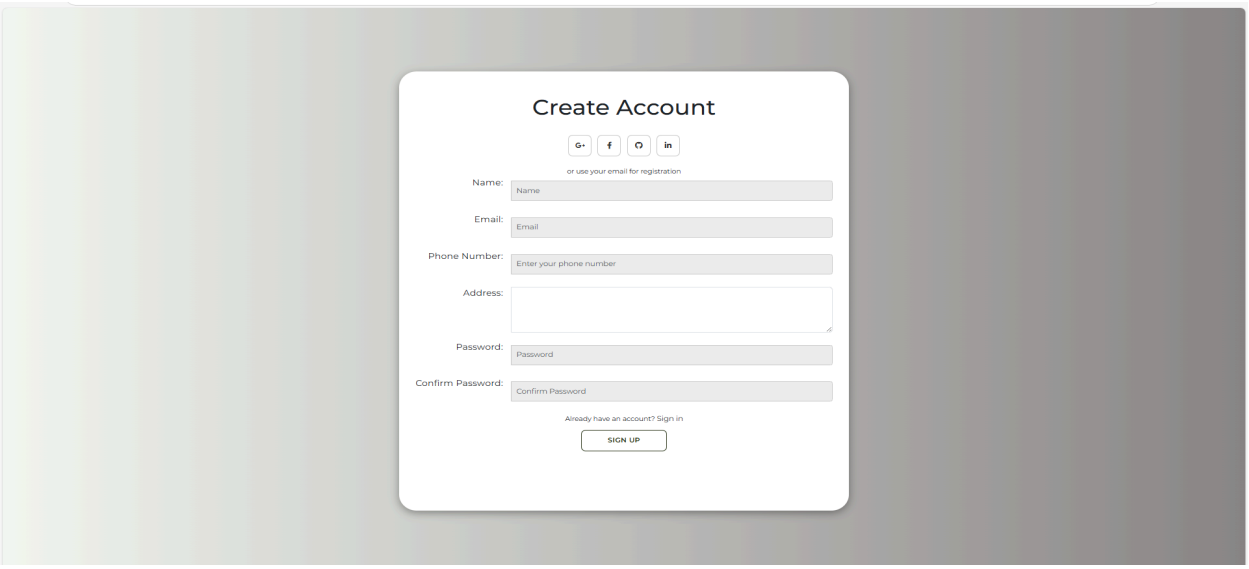


Figure 22. User Registration

Figure 22 illustrates the User Registration process, where new users can create an account by providing essential information such as name, email, password, and contact details.

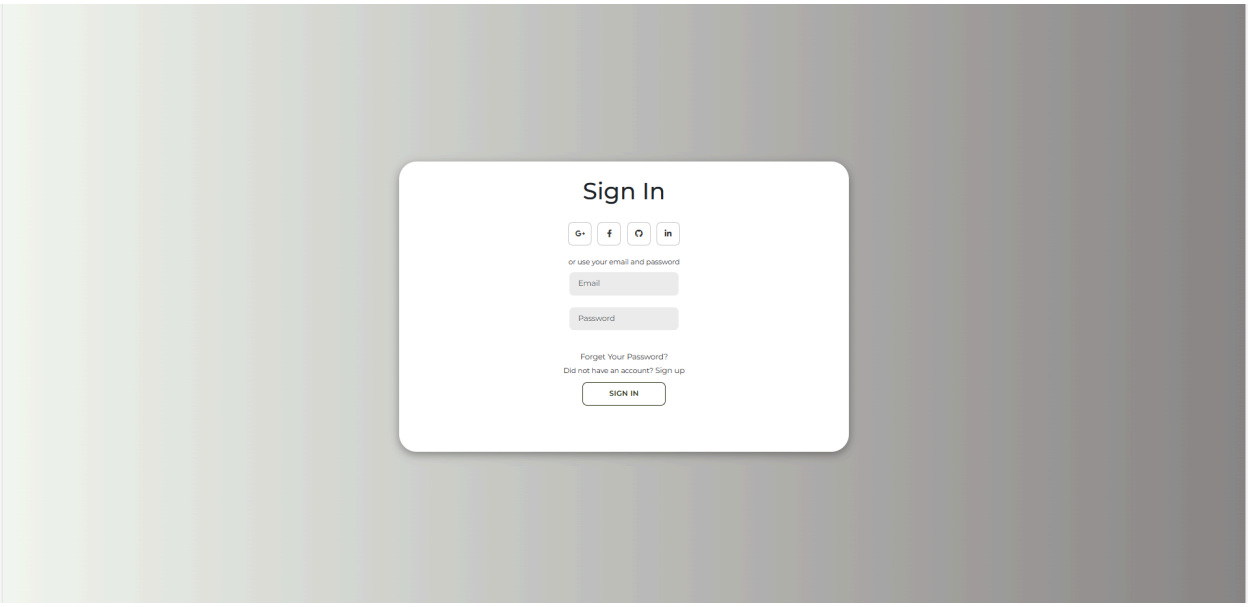


Figure 23. User Login Page

Figure 23 illustrates the User Login page, where registered users can securely access their accounts by entering their username and password. The system includes features such as "forgot password" for convenience.

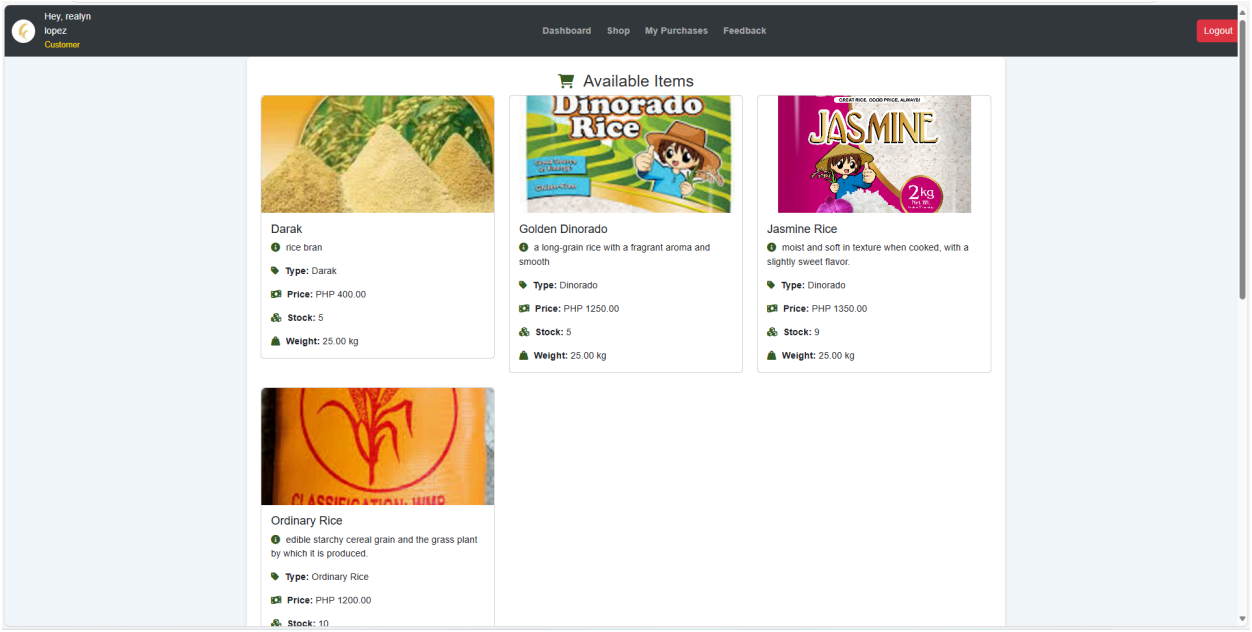


Figure 24. User Dashboard

Figure 24 illustrates the User Dashboard, which displays an overview of available products and their stock levels. It shows a list of products with key details such as product name, image, price, and available quantity. Users can quickly see which items are in stock and which need restocking, allowing for efficient inventory management.

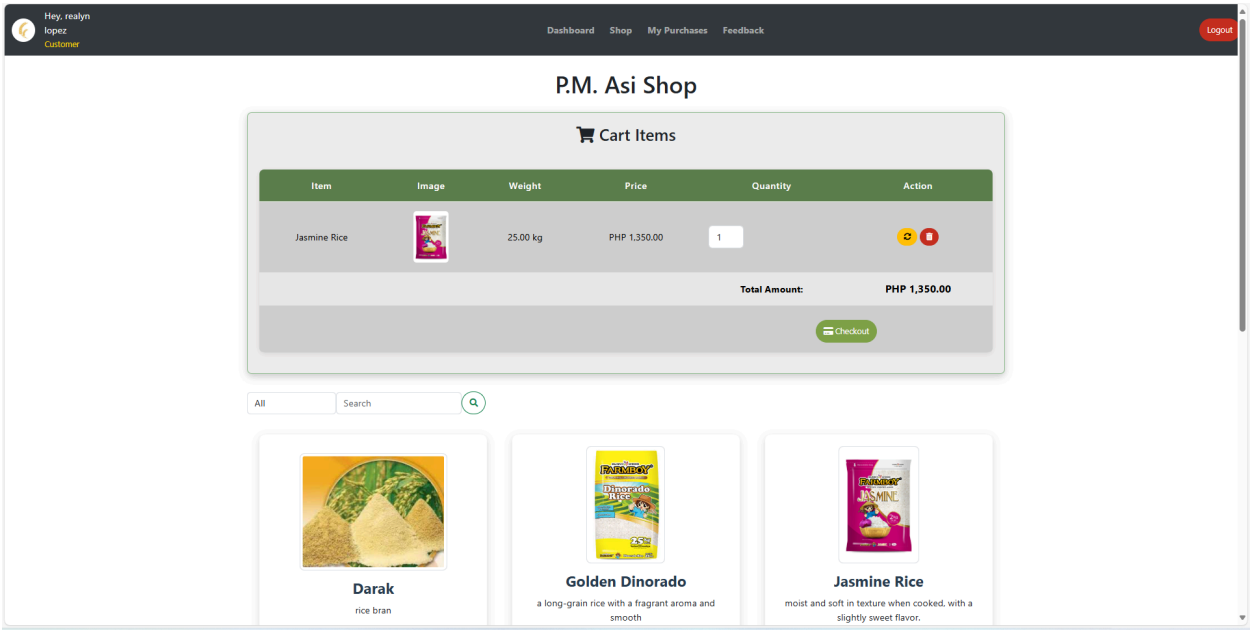


Figure 25. User Cart

Figure 25 depicts the User Cart, where users can review and manage the products they have selected for purchase. The cart displays key information such as product names, quantities, individual prices, and the total amount. Users can update item quantities, remove products, or proceed to checkout.

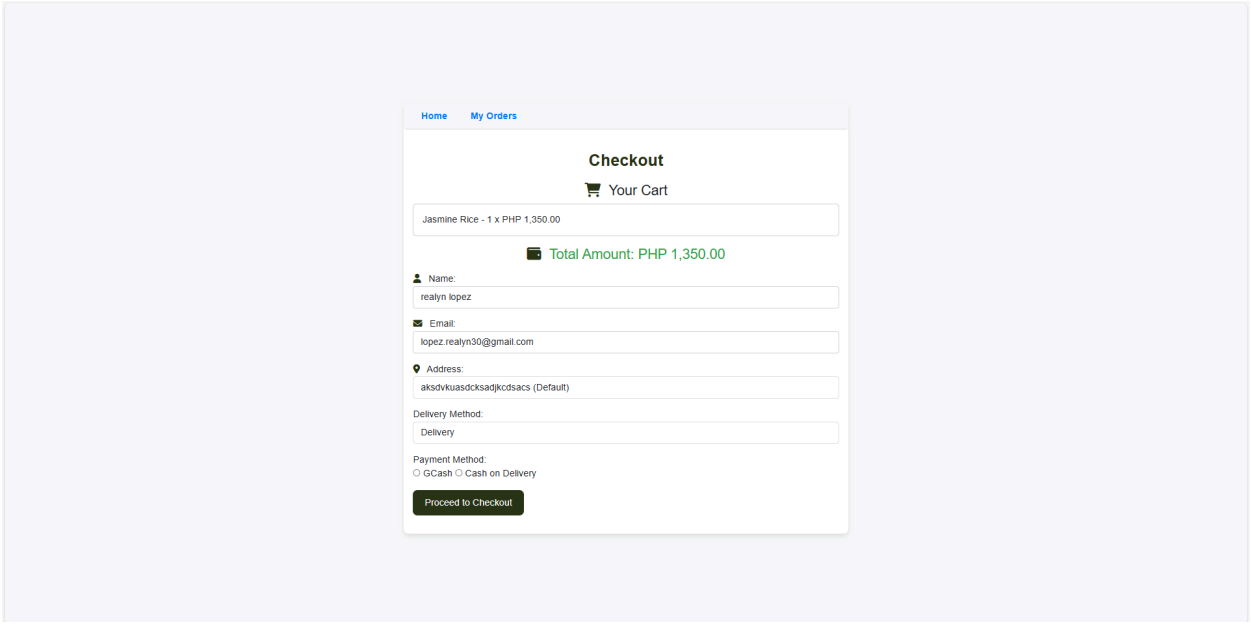


Figure 26. User Checkout

Figure 26 illustrates the Checkout Page, where users finalize their purchase by reviewing their order details. The page includes sections for entering personal information, selecting a payment method and confirming the shipping address. It also displays the order summary, including product details, quantities, and total cost.

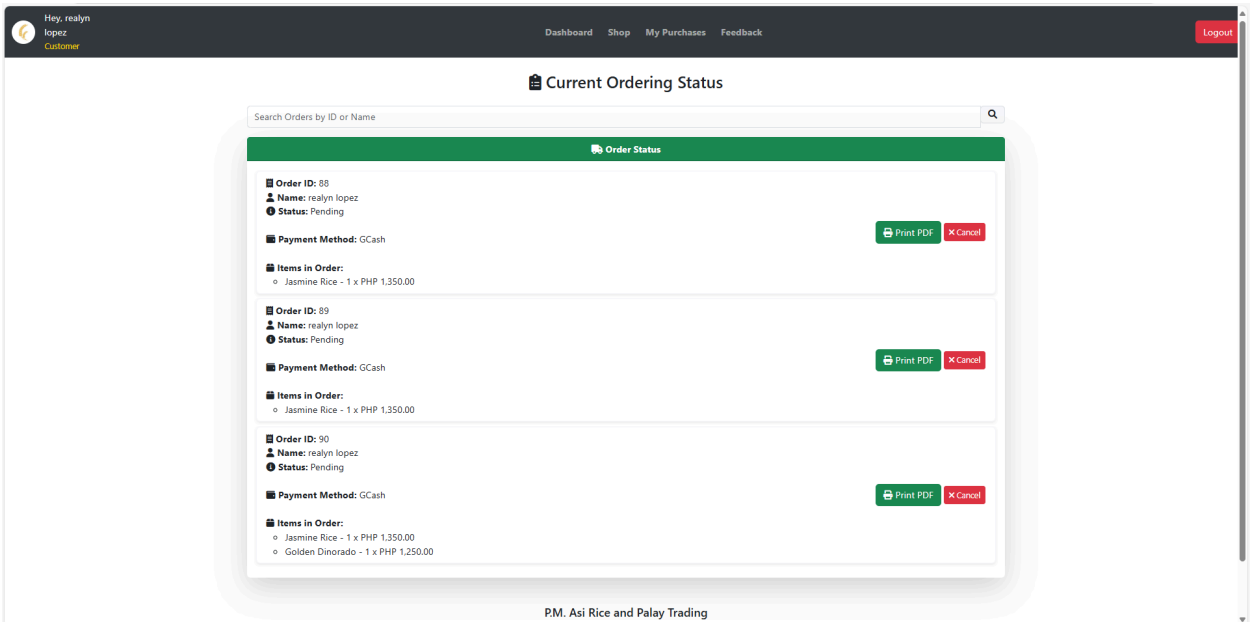


Figure 27. User Order Status

Figure 27 depicts the Current Ordering Status page, where users can view the status of their ongoing and past orders. It includes details such as order number, product names and quantities.

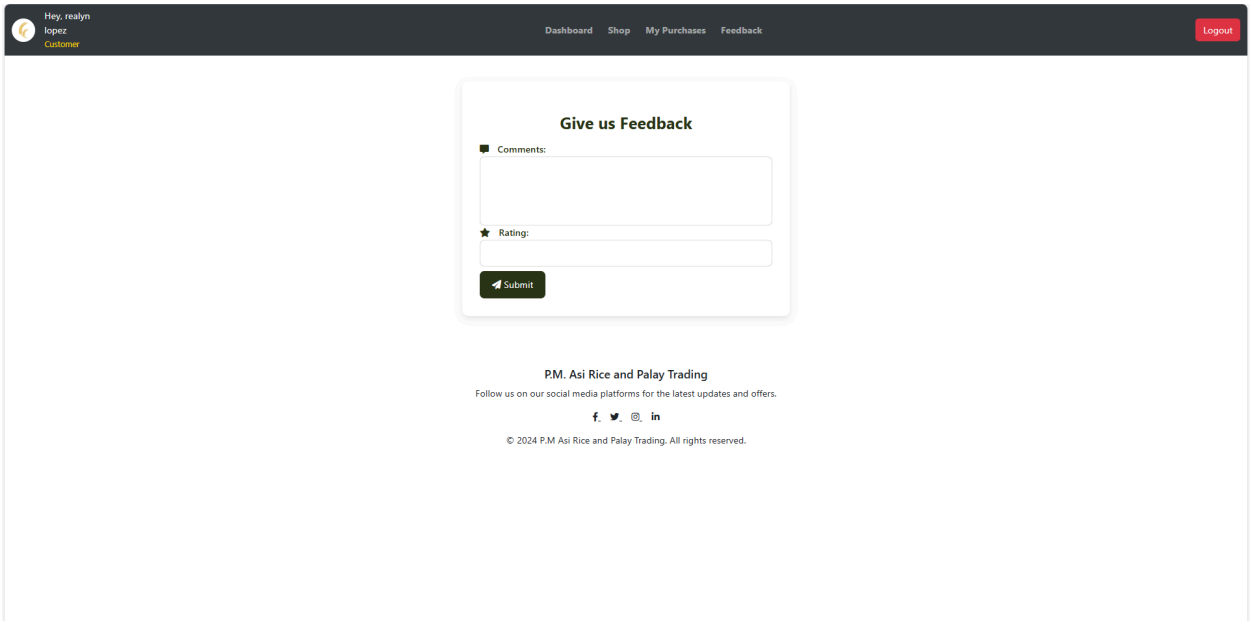


Figure 28. User Feedback

Figure 28 illustrates the User Feedback section, where users can provide reviews and ratings for products and services. This page allows users to submit their opinions, rate products, and leave comments based on their experience. Feedback can include suggestions for improvement or compliments, helping businesses gather valuable insights into customer satisfaction.

Evaluation of the System

The Cloud-Based Rice Mill Management System for P.M.Asi was designed and evaluated. A thorough evaluation of P.M Asi Rice and Palay Trading is provided at the end of the study, covering a number of different aspects, including Functionality, Reliability, Performance, Usability, Security, Compatibility, and Maintainability. 50 respondents—including the manager,

employees, clients, and IT specialists—were surveyed using structured questionnaires to get their opinions. The gathered information was carefully examined, tabulated, and provided with in-depth explanations of the system's evaluation results. This evaluation supports the system's function in raising the general operational efficiency of the rice mill by confirming that it satisfies the needs and expectations of its users.

1. ISO 25010 Software Metrics

Table 8. Functional Stability of the System

Functional Stability	Mean	Rank	Verbal Interpretation
1.1 The functions of the system cover all the specified task and user objectives.	3.36	3	Satisfactory
1.2 The functions of the system provide the correct results with the needed degree of precision.	3.59	2	Very Good
1.3 The functions of the system facilitate the accomplishment of specified tasks and objectives.	3.79	1	Very Good

Overall Mean	3. 58	Very Good

The system demonstrates satisfactory performance in covering user objectives, providing correct results with good

precision, and facilitating task accomplishment. Overall, the system performs at a Very Good level, with a mean score of 3.58.

Table 9. Performance Efficiency of the System

Performance Efficiency	**Mean**	**Rank**	**Verbal Interpretation**
2.1 The functions of system response and process the output on time to meet the user requirements.	3.18	1	Satisfactory
2.2 The maximum limits of the product or system. parameters meet requirements.	3.12	2	Satisfactory
Overall Mean	3.15		Satisfactory

The system's performance in responding and processing output on time, as well as meeting maximum product or system limits, is rated as Satisfactory. The overall mean of 3.15 reflects a consistent level of performance, meeting basic user requirements.

Table 10. Usability of the System

Usability	Mean	Rank	Verbal Interpretation
3.1 The system is appropriate for my needs.	3.12	3	Satisfactory
3.2 The use of the system is effective and efficient in emergency situations.	3.16	2	Satisfactory
3.3 The system is easy to operate, control and appropriate to use.	3.18	1	Satisfactory
3.4 The system protects users against making errors.	3.02	4	Satisfactory
3.5 The user interface of the system enables pleasing and satisfying interaction for the user.	2.98	6	Satisfactory
3.6 The system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use.	3.1	5	Satisfactory

Overall Mean	3.09	Satisfactory

The system is generally Satisfactory in meeting user needs, with the majority of users finding it effective and easy to operate in typical and emergency situations. However, there are areas for improvement, particularly in error prevention and user

interface design, as indicated by the slightly lower scores in these areas. The overall mean of 3.09 reflects an overall Satisfactory user experience.

Table 11. Reliability of the System

Reliability	Mean	Rank	Verbal Interpretation
4.1 The system meets needs for reliability under normal operation.	3.06	2	Satisfactory
4.2 The system is operational and accessible when required for use.	3.06	2	Satisfactory
4.3 The system operates as intended despite the presence of hardware or software faults	3.12	1	Satisfactory
4.4 When an interruption or a failure happens, the system can recover the data on the directly affected and re-establish the desired state of the system.	3.12	1	Satisfactory
Overall Mean	3.09		Satisfactory

The system demonstrates Satisfactory reliability, meeting basic needs for normal operation, accessibility, and fault tolerance. It performs well in recovering from failures and maintaining functionality despite issues. The overall mean of

3.09 indicates that while the system generally meets reliability expectations, there is room for improvement in certain areas.

0. Unified Theory of Acceptance and Use of Technology (UTAUT) Model

Table 12. Performance Expectancy of the System

Performance Expectancy	Mean	Rank	Verbal Interpretation
1.1 Using the system, my job would increase my productivity.	3.02	7	Satisfactory
1.2 Using the system would enhance my effectiveness on the job.	3.06	6	Satisfactory
1.3 Using the system would make it easier to do my job.	3.08	5	Satisfactory
1.4 I would find the system useful in my job.	3.08	5	Satisfactory
1.5 Using the system enables me to accomplish tasks more quickly.	3.2	7	Satisfactory
1.6 Using the system improves the quality of work I do.	3.18	3	Satisfactory
1.7 Using the system makes it easier to do my job.	3.22	2	Satisfactory
1.8 Using the system enhances my effectiveness on the job.	3.26	1	Satisfactory

Performance Expectancy	Mean	Rank	Verbal Interpretation
1.9 If I will use the system I will increase my effectiveness on the job.	3.06	6	Satisfactory
1.10 If I will use the system I will spend less time on routing job tasks.	3.16	4	Satisfactory

Overall Mean	3.12	Satisfactory

The system is perceived as Satisfactory in terms of improving productivity, job effectiveness, and task efficiency. While respondents generally agree that it can enhance performance and quality of work, the overall ratings indicate room for improvement in terms of task speed and job ease. The overall mean of 3.12 reflects a moderate expectation of performance improvements with the system.

Table 13. Effort Expectancy of the System

Effort Expectancy	Mean	Rank	Verbal Interpretation
2.1 Learning to operate the system would be easy for me.	3.14	3	Satisfactory
2.2 I would find it easy to get the system to do what I want it to do.	3.14	3	Satisfactory
2.3 My interaction with the system is clear and understandable.	3.2	4	Satisfactory
2.4 My interaction with the system would be clear and understandable.	3.26	1	Satisfactory
2.5 I would find the system to be flexible to interact with.	3.2	4	Satisfactory
2.6 Using the system doesn't take too much time from my normal duties.	3.22	2	Satisfactory
2.7 Working with the system is so simple, it is not difficult to understand what is going on.	3.02	6	Satisfactory
2.8 Using the system involves lesser time doing mechanical operations	3.06	5	Satisfactory
2.9 My interaction with the system is clear and understandable.	3.14	3	Satisfactory

Overall Mean	3.02	Satisfactory

The system is generally rated as Satisfactory in terms of ease of use, with users finding the system clear and understandable. Most respondents feel that learning to operate the system and interacting with it does not require significant effort. However, there are some areas where improvement is needed, such as reducing the time spent on mechanical operations. The overall mean of 3.02 reflects a moderate level of ease expected from the system.

Table 14. Facilitating Conditions of the System

Facilitating Conditions	Mean	Rank	Verbal Interpretation
3.1 I have control over using the system.	3.06	8	Satisfactory
3.2 I have the resources necessary to use the system.	3.16	5	Satisfactory
3.3 I have the knowledge necessary to use the system.	3.22	2	Satisfactory
3.4 Given the resources, opportunities and knowledge it takes to use the system, it would be easy for me to use the system.	3.20	3	Satisfactory
3.5 Guidance was available to me in the selection of the system.	3.08	7	Satisfactory

Facilitating Conditions	Mean	Rank	Verbal Interpretation
3.6 Specialized instruction concerning the system was available to me.	3.04	9	Satisfactory
3.7 A specific person (or group) is available for assistance with system difficulties.	3.18	4	Satisfactory
3.8 Using the system is compatible with all aspects of my work.	3.12	6	Satisfactory
3.9 I think that using the system fits well with the way I like to work.	3.1	10	Satisfactory
3.10 Using the system fits into my work style.	3.24	1	Satisfactory

Overall Mean	3.04	Satisfactory

The system is generally perceived as Satisfactory in terms of the necessary resources, control, and support for use. Most users feel they have the knowledge and resources to operate the system, and that it aligns with their work style. However, there are areas for improvement, such as access to specialized instruction and more direct guidance. The overall mean of 3.04 reflects moderate satisfaction with the facilitating conditions supporting system use.

Table 15. Behavioral Intention of the System

Behavioral Intention	Mean	Rank	Verbal Interpretation
4.1 Using the system is a good idea.	3.24	3	Satisfactory
4.2 Using the system is a wise idea.	3.16	5	Satisfactory
4.3 I like the idea of using the system.	3.28	2	Satisfactory
4.4 I find using the system to be enjoyable.	3.16	5	Satisfactory
4.5 The actual process of using the system is pleasant.	3.28	2	Satisfactory
4.6 I have fun using the system.	3.32	1	Satisfactory
4.7 The system makes work more interesting.	3.32	1	Satisfactory
4.8 Working with the system is fun.	3.06	6	Satisfactory
4.9 I like working with the system.	3.22	4	Satisfactory

Overall Mean	3.22	Satisfactory

The system is generally seen as Satisfactory in terms of user enjoyment and the positive perception of using it. Users express moderate enjoyment and find using the system to be a good and wise idea, with some indicating that the process is pleasant and interesting. The overall mean suggests that while the system is somewhat appealing, there is potential to increase engagement and enjoyment.

ISO 25010 Software Metrics

Table 15. Summary Results of ISO 25010 Software Metrics

Items	Mean	Rank	Verbal Interpretation
1. Functional Stability	3.58	1	Satisfactory
2. Performance Efficiency	3.15	3	Satisfactory
3. Usability	3.09	5	Satisfactory
4. Reliability	3.09	5	Satisfactory
Overall Mean	3.22		Satisfactory

Table 15 presents the evaluation results, showing that the system is rated Satisfactory across all dimensions. Functional

Stability received the highest score of 3.58, indicating users are most satisfied with the system's reliability in meeting task objectives. Performance Efficiency (3.15) and Performance Expectancy (3.12) were also rated relatively well, while Usability and Reliability tied at 3.09, suggesting room for improvement in user-friendliness and system dependability.

Unified Theory Of Acceptance and Use of Technology (UTAUT) Model

Table 16. Summary Results of UTAUT Model

Items	Mean	Rank	Verbal Interpretation
1. Performance Expectancy	3.12	4	Satisfactory
2. Effort Expectancy	3.02	7	Satisfactory
3. Facilitating Conditions	3.04	6	Satisfactory
4. Behavioral Intention	3.22	2	Satisfactory
Overall Mean	3.01		Satisfactory

Table 16 demonstrates the UTAUT Model with the Effort Expectancy (3.02) and Facilitating Conditions (3.04) scored lower, pointing to the need for easier user interactions and

better support. The Overall Mean is 3.01, reflecting a generally satisfactory system with areas for enhancement.

Implementation Results

This portion illustrates the comprehensive result of the progress made in the implementation activity and its impact on the development and outcome of the system.

Table 17. Implementation Results

This portion illustrates the comprehensive result of the progress made in the implementation activity and its impact on the development and outcome of the system.

Activities	Targeted Date	Progress Notes	Outcome	Remarks
Discussion with the client	October 28, 2023	Completed	The system's required functions have been gathered and documented.	The needed functions and requirements have been discussed.
Letter for deployment		Approved	The system was deployed successfully.	None
System Development and Monitoring period	September 6, 2023	Few Patches	Various issues and bugs were resolved.	The system was deployed successfully.
Demonstration of Systems to users	September 19, 2024	Completed	The system was successfully demonstrated to the users.	None

Evaluation of System	October 8, 2024	Completed	The participants evaluated the system.	None

The table shows the outcomes of the implementation activities and demonstrates that the system deployment and process were effective in putting the system requirements and testing procedures into effect.

Chapter V

SUMMARY, CONCLUSION AND RECOMMENDATION

This final chapter presents the major conclusions of the study, highlighting their significance. It summarizes the key findings from the analysis and offers valuable recommendations for further research or system improvements. The chapter provides a concise overview of the study's outcomes and suggests potential directions for future development, ensuring that the research can serve as a foundation for ongoing enhancements and exploration.

Summary

The capstone project, eRicemill: "A Cloud-Based Rice Mill Management System for P.M. Asi Rice and Palay Trading," details the development and implementation of an innovative solution tailored to meet the specific operational needs of P.M. Asi. In this research, a structured approach was taken with the involvement of 50 individuals, encompassing IT professionals, staff members, customers, and managers. Their valuable feedback was gathered through a questionnaire designed in line with ISO 25010 standards.

Conclusions

The researchers have gathered different conclusions and observations while conducting the evaluation about **eRiceMillApp:**

A Cloud-Based Rice Mill Management System For P.M. Asi Rice and Palay Trading. Listed below are the following:

1. In EriCeMillApp, admins can generate detailed sales reports, including orders and order numbers, with breakdowns by product categories. Reports are exportable in PDF format, helping admins analyze data and make informed decisions.
2. Admins can manage products, pricing, inventory, and order processing, while customers can browse, add items to the cart, and complete purchases.
3. Customers can create accounts using email or social logins and manage their profiles. Admins can view, modify, or delete customer information, and two-factor authentication ensures secure access for admins.
4. EriCeMillApp allows admins to track orders in real time, with alerts for low stock, product availability, and order issues, ensuring smooth operations and quick response to potential problems.

Recommendations

1. Enhance reporting features to include predictive analytics, helping admins forecast sales trends and identify opportunities for growth. Additionally, consider adding customizable report templates to meet specific business needs.

2. Introduce more advanced product management features such as bulk upload for product listings, improved search and filter options for customers, and recommendations based on browsing and purchasing history to further enhance the user experience.
3. Add more role-based access control for admins to manage different levels of access. Additionally, consider integrating single sign-on for better user convenience and enhanced security for both admins and customers.
4. Implement predictive alerts to notify admins not only of low stock or product issues but also of potential supply chain disruptions.

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