ASIAN COLLEGE DUMAGUETE
The Student Research Journal

The Bridge-Student Research Journal of Asian College is a multidisciplinary journal published annually and disseminated in the month of August. The primary goal of a research journal is to serve as a platform for the dissemination of original research findings, scholarly articles academic content within a specific field of study.

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FOREWORD

Greetings from Asian College!

I am delighted to present the first edition of **"The Bridge,"** which showcases our students' hard work and dedication and their educational pursuits. The Journal of Student Researchers provides a platform for young researchers to share their innovative ideas, critical analyses, and insightful discoveries with a broader audience.

Research is at the heart of intellectual growth and development. As the leaders of tomorrow, students need to engage in this process early on in their academic journey. Through research, students learn to think critically, ask relevant questions, and seek answers that push the boundaries of knowledge.

The articles featured in this edition cover various topics across various disciplines, reflecting our student researchers' diversity and depth of interest. Each study offers a unique perspective and contributes valuable insights to its respective fields.

I commend all the contributors for their hard work and dedication in conducting rigorous research and writing compelling papers. I also want to thank the Technical Group and Research Council reviewers for their meticulous efforts in ensuring the quality and integrity of the articles published in this edition.

The research presented in this journal will inspire and encourage other students to embark on their scholarly pursuits and contribute meaningfully to advancing knowledge in their respective fields.

Thank you for supporting the Asian College Student Research Journal, and I look forward to seeing our future scholars' continued growth and success.

Congratulations!

ROSGEN GUMBAN, MA CDDS, MAED SPED, LPT
Research Head, Office of Research and Development

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ESTABLISHMENT OF MODERN A.L.E. TILAPIA OASIS FARM INNOVATING WITH UMITRON LENS TECHNOLOGY IN CANDAU-AY

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ABSTRACT

The modern A.L.E Tilapia Oasis Farm in Candau-ay, which employs unique Umitron Lens Technology, is an innovative action designed to address the growing demand for high-quality tilapia products. This feasibility study analyzes the market demand, supply possibilities, technical aspects, and financial feasibility of this acquaintance project. Our data show that 393 survey participants showed a remarkable 98.25% interest in the services and products offered. Furthermore, the strategic site in Candau-ay, without direct competitors, increases the farm's supply potential. The financial predictions show a positive return on investment. This project offers to satisfy specified market demands while adopting modern technologies, establishing it as an essential contribution.

Keywords: Oasis farm, umitron lens technology, strategic site

CHAPTER I
BACKGROUND OF THE STUDY

Introduction

Tilapia is a common name for certain species of fish belonging to the family Cichlidae (order Perciformes), represented by numerous, mostly freshwater species native to Africa. Tilapias are best known for their potential as easily raised and harvested food fish. Their commercial advantages include fast growth, resistance to disease, and a diet of readily abundant algae and zooplankton (Tikkanen, A. 2023).

Tilapia farming in the Philippines is a growing industry, contributing 20 % to the country's aquaculture sector. Growing on 14,500 ha of freshwater, tilapia yields 5.61 mt/ha for export and import. To maximize profits, consider costs within a 100-sqm concrete pond weighing 200-250 grams per tilapia and manage production volume.

Understanding these factors can help in entering the business in 2023. (Roa, S. 2023). China has built up a large tilapia farming industry in its southern provinces and is now the largest exporter of tilapia. In parallel, alternative suppliers in Southeast Asia and Latin America have increased their exports at the expense of China. While China remains the dominant tilapia supplier, the imposition of import tariffs by the United States of America on Chinese Tilapia, combined with logistical challenges related to the Covid-19 pandemic and the purposing land in crucial production regions, means dominance is expected to decline (F.A.Q.,2022).

Freshwater aquaculture refers to raising and breeding aquatic animals (fish, shrimp, crab, shellfish, etc.) and plants for economic purposes by the use of ponds, reservoirs, lakes, rivers, and other inland waterways (including salty water), which play an essential role in the aquaculture industry. (Li & Lui, 2019) Rafael Ortiz states that technology empowers small-scale fishers by providing information on fisheries and markets, demonstrating their commitment to ocean conservation. It also aids consumers in making informed decisions about their food choices and their environmental impact on the environment and those involved in production.

Aquaculture has long been a cornerstone of Candau-ay local economy in Dumaguete, Negros Oriental, contributing significantly to its sustenance and growth. In the ever-evolving tapestry of aquaculture, where traditions find their place alongside technological innovation, we embark on a study that will reshape the landscape of tilapia farming in Candau-ay. This study aims to embark on an exploratory journey to assess the feasibility of establishing a modern tilapia farm in Candau-ay while harnessing the transformative impact of Umitron Lens Technology. This convergence of two worlds—the time-honored practice of tilapia farming and the visionary pursuit of sustainability through Umitron Lens technology—holds promise for the lush grounds of this community.

The location in Brgy Candau-ay, Dumaguete, Negros Oriental, represents a blend of tradition and innovative technology. This venture aims to explore various critical aspects, ensuring a comprehensive understanding of the mission's feasibility.

Name of the Project and Location

The project, named A.L.E. Tilapia Oasis Farm, derives its initials from the individuals or entities involved in the tilapia fishery business, thereby personalizing the farm's identity. The name reflects the uniqueness of our work and innovation while evoking a sense of grandeur, specialty (Tilapia), and an oasis-like ambiance. It sets the tone for the success of our enterprise and leaves an indelible impression on our audience. It reflects our dedication to modernism, sustainability, and quality in tilapia farming by incorporating Umitron Lens Technology. It exemplifies a forward-thinking approach that uses technology to maximize operations, protect the environment, and fulfill the expectations of a demanding market.

Location

The project's strategic location is in Zone 2 Purok Sampaguita, Brgy. Candau-ay, Dumaguete City, within an established aquaculture hub, presents significant advantages. Being situated in an area with a thriving aquaculture industry provides us with abundant resources, valuable experience, and potential networking opportunities. This location can facilitate efficient product distribution and grant us access to local and government markets.

This comprehensive description of the project highlights the significance of tilapia farming in the Philippines, the evolving dynamics in the global tilapia industry, the role of technology in aquaculture, and the specific aims and advantages of the A.L.E. Tilapia Oasis Fa rm in Candau-ay, Dumaguete.

Project Proponent

Theentirety of funding required for this project will be sourced from the p ersonal savings of the proponent, Mr. Elrey Elmoore Abella, owner of "El Cafe and Flairemoore Bartending Services," who leads the project in Candau-ay, Dumaguete. His knowledge of company management, digital marketing, and teamwork are critical to the project's success. Abella's entrepreneurial leadership, team dynamics, and dedication to sustainability align with the project's objective of revolutionizing Candau-ay tilapia farming. Abella takes a comprehensive project financing approach, including an investment portfolio, grant opportunities, and a sustainable business model. He seeks support from individuals, partnerships, and organizations that promote sustainable agriculture

and aquaculture methods. His expanded skill set, entrepreneurial spirit, and devotion to sustainability make him an essential proponent of the project's success.

Nature of the project

The project aims to establish a modern tilapia farm in Brgy. Candau-ay, Dumaguete, Negros
Oriental. It combines traditional aquaculture practices with cuttingedge technolo gy, such as Umitron Lens Technology, to improve efficiency and yields. The initiative focuses on modernizing the local aquaculture community by creating employment opportunities and enhancing the quality of life. The project invests in infrastructure development, including advanced fish ponds, modern housing facilities, and Umitron Lens Technology equipment. It is market-responsive, catering to local and export markets, and focuses on responsible resource management.

The project's commitment to Eco-conscious aquaculture ensures cost-effective and environmentally sustainable operations. The project's transformational approach to tilapia farming in Negros Oriental not only meets market demands but also uplifts the local economy. The Philippines' demand for high-quality tilapia will continue in 2023 due to rising consumer knowledge of healthy protein sources and a preference for locally sourced, sustainable food products. The primary focus will be on the local consumer, with prospects for local markets being available and offered to businesses that want to be our sales agents. A project in Brgy. Candau-ay, Dumaguete, and Negros Oriental are well-positioned to capitalize on this rising need.

Mode of Financing

Theprimaryfundingsource for this project will come from Mr. Elrey Elmo ore Abella's savings. His funds will be strategically allocated to cover a range of essential expenditures, such as land, equipment procurement, financing the construction of the tilapia farm, acquiring necessary supplies, infrastructure development and technology implementation, and addressing a variety of other critical business-related expenses. The total projected cost of building this futuristic tilapia farm is 8,500,000.00 (8.5 M). This significant financial commitment illustrates the proponent's unrelenting commitment to assuring the project's solid foundation and long-term profitability, which matches flawlessly with the creative concept of modernizing Tilapia farming in Candau-ay via Umitron Lens Technology.

Objectives of the study

These are the objectives of the study that the researchers would like to achieve in conducting this feasibility study on establishing a modern fish farm in Brgy. Candau-ay, Dumaguete, Negros Oriental.

- To determine whether the proposed project is likely to succeed or not.
- To examine the suitability of Brgy.Candauay for tilapia farming in terms of water quality.
- To determine the area's current market demand for Tilapia(Cichlidae).
- To identify whether the use of Umitron lens technology aligns with sustainability goals and principles.
- To produce high-quality tilapia consistently.

THE PROBLEM

Statement of the problem

This feasibility study deals with establishing a Modernized Tilapia Farm with the Innovation of Umitron Lens Technology.

This study is designed to determine the viability of this study in various areas of the feasibility study.

1. Is the proposed study of establishing a Modernized Tilapia Farm with the Innovation of Umitron Lens Technology feasible in Marketing?
2. Is the proposed study of establishing a Modernized Tilapia Farm with the Innovation of Umitron Lens Technology feasible in the technical aspect?
3. Is the proposed study of establishing a Modernized Tilapia Farm with the Innovation of Umitron Lens Technology feasible in terms of Management?
4. Is the proposed study of establishing a Modernized Tilapia Farm with the Innovation of Umitron Lens Technology feasible financially?
5. Is the proposed study of establishing a Modernized Tilapia Farm with the Innovation of Umitron Lens Technology feasible from a socioeconomic perspective?

Significance of the Study

This study of establishing Modernized Tilapia Farming with the Innovation of Umitron Lens Technology is significant to all potential customers. This research aims to describe the study's various significance to our target customers, proponents, researchers, and future researchers.

The Researchers - The researchers will benefit from this study because it contributes to the school. It allows them to look for encouraging explanations and responses from the respondents.

The Proponent - This will allow the project promoter to build it superbly. It will serve as a guide for them as they begin to develop this business.

The Students - This study will be a valuable reference to students, especially future researchers planning to make any related study about modernized Tilapia Farms. It will also serve as knowledge for them to pursue this kind of business in the future.

The Community -This study can help thecommunity by giving them knowledge about fish farming, which plays a big part in our daily consumption.

Investors- This study will help investors establish their required capital and intended use. The investment requirements can be grouped into different categories, such as working capital, infrastructure, and equipment.

Scope and Limitation of the Study

This study is about establishing Modernized Tilapia Farming with the Innovation of Umitron Lens Technology. The study will focus on the business's marketing, technological, financial, socioeconomic, and Management elements to understand and determine the viability of establishing a modernized tilapia farm in Brgy. Candau-ay, Dumaguete, Negros Oriental.

This proposed project will focus on the actual aquaculture farming sites. The data collection will be conducted by the local consumers and the central government of Candau-ay, Negros Oriental.

Theresearchersconducting this study have limited funds, limited sources of data, and time constraints. The researchers have chosen the Brgy. Candau-ay, due to the reason that they have an abundance of culture fish farms than the other place in the province of Negros Oriental.

Research Methodology

This chapter serves as a comprehensive outline of the methodologies and procedures the researchers will use throughout the study. It includes the following key elements: research design, research environment, selection and description of respondents, clarification of research instruments, and a detailed explanation of the data-gathering procedure.

Research Design

To accomplish the objective of the study, researchers will be using survey questionnaires that will be distributed to the respondents. This method will help gather relevant data and draw a significant conclusion about the impact of the innovation and modernization of establishing the Tilapia farm.

Research Environment

The researcher's proposed location is in Brgy. Candau-ay, Dumaguete Negros Oriental, which serves as the location of the Tilapia Farm. Where the Tilapia Farming Industry is suited to the area we chose to establish. The location is surrounded by trees, which will help the fish avoid direct contact with sunlight, which would cause them stress. Also, it is near the river, the water source we'll use for our fish farm.

Respondents

As the main subjects of our study, the respondents in our feasibility study play a crucial position. The survey gathered information from 400 participants, most of whom are from Brgy. Candau-ay in Dumaguete, Negros Oriental, as well as barangays within a 5-kilometer radius. Purposive sampling ensured that these respondents had relevant information and experience in creating the modern A.L.E. Tilapia Oasis Farm with Umitron Lens Technology. By incorporating responses from both Brgy. The research in Candau-ay and nearby barangays aimed to provide a complete understanding of the local perspective and possible market for the tilapia farm. The information gathered from these respondents offered vital insights into the project's feasibility and acceptance in the local community and nearby locations.

Research Instrument

Self-made surveys and interviews are used as the study tool to get insights from respondents regarding the innovation of Umitron Lens technology in Tilapia farms. These tools have been created to extract precise data from farm owners, employees, and other stakeholders. The surveys ask specific questions about respondents' perspectives, experiences, and opinions regarding using Umitron Lens technology in aquaculture. Additionally, in-depth interviews are conducted to learn more about their viewpoints, difficulties, and potential advantagesrelatedto this technology. These study tools work as a way to gather i nsightful mixed methods information from respondents, illuminating the effect and prospective advancements of Umitron Lens technology in Tilapia farming techniques.

Data Gathering Procedure

The study "Establishment of Modern A.L.E. Tilapia Oasis Farm Innovating with Umitron Lens Technology in Candau-ay" used a structured data collection approach. The study began with thorough planning and questionnaire creation to ensure that the research objectives aligned with the scope of the modern tilapia farm project. The survey instrument was validated to assure its effectiveness, and formal requests for permission to conduct the study in Candauay, Negros Oriental, were made. Following authorization, surveys were distributed to various Candau-ay potential customers. Respondents were treated

with respect and civility, and their schedules were accommodated. The obtained data was carefully evaluated and interpreted, allowing for a complete examination of the community's thoughts and attitudes toward the innovative aquaculture venture. This systematic method made it easier to thoroughly analyze the feasibility of the modern tilapia farm and the inclusion of Umitron Lens Technology.

Statistical Treatment of Data

When surveying data collection, the researchers used Slovin's Formula, a statistical method used to determine the sample size required for a given population. It helps ensure that the sample accurately represents the population without excessive sampling. The formula is as follows:
Slovin's formula is calculated as:

$$n = N / (1+ Ne2)$$

Where:
- ***n*** represents the required sample size
- **N** is the total population
- **E** is the desired margin of error, expressed as a decimal (e.g.0.05 for a 5% margin of error)

Substitute numbers in formula: **n= 40,663/1+ 40,663 (0.05)^2 n= 399.99 0r 400**

Table 1. Proportional Allocation of 400 respondents to 7 strata by barangay.

Barangay Candau-ay and Neighboring Barangays with (5km radius)	Number of Household Population	Sample Size	Sample Size: Rounded Values
Candau-ay	9,593	94.36	94
Camanjac	4,851	47.79	48
Calabnugan	1,891	18.60	19
Cadawinonan	6,887	67.74	68
Palinpinon	3,352	32.97	33
Balugo	4,116	40.48	40
Batinguel	9,965	98.02	98

Definition of terms

Aquaculture - encompasses a variety of species and agricultural methods in many ecologies. Farming seaweed, milkfish, tilapia, shrimp, carp, oysters, and mussels account for most of production.

Cornerstone- since Calabnugan, Sibulan, Negros Oriental is located near a river, most people living there established a Tilapia farm as their business; it is their great advantage to run a Tilapia business because of the availability of freshwater and rich soil.

Fingerlings -We should have enough fingerlings or eggs to replace the harvested tilapia.

Innovation - Instead of manually removing all the fish to check their sizes to see if they're ready to be harvested, we use this technology to automatically check their sizes even if they are in the water, as long as the Umitron lens is already submerged in the pond.

Umitron lens - the device used to estimate fish size and weight if they are ready to be harvested.

CHAPTER II
PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

MARKETING ASPECT

Twin's 2022 study highlights the significance of marketing in business management. Marketing entails promoting and distributing goods and services and connecting businesses with potential customers. It begins with understanding the customer's needs and preferences, followed by developing strategic approaches to meet and exceed expectations. This chapter delves into the complexities of marketing, focusing on identifying the right audience, developing compelling strategies, and implementing effective channels for communicating value propositions.

Business Description

A.L.E. Tilapia Oasis Farm is a modern tilapia farming enterprise in Brgy. Candau-ay, Dumaguete , Negros Oriental. The farm aims to revolutionize traditional practices by integrating advanced technology and innovative methodologies. The farm uses advanced technologies like Umitron Lens Technology to monitor and optimize parameters, ensuring high water quality standards and fish health. The farm also focuses on community empowerment, creating employment opportunities, and contributing to the economic growth of the local community. The farm invests in state-of-the-art infrastructure, including fish ponds, modern housing facilities, and Umitron Lens Technology equipment. The market-responsive farm focuses on local consumers to meet local demand and explore opportunities. The farm's core values include responsible resource management.

Company Logo

The Modern A.L.E Tilapia Oasis Farm

The logo for A.L.E. Tilapia Oasis Farm showcases their commitment to sustainable aquaculture and innovation. The stylized tilapia fish symbolizes high-quality produce and the aquatic environment, while subtle tech elements like circuit-like patterns represent Umitron Lens Technology integration. The clean typography complements the logo, showcasing their professionalism and mission to redefine tilapia farming.

Target Market

A.L.E Tilapia Oasis Farm focuses on local consumers in Candauay, Dumaguete, and neighboring areas in Negros Oriental. There is a growing awareness of the importance of nutrition, and tilapia is regarded as a high-quality protein source. The supply of fresh, locally sourced Tilapia from A.L.E. Tilapia Oasis Farm meets the nutritional needs of residents, capitalizing on the trend toward healthier food choices. The farm supplies fresh, locally sourced tilapia to meet residents' dietary needs and culinary preferences. Secondary targets include restaurants, seafood eateries, and retailers. The farm also has potential for export, with regional and international markets emerging as demand for high-quality tilapia remains strong. Eco-conscious consumers appreciate the farm's commitment to responsible resource management and sustainable practices.

Aquaculture enthusiasts are attracted to the innovative use of Umitron Lens Technology and sustainable practices. The farm also engages with local communities through community events and collaborations. Data was gathered from 400 respondents, mostly aged 26 and above, with various incomes and mostly college-level educational attainment. That can help provide insights into the feasibility and acceptance of the project in the local community and surrounding areas.

Demand

The primary goal of conducting a feasibility study is to determine the demand for the farm's products and services. A survey with 400 participants was conducted closely to measure the demand precisely. The results of this thorough questionnaire were remarkable, with an incredible 98.25% of respondents expressing a strong interest in the establishment of modern.

A.L. E. Tilapia Oasis Farm, complete with the innovative Umitron Lens Technology, is in the scenic location of Candauay. This overwhelming response from 393 participants demonstrates genuine passion and interest. Conversely, only 1.75% of respondents, or seven people, disagreed. Nonetheless, this survey validates the project's high demand, laying the foundation for future success.

Supply

This research aims to determine the viability of establishing a modern A.L.E. Tilapia Oasis Farm in Candauay using Umitron Lens Technology. This innovative farm in Candauay is situated along a prime stretch between two well-known landmarks, making it a strategic location for aquaculture operations. The modern A.L.E. Tilapia Oasis F arm is a one-of-a-kind offering in the Barangay, with no direct competitors, ensuring a distinct edge in the aquaculture industry. This venture aims to meet the needs and preferences of the local market by providing high-quality tilapia products and embracing innovative technology. This study seeks to determine this project's potential demand and suitability for the selected market.

Demand and Supply Analysis

The Demand and Supply Analysis proved helpful in determining the sustainability of Candau-ay modern A.L.E. Tilapia Oasis Farm with Umitron Lens Technology, an innovative aquaculture venture. Its strategic location and lack of direct competitors make it an appealing investment. A survey of 400 people reveals that 98.25% are very interested in the farm's services and products, indicating a strong demand for highquality tilapia and innovative aquac ulture. The farm is well-positioned to meet this demand because of its commitment to improving production through Umitron Lens Technology. This analysis confirms the farm's feasibility in meeting the needs and preferences of the local market.

Marketing Strategies

A.L.E. Tilapia Oasis Farm is a tilapia farm that uses Umitron Lens Technology to provide high-quality products. Pricing at the farm is competitive and flexible, catering to a wide range of customers. To engage customers, the farm offers a subscription service that delivers fresh tilapia regularly, fostering brand loyalty. On the wholesale side, the farm forms strategic alliances with key distributors, providing tiered pricing and exclusive training programs.
A.L.E. Tilapia Oasis Farm builds word of mouth to build its image, ensuring high-quality tilapia products, innovative technology, and commitment to freshness and safety, fostering positive customer experiences. Digital marketing platforms like Facebook and Instagram promote products and raise awareness among the wholesaler network. The farm also forms relationships with local restaurants and markets to expand its reach and contribute to the local economy. These efforts highlight the farm's versatility and freshness, boosting its image among consumers and wholesale markets.

Marketing Mix

A.L.E. Tilapia Oasis Farm in Candauay has thoughtfully designed its marketing mix to accommodate its customers' diverse needs and preferences.

PRODUCT

The proposed business will offer fresh tilapia from its farm and ensure a consistent supply, employment opportunities, and food security for the residents of Brgy. Candau-ay, Dumaguete, Negros Oriental, and the neighboring barangays. Customers can purchase tilapia directly from our farm located in Brgy. Candau-ay, Dumaguete, Negros Oriental. Our product range includes fresh tilapia and value-added options like marinated fillets, smoked tilapia, ready-to-cook packages, and the option to catch fish. We aim not only to cater to diverse tastes and preferences, enhance dining experiences, and showcase the versatility of tilapia as a delicious and nutritious seafood option but also to enhance customer satisfaction by offering a memorable and interactive component to their visit.

Our commitment to quality begins with sourcing locally and meticulously selecting tilapia from our farm in Brgy. Candau-ay, Dumaguete, Negros Oriental. We prioritize sustainability and employ eco-friendly practices, ensuring freshness and transparency in our supply chain. Our tilapia is free from harmful chemicals and pesticides, guaranteeing health and well-being. We strive to give your table a pure, wholesome, and safe choice.

PRICING

A.L.E. Tilapia Oasis Farm prioritizes providing exceptional quality and value to customers through competitive pricing, occasional discounts, and loyalty programs. They analyze local market rates and production costs to ensure the best value for their products. Their pricing philosophy is based on transparency, fairness, and delivering value, ensuring the availability of high-quality, sustainable tilapia products.

PROMOTION

Promotion is crucial to the current A.L.E. Tilapia Oasis Farm project's success. In addition to traditional word-of-mouth marketing, the researchers are utilizing a variety of marketing tactics to ensure the business's extensive promotion. Using social media platforms such as Facebook and Instagram, the farm will be able to reach a larger audience, engage new consumers online, and share information about its creative offerings. Furthermor e, distributing brochures and posters will inform the local population about the tilapia farm's offerings and procedures. However, it is not simply about traditional advertising but also about developing strong community relationships and networks. Customers pleased with the project's sustainable and innovative approach are expected to become important ambassadors for the company, which can lead to new business prospects. This multifaceted marketing plan is intended to give the modern A.L.E. Tilapia Oasis Farm a significant market presence, adding to its potential success in Candauay, Negros Oriental.

PLACE

A.L.E. Tilapia Oasis Farm offers a dual-pronged approach to customer convenience and accessibility. The farm store, located in Brgy. Candau-ay, Dumaguete, Negros Oriental, showcases the freshness and variety of tilapia products, allowing customers to handpick their preferred tilapia and witness the authenticity of their operations. The online presence established in Brgy. Candau-ay, Dumaguete, Negros Oriental, will enable customers to explore the product range, access information about sustainable farming practices, and place orders from home. This dual approach reflects A.L.E.'s commitment to customer-centrality, offering choices that cater to varying preferences and needs. The farm aims to provide accessibility and a personal touch in every interaction.

SWOT ANALYSIS

This SWOT analysis illustrates our strengths and chances for growth, as well as our vulnerabilities and potential threats. To ensure the success and

sustainability of A.L.E. Tilapia Oasis Farm, we are committed to exploiting our strengths and capturing opportunities while proactively addressing weaknesses and reducing threats.

Strengths

● Our farm's strategic location is in Brgy. Candau-ay, Dumaguete, Negros Oriental, ensures the freshest and locally sourced tilapia
● We offer a wide range of tilapia products
● guarantees the quality and safety of our tilapia.
● catering to various consumer preferences and culinary needs.
● Our commitment to sustainable and eco-friendly farming practices
● Actively participating in local events, sponsoring activities, and collaborating with nearby businesses, we foster a strong sense of community and goodwill.

Weaknesses

● While we have a solid local presence, expanding our reach outside our immedi ate community may provide obstacles.
● Online Competition: The online market is competitive, necessitating ongoing work and resources to stand out in the digital scene.

Opportunities

●Our tilapia products meet the
growing consumer demand for healthy protein sources and sustainable food options.
●Offering potential for export due to their high quality and sustainability.

Threats

●The aquaculture sector faces both existing and new market competitors.
● Environmental factors such as climate change and disease outbreaks may impact tilapia productivity.
● Changing legislation may necessitate adaptation and compliance, which may impact business.

Technical Aspect

The technical part emphasizes the farm's readiness to function efficiently and create high-quality tilapia products utilizing innovative and environmentally friendly ways. It establishes the modern A.L.E. Tilapia Oasis Farm as a cutting-edge and competitive competitor in the aquaculture business.

Service/ Product Process

The A.L.E. Tilapia Oasis Farm's service method combines cutting-edge technology with traditional aquaculture practices to give consumers the freshest and highest-quality tilapia products. It all starts with carefully monitoring and maintaining the fish in our technologically superior fish ponds equipped with Umitron Lens Technology. This innovation allows us to track fish health, growth, and environmental factors in real-time, guaranteeing that our tilapia are kept in the best possible conditions.

Customers who visit our farm have the unique chance to catch fish, developing a closer relationship with their food. Our trained and pleasant team will walk them through the procedure, offering support as required. Customers can opt to have their fresh tilapia processed on-site or take it home to cook. For those who want a more convenient choice, our farm store sells marinated fillets, smoked tilapia, and ready-to-cook packets of fresh tilapia. These goods have been subjected to strict quality assurance to fulfill industry standards, ensuring the highest product quality and safety levels.

Our service approach is designed to provide unmatched freshness, quality, and sustainability. It allows clients to participate in farming, encourages transparency, and offers a one-of-a-kind and enjoyable experience at the modern A.L.E. Tilapia Oasis Farm.

Project Location

The modern A.L.E. Tilapia Oasis Farm's project setting, in the center of Candauay, is complemented by 20 well-designed ponds and a two-story home. This strategic position guarantees all A.L.E. staff easy job access, creating efficiency, convenience, and a strong sense of community among farm employees. These features blend perfectly with the project, making the location an excellent hub for productive and harmonious aquaculture operations.

Utilities

The A.L.E. Tilapia Oasis Farm is located in Brgy. Candau-ay, Dumaguete, and Negros Oriental rely on dependable utilities for their success. The project will get its electricity from the Negros Oriental II Electric Cooperative (NORECO II), which will be necessary for powering the farm's critical equipment and systems. A reliable power source could lead to fish health issues and lower output.

The farm's fishponds will rely on freshwater from the local environment. The Water District demonstrates the importance of these services in supporting modernized tilapia farming by providing clean and safe water, which is essential for maintaining a sanitary environment and ensuring

the fish's wellbeing. These utilities increase project efficiency, productivity, and overall success.

Waste Disposal

Waste disposal is essential for maintaining the environment and water quality. The proper separation and la beling of trash into biodegradable and non-biodegradable types will be done. If we encounter a fish kill, we will use the dead fish as one of the elements to build a vermicast to produce an organic and natural soil fertilizer that is excellent for agriculture. This method of composting organic waste, including pond water and mud, can also provide plants with organic fertilizer.

Risk Management

Market fluctuations, environmental impact, technological challenges, operational risks, regulatory compliance, financial risks, labor shortages, community perceptions, supply chain disruptions, disease outbreaks, and resistance to technology adoption are all risks that the A.L.E. Tilapia Oasis Farm project faces. The farm will conduct market research, diversify product offerings, and employ adaptive marketing strategies to address these issues. It will also implement regular maintenance, staff training programs, and technology-related disruption contingency plans. The farm will address regulatory compliance, financial risks, and community perceptions through transparent communication, community engagement programs, supply chain disruptions, and disease outbreaks.

Legal Requirements

Meeting regulatory standards is critical to the success of A.L.E. Tilapia Oasis Farm in Brgy. Candau-ay, Dumaguete, and the Oriental Negros. The following are some of the most important legal considerations and requirements that the project should address.

A. **Business name registration**

Requirements:

- Accomplished Business Name Registration Form(Single Proprietorship)
- Photocopy of 1 government-issued valid I.D.
- Barangay Clearance
- Registration fee- Php 530.00

B. **Mayor's Permit**

Requirements:

- Accomplished the Business Application Form

● D.T.I. Certificate of Registration
● two pcs. 2x2 I.D. picture
● Barangay and Police Clearance
● Transfer Certificate of Title
● Sketch/ Picture of the Business Location
● Registration Fee- Php 500.00
● Zoning Certificate from the Barangay
● Sanitary Permit and Certificate of Occupancy
● Fire Safety Inspection Permit
● Community Tax Certificate/ Cedula (City Treasurer's Office)
● PEST Control Clearance (City of Veterinary Office

C. **B.I.R. Registration (Sole Proprietorship)**
Requirements:
● TIN (Tax Identification Number)
● D.T.I. Certificate of Registration
● Barangay Business Clearance
● Mayor's Permit
● Certificate of Lease (if the place is rented) or Certificate of Land Title (if owned)
● Government-issued identification (Passport, Driver's License, Birth Certificate, etc.

● B.I.R. Form 1901
● Book of Accounts
● Registration fee- Php 500.00
● N.S.O. Certified Birth Certificate of the dependents
● Documentary Stamps

D. **DOH-BFAD**
Sanitary Permit Requirements:
● Medical Certificate
● Inspection reports include A master list of employees of the establishments with their respective positions, pest control contract, and microbiological analysis of water.
● Authentic Health Certificates of employees, including the x-ray and drug test, to ensure they are suitable for work.
● Sanitary Fee- Php 90.00

E. **Social Security System (SSS), Philhealth, and Pag-ibig Certificate**
Email Address: member_relations@sss.gov.ph Website: sss.gov.ph

F. City Treasurer's Office
Requirements:
● Community Tax Certificate or CEDULA
● Medical Certificate
● Health Certificate Fees
● Miscellaneous
● Business Permit Plate
● Business permit Plate Sticker

G. **Fire Safety Inspection Certificate or Fire Permit**
Requirements:
● Building Plans
● Building Permits
● Barangay Business Clearance
● Fire Insurance Coverage
● Recommendations from fire safety inspectors

Management Aspect

A.L.E. Tilapia Oasis Farm's management principles are created to promote sustainability and excellence across all facets of our operations.

Company Vision

"Empowering communities through sustainable and innovative tilapia farming, envisioning a future where nutritious seafood is accessible to all while preserving our planet's aquatic ecosystems."

Company Mission

"To lead the way in sustainable tilapia farming, providing a consistent su pply of high-quality, nutritious seafood while prioritizing environmental responsibility and community well-being."

Ownership and Capitalization

A.L.E. Tilapia Oasis Farm is a privately owned business whose proponent primarily funds Mr. Elrey Elmoore Abella's money. Mr. Abella, as the sole proprietor, is committed to funding the project and providing the

financial resources required to construct and maintain the tilapia farm. His financial investment covers various company issues, including land renting, equipment procurement, infrastructure development, technology implementation, and working capital. Mr. Abella is open to investigating investment options, grants, and partnerships with individuals, organizations, and entities who share his vision of promoting sustainable agriculture, aquaculture techniques, and funds. This diverse funding method secures the project's solid financial foundation and effortlessly meshes with the creative concept of modernizing.

Projected Timeline

The essential milestones and activities involved in building and operating the A.L.E. Tilapia Oasis Farm in Candau-ay are outlined in this proposed timetable.

Organizational Structure

A.L.E. Tilapia Oasis Farm's organizational structure includes key positions like Manager, Farm Workers, and Marketing Team, ensuring efficient coordination and focus on daily operations.

Recruitment Program

The A.L.E. Tilapia Oasis Farm is looking for skilled farm workers to join their team. The farm requests individuals with hands-on experience in aquaculture or related agricultural fields, particularly tilapia farming. Applicants with Umitron Lens Technology knowledge and a passion for sustainable farming practices are preferred. The hiring process begins with careful screening to identify candidates who possess the necessary skills and are committed to excellence. After being hired, they undergo a solid orientation to become comfortable with the farm's processes and practices. Continuous training and development opportunities are provided to help them improve their skills. A.L.E. Tilapia Oasis Farm provides a welcoming and collaborative work environment for all team members, including farm workers.

A.L.E. creates a warm and collaborative work atmosphere for all A.L.E. Tilapia Oasis Farm team members. Farm workers are required to cover operational needs daily through shift rotations. Furthermore, our managerial and marketing jobs are available on-call, allowing flexibility and responsiveness.

Job Analysis

At A.L.E. Tilapia Oasis Farm, the job analysis process is critical for understanding the specific requirements and responsibilities of roles such as Marketing and Manager. It involves a careful review of duties, qualifications, and environmental factors. The manager's analysis will concentrate on marketing strategies, campaign planning, customer engagement, and digital marketing proficiency. Strong marketing experience, strategic thinking, and practical communication skills may be required. The job analysis will aid in creating accurate job descriptions and aligning roles with the farm's goals and values. Flexibility and responsiveness are essential for managing marketing strategies and administrative functions.

Onboard Training

New hires must undergo onboarding training to learn the fundamentals of their new jobs. Onboarding training lasts one week, so employees should quickly pick up on the necessary skills. The officer in charge must set up the classroom and lecture materials for an employee to learn effectively and discuss the subjects that must be covered in the operation. The onboarding training will determine the level of new hires' interest in or dedication to their jobs. After this training, new hires ought to have acquired the abilities, information, and attitudes required to contribute effectively to the operations of A.L.E. Oasis Tilapia Farm.

Soft Skills Training

Personnel must acquire and improve soft skills since A.L.E Oasis Tilapia Farm appreciates strong business relationships and business entity integration. Employees with soft skills are better able to interact, communicate, and settle disputes at work. It aids organizations in creating a positive workplace environment and culture. A.L.E Oasis Tilapia Farm will provide training sessions with exercises that encourage and enhance the employees' interpersonal, coping, and organizational skills as well as their communication and rapport-building abilities. The company's success in the long run and the maintenance of a positive corporate culture are significantly influenced by this form of training.

Technical Skills Training

The A.L.E Oasis Tilapia Farm focuses on developing each employee to the fullest extent possible. A.L.E Oasis Tilapia Farm employees can attend forums, seminars, and other training programs to advance their core competencies and skills. The business will fully assist in the total grooming of the personnel by supervising the training and regularly giving moral support to employees. They

could attend seminars, trainings, and workshops on various aspects of aquaculture in the Bureau of Fisheries and Aquatic Resources. In this way, employees can gain new knowledge about this business. A.L.E Oasis Tilapia Farm may receive technical skill training in accounting administration, customer service systems, business-relations communication, and poultry management systems. The officer in charge of the training program must create a thorough training development plan to assess each employee's performance history.

Product or Service Training

Products and services must be optimized to maintain a profitable and long-lasting firm. A.L.E Oasis Tilapia Farm will hold training sessions on product storage, quality control, and assuring effective and safe products for the target markets. The product or service training provided by A.L.E Oasis Tilapia Farms includes customer service management, inventory stock auditing, and inventory control management. Thanks to this training, employees will be more prepared to handle difficult situations that emerge during business o perations.

Compliance Training

Additionally, A.L.E Oasis Tilapia Farm will offer compliance training to uphold a safe workplace and respectable workers. The compliance training will cover diversity, workplace substance abuse, workplace safety security, anti-harassment, anti-violence, anti-negligence of information security, and workplace safety and security. Training in company reputation, for example, will reduce risk and foster the growth of a strong and cohesive corporate community.Additionally, it will promote effective employee governance and aid in preventing undesirable employee behavior.

Managerial and Leadership Training

A.L.E Oasis Tilapia Farm will develop a training program that is only available to the business organization's leaders. Conflict resolution, innovation, virtual leadership, managing changes in business transition and diversity of the workforce, building trust and respect, coaching to improve employee performance, managing fruitful meetings and discussions, inspiring and motivating employees, practical communication skills, and time and energy management are some of the topics covered in this type of training. By developing effective leadership across all organizational functions, this type of training strengthens the bonds between team members and aids in achieving the firm's goals.

Organizational Policies

● Rules of Conduct

I. The Code of Ethics and Conduct of A.L.E. Tilapia Oasis Farm encourages workers' integrity, transparency, and honesty. They avoid conflicts of interest and quickly disclose potential conflicts to retain confidence. Respect and professionalism characterize their interactions with customers, coworkers, and those who matter, generating beneficial relationships and productive teamwork. They follow local aquaculture laws and regulations, aiming for ethical and compliance operations. This dedication is critical to their principles and vision for a responsible and sustainable aquaculture future.

II. Policy on Environmental Sustainability:

A.L.E. Tilapia Oasis Farm is dedicated to reducing its environmental imp act through eco-friendly measures. All personnel are accountable for maximizing resource utilization and eliminating waste.

The farm will abide by all environmental laws and regulations to maintain local ecosystems.

III. Workplace Health and Safety:

- All employees' safety and health are a significant priority.
- All employees must observe safety measures, including wearing suitable protective gear and operating equipment safely.
- Report any safety concerns or occurrences to bosses right away.

IV. Excellent Customer Service:

- You may provide excellent customer service by being attentive, responsive, and respectful to consumers.
- Respond to consumer problems and inquiries in a timely and professional manner.
- You can increase client satisfaction and repeat business by providing high-quality products and services.

V. Data Security and Confidentiality:

- Always keep vital company and consumer information secure.
- Do not share confidential information with unauthorized people or utilize it for personal advantage.
- To avoid data breaches, follow best practices for data security.

VI. Anti-discrimination and diversity

We are committed to respecting the ideals of anti-discrimination and diversity at A.L.E. Tilapia Oasis Farm. We are delighted to be an equal-opportunity workplace where every employee, regardless of background, is treated fairly and respectfully. Discrimination, harassment, or bias based on any personal attribute, such as color, gender, religion, or any other distinguishing feature, is not only not acceptable but also strictly prohibited within our organization. We are passionate advocates of workplace diversity and inclusion, understanding that our team members' experiences and viewpoints contribute to our overall success. We aggressively encourage an inclusive culture in which everyone is respected and has an equal chance of success.

VII. Professional Development and Learning

Weencourageall employees to continuously broaden their knowledge and skill set as part of our commitment to Professional Development and Learning. We believe that continuous learning is critical for personal and professional development. We encourage our team members to attend training sessions and workshops to improve their professional skills and expertise. We respect their information and encourage mentoring and expert exchange among colleagues wherever possible. This collaborative approach promotes a dynamic learning environment where all employees can continue to grow and enhance their skills.

VIII. Quality assurance

At A.L.E. Tilapia Oasis Farm, quality assurance is critical to everything we do. We maintain firm product quality and safety standards to ensure our clients' satisfaction and well-being. To ensure the quality of our tilapia products, we use robust quality control methods across our processes. Our dedication includes careful adherence to industry standards and best practices. By continually meeting and exceeding industry standards, we ensure that our goods are of the most excellent quality and safety, fulfilling our pledge to produce more extraordinary tilapia products.

Work Policy

This work policy aims to establish a comfortable and practical workplace. In response to violations of this policy, corrective action, including termination of employment, may be taken. It is crucial that everyone on staff is aware of and follows these rules.

- **Office hours** are our regular business hours**,** Monday through Sunday, from 9:00 AM to 5:00 PM. Employees must show up on time and be prepared to begin working when it is time.

- **Day Off Schedules:**
- Rotating Day Off: To ensure fair distribution, a rotating day off schedule changes the day off from week to week.

- **Breaks:** Employees are granted two 15-minute and one-hour lunch breaks during the workday. Please respect break hours and get back to work right away.

- **Attendance:** Being on time and showing up regularly are essential. Please give your boss as much advance notice as possible if you cannot report for work.

- **Dress Code:** Our workplace has a formal dress code. All personnel must present themselves professionally and appropriately.

- **Protection of sensitive information:** Confidentiality is a top responsibility, and employees are forbidden from sharing proprietary or private information with outside parties.

- **Use of Company Equipment:** Employee-owned computers, phones, and automobiles must only be used for business-related activities. Personal use should be kept to a minimum and not conflict with work obligations.

- **Internet and email usage:** Only use the internet and email for tasks connect ed to your job. Personal use should be kept to a minimum and not interfere with productivity.

- **Workplace behavior:** Be respectful and professional to all coworkers, clients, and stakeholders. Discriminatory, harassing, or demeaning behavior is not acceptable.

- **Health and safety are our top priorities for all employees:** Any dangerous situations or event s should be reported immediately.

- **Communication** is encouraged to be respectful and open. Discuss any issue or suggestions with your manager or the Human Resources.

- **Respect all local ordinances, rules, and company policies:** Discipline may be taken in response to noncompliance.

Operating Hours and Work Schedule Salaries and Wages

A.L.E Tilapia Oasis Farm provides convenient services with flexible operating hours to accommodate various schedules.
Monday through Friday from 8:00 AM to 5:00 PM, and weekends and holidays from 7:00 AM to 5:00 PM. The manager regularly takes a weekend break, whereas the marketing and the Administrative staff relax on weekends. Farm workers, who play an essential role in aquaculture operations, work on a rotating day-off schedule to ensure adequate coverage. This approach ensures operational excellence and employee satisfaction by balancing the farm's operational needs and employee well-being.

Employees ' monthly pay is correctly established based on their unique job duties and responsibilities. Only work attendance, overtime compensation, ordinary holiday rates, special holiday rates, and working on rest days can affect an employee's monthly pay. The business manager will make a log book or attendance checker to display the track for hours worked thoroughly and the appropriate rates. Employees should log in with their credentials five minutes before starting work to report any technical issues as soon as they arise. It's crucial to immediately alert the officer in charge to prevent erroneous employee time and payroll records.

Compensation

Employees can receive bonuses and incentives based on their performance and the extent to which they contributed to the company's success.

Personal Accident Insurance

According to Article 162 of the Philippine Labor Code, any employer must give an injured or ill worker all the support required to receive proper and prompt medical care. Respectable and seasoned insurance companies provide personal accident insurance to regular employees. The Insurance Company will pay for this regardless of where and when the occurrences occur. The employee and the company must agree on the availability and choice of a personal accident insurance plan.

Regular Paid Holiday

Every employee shall be entitled to a rest day of 24 hours every six consecutive working days.

According to **pinoyadventurista.com**, the following shall be considered regular holidays:

a. New Year's Day - January 01
b. Maundy Thursday - movable date
c. Good Friday - movable date
d. Araw ng Kagitingan - April 09
e. Labor Day - May 01
f. Independence Day - June 12
g. National Heroes Day - Last Sunday of August
h. Ramadan - movable date
i. Bonifacio Day - November 30
j. Christmas Day - December 25
k. Rizal Day - December 30

As stated in **pinoyadventurista.com**, the following shall be considered special holidays:

a. All Saints Day - November 01
b. Last Day of the Year - December 31

Employees who happened to work/called to work/obligated to work on a ny of the holidays above shall receive 130% of his or her regular daily salary.

Mandatory Government Contributions Other Benefits

The Republic Act No. 8282, also known as the Social Security Law, which is the government's social insurance program and provides the following benefits, must be followed by
A.L.E. Tilapia Oasis Farm:

- Social Security System (S.S.S.)
- Pag-IBIG Mutual Fund
- PhilHealth

13th Month Pay

According to the Department of Labor and Employment (DOLE), the company provides employees with a 13th-month pay equal to 100% of their regular monthly salary. Every year, the benefit is due no later than December 24. These benefits are available to A.L.E. Tilapia Oasis Farm employees who have worked hard and deserve them.

Retirement Benefits

Under the Republic Act No. 7641, Employees who meet the requirements will be eligible to receive a predetermined retirement pay upon retirement, as required by law and granted by A.L.E. Tilapia Oasis Farm business.

Termination/ Employee Dismissal Legal Consideration

A member of the workforce may be fired by their employer for just causes, which could include any of the following, by Article 282 of the Labor Code:

1. Serious misbehavior or willful violation by an employee of the legitimate instructions of his employer or agent while performing his job;
2. gross and persistent failure to perform obligations by the employee;
3. fraud or a deliberate breach by the employee of the confidence that his employer or properly authorized staff have placed in him;
4. committing a crime or infraction against the employer's person, a member of their immediate family, or one of their adequately appointed representatives, and other comparable reasons.

A.L.E. Tilapia Oasis Farm will follow all of the rules mentioned above.

Employer Termination

When an employee's employment with the company ends, the employee will receive the necessary notice of termination once all unpaid obligations have been completed, as stated in Art. 283 of the Labor Code Law of the Philippines.

The following are the reasons for termination:

1. The employee engages in serious misconduct
2. fraud or betrayal
3. committing a crime against the employer of the employee
4. Gross and habitual neglect of duties
5. Loss of confidence
6. Commission of crime or offense

The following are authorized grounds for termination:

1. installing labor-saving equipment
2. redundancy
3. Reduction in force or downsizing
4. closing down or ceasing operations
5. Disease

Employee Termination

The rules of Article 285 strengthen this kind of termination. According to Article 285 of the Labor Code, an employee may terminate their employment for cause or without cause. Without good reason, the employee must provide the employer one (1) month's notice of their intention to resign and submit a resignation letter. Giving the employer enough time to recruit a substitute is essential to prevent job disruption. Employees who don't submit a resignation letter will be held responsible for any resulting harm.

However, if the employee leaves for legitimate reasons, they are not required to give notice. According to Article 285, the following are examples of justified reasons for resignation: grave insults to the employee's honor and person, cruel or intolerable treatment by the employer or a representative, crimes committed against the employee's person or the persons of any immediate family members, other similar reasons.

Legal Considerations

According to the Barangay Classification, the proposed business must follow the mandated regulations or comprehensive census when operating a Tilapia farm. These are the following:

- Business Registration and Licensing
- Ensure that the farm follows aquaculture health and safety standards.
- Create employment contracts that comply with labor laws to protect your employees and business.
- Understand the income generated by your tilapia farm.
- Follow applicable labor laws and industry-specific safety regulations.
- Strictly follow all local laws and regulations about aquaculture and business operations.
- Ensure the quality and safety of tilapia products; compliance with industry standards and best practices is essential.

Financial Aspect

This aspect calculates the amount of start-up capital required. It examines the necessary amount of money, its source, and its planned use. Researchers must forecast five-year financial statements to determine whether the business industry will be profitable.

Capital Requirements

The initial investment required to start the firm is Php 8,500,000.00. This amount will be used to cover the costs of buying land for 1-hectare tilapia farm in Zone 2 Purok Sampaguita Candau-ay, Negros Oriental, as well as the machinery, equipment, building, and other expenses for running the business.

Source of Funding

Mr. Elrey Elmoore Abella's savings will fund this project. His funds will be strategically allocated to cover various critical business-related expenses, such as land equipment, financing the construction of the tilapia farm, acquiring necessary supplies, infrastructure development, and technology implementation, as well as addressing a variety of other critical business-related expenses. Mr. Elrey Elmoore Abella, proprietor of "El Cafe and Flairemoore Bartending Services," is responsible for the project. His understanding of business management, digital marketing, and teamwork is essential to the project's success. Abella's entrepreneurial leadership, team dynamics, and commitment to sustainability align with the project's goal of transforming Candau-ay tilapia farming.

Financial Assumptions

Sales

a. Revenue is based on the results of demand and supply analysis.
b. Project income will increase gradually by 10% per year.
c. The income for Catch Your Own Tilapia (Creational Income) and
Fishing Rod Rent will start in the second year of the operations and will increase 10% per year.

Cost of Sales

a. Sales costs are estimated based on production costing and will increase by 5% annually.

Pre-operating Expenses

Preoperating expenses are expenses to be incurred before the commencement of the operation.
a. Pre-operating expenses include business registration and soft opening.
b. The amount reflected in the pre-operating expenses are mere projections.

Operating expenses

a. Salaries
and Wages of the employees other than those reflected in direct cost are expected to remain the same for the first five years. They will increase by
5% at the beginning of the 6th year of operations and 5% every three years after that.
b. Depreciation expense is computed using a straight-
line method with zero salvage value.
The expected useful life of the asset is found in Schedule 8.

c. Utility Expenses include electricity, internet, and water, which are expected to increase by 8.5% per year. (higher than the inflation rate of 8.1% as of December 2022)
d. Supplies Expenses are expected to increase by 5% per year.
e. Repairs and Maintenance are assumed to be 2% based on the Acquisition Cost of Fixed Assets and are expected to increase by 5% annually. Repair and maintenance for the building is 1% of its cost and is expected to grow by 5% annually. Other equipment, furniture & fixtures not subject to repair and maintenance will be replaced after five years.
f. Business tax to be paid by the local government for business permits is expected to be 2% based on gross sales.
g. S.S.S., PAG-IBIG, and PhilHealth Contributions are computed in line with the government rules and regulations.
h. Miscellaneous expense includes the provision of probable necessary farm expenses.

The amount is estimated to be ½ of 1% of Sales. Income Tax Expense is computed based on the Graduated Tax Table by the NIRC as amended by TRAIN Law.

Socio- Economic Aspect

This chapter discusses the proposed business's advantages and how they impact the government, the economy, employment opportunities, the environment, and households. It also mentioned the business's connection to the economy and its contribution. The company should take this into account to get positive feedback from the community. The impact of a business on its customers and society should also be considered.

Socio-Economic Environment

The suggested firm improves the economy by providing jobs and career opportunities for various people. Additionally, the planned firm will require laborers and plumbers to develop the facilities under the engineer's supervision. Delivery staff, quality assurance, security personnel, inventory employees, hatchery attendants, hatchery supervisors, production workers, and all other employees listed in the business organizational chart will be required when the business opens for business. As stated in EdenHealth.com (2021), when people are employed, they can improve their and their families' living situations, whether for education, healthcare, shelter, or security. They are (human resources) the most critical asset of the proposed business. Therefore, they must be treated and compensated appropriately and with various benefits. It also helps the economy through taxes paid by the company and the employees.

Direct Economic Benefits

The company may offer plenty of straightforward advantages to the economy, given that it is a part of the developing agricultural sector. The demand for this sector is rising rapidly. Maintaining relationships with its significant consumers is one of the business's direct economic benefits to the economy. Accurately projecting supply levels while meeting the volume of demand from the company's clientele will be possible thanks to the integrated relationship. Apart from the cash it will regularly make, this firm will also gain from hiring people to work for it. It is clear that this project will probably be successful and that it will address the growing demand from customers who wish to have high-quality products at reasonable costs.

Indirect Economic Benefits

The productivity, physical concentration, vertical integration, and connectivity to global supply networks across tilapia farming places are rapidly increasing. In several countries, tilapia farming is distinguished by contract growing systems. Under such a system, the production units are owned and operated by contract farmers who are paid according to productivity and output. Typically, contract growers get their feed, medicine, and fingerlings from an integrator. Essentially, the grower's contract is a means of sharing risk and expense between the grower and integrator. Economies of scale, reduced transaction costs, and decrea sed risks associated with large price fluctuations benefit the grower. Governments have to pass legislation to prevent contract growing from permitting the introduction of adverse effects to growers, tilapia farmers' employees, local communities, and the general public. This is because it provides smaller tilapia farmers with employment and revenue prospects.

LEGAL ASPECTS

Large and small enterprises, particularly corporations like the A.L.E. Tilapia Oasis Farm, must fulfill all legal obligations to commence entire operations. These obligations are imposed by law. It will be essential to avoid any unique legal problems. This chapter will list and present specific registrations and requirements from particular government agencies. The specifics of the registration process will then also be covered.

Security Exchange Commission (S.E.C.)

The Security Exchange Commission, or S.E.C., is one of several government organizations with which new business entities, such as companies, partnerships, or associations, must register. This national government regulatory body is in charge of monitoring, regulating, and investigating the operations of the Philippine corporate sector. By registering with the S.E.C., a firm can lawfully conduct business, issue receipts, and trade financial assets.

Basic Requirements for Registration/Recording of Corporation

• Cover Sheet
• Name Reservation and Payment Form
• Notarized Articles of Incorporation, By-Laws, and Treasurer's Affidavit
• Accomplished Registration Data Sheet

Procedures

1. Secure, verify, or reserve a business name through S.E.C.'s online services portal - S.E.C. iView or at the S.E.C. Office in Mandaluyong.
2. Accomplish an Application Form from the S.E.C.
3. Draft and notarize the necessary documents required for the specific business entity you plan to register, which are as follows:
a. Articles of Incorporation By-laws
c. Treasurer's Affidavit
4. Attain necessary licenses or permits from appropriate government agencies (fo r regulated industry sectors and business activities)
5. Submit the notarized documents.
6. Pay the filing fee at the Cashier.
7. Claim the S.E.C. Certificate of Recognition, which will be processed at least one week after submission.

Registration with the Bureau of Internal Revenue (B.I.R.)

The Bureau of Internal Revenue (B.I.R.) oversees taxation and gathering internal revenue taxes.

B.I.R. Form 1903 - Application for registration for Corporation/Partnership

Procedures:

1. Accomplish B.I.R. Form 1903 and submit the required supporting documents to the Revenue District Office (RDO), which has jurisdiction over the registered address of your business establishment. The supporting documents to be attached to the Form 1903 are as follows:
• S.E.C. Certificate of Registration
• Mayor's Permit or application for Mayor's
• Contract of Lease

• Other documents to be submitted if applicable:
• Certificate of Authority
• Franchise Agreement
• Proof of Registration/Permit to Operate with BOI, PEZA, SBMA or BCDA
2. Payment of the Annual Registration Fee (PHP500.00) at the concerned RDO's Authorized Agent Banks (A.A.B.s).
3. Payment of the Documentary Stamp Tax (DST) on Subscription and Lease (B. I.R. Form 2000).
4. After securing a B.I.R. Certificate of Registration, you will be required to do the following:
• Apply for Sales Invoices/Official Receipts through B.I.R. Form 1906 – Authority to Print Receipts and Invoices.
• Register books of accounts and stamp them by the RDO where your business is registered. Note that the B.I.R. examiner will usually advise you on the
Types of books and taxes applicable to your business upon the initial taxpayer's briefing.
• Attend the taxpayer's initial briefing, which the RDO will conduct for new registrants to inform them of their rights and duties/responsibilities.

Registration with the Municipality Mayor's Permit
List of Requirements for Mayor's Permit and securing other permits or clearances
• Application Form
• Certificate of Registration from the Securities and Exchange Commission (S.E.C.)
• Barangay Business Clearance
o Photocopy of S.E.C. Registration
o Land Title and Tax Declaration
o Barangay Clearance Fee
• Community Tax Certificate
• Transfer Certificate of Title
• Three (3) copies of sketches or pictures of the site
• Public Liability Insurance
• Zoning Clearance
o Transfer Certificate of Title
o Declaration of Real Property Tax
Sketch or pictures of the site
o Building Permit
o Certification of No Renovation
• Certificate of Occupancy
Sketch or pictures of the site
o Approved Plan

o Fire Inspection Certificate
o Duly Accomplished Certificate of Completion
• Building Permit and Electrical Inspection Certificate
o Building plans (including fencing, signboard, etc.)
o Lot plan
o Clearances
o Title, tax declaration, tax receipt
o Contractor's business permit
o Sketch or pictures of the site.
o Bill of materials, specifications, structural computation
• Sanitary Permit
o Chest X-ray and 1×1 picture of each employee
Inspection of the establishment
o Sanitary permit fee
Payment of sanitary permit and sanitary inspection fees
o Medical Certificate or Health Card issued by the City Health Officer or duly authorized representative.

Fire Safety Inspection Permit
o Building plans
o Building permit
o Barangay Business Clearance
o Fire insurance coverage
Compliance with requirements and recommendations from fire safety inspectors.

Procedure
1. Secure and file the initial requirements, permits, clearances, and Application Forms to the BPLO or Business Permits and Licensing Office at the Municipal Hall.
2. The application fees will then be assessed, and the BPLO officer must validate the official billing assessment.
3. Submit the application requirements together with the Official Billing Assessment.
4. Pay the necessary payment fees.
5. Claim the business or mayor's permit.

Social Security System
Procedures
1. Registration and submission of the following requirements:
• SSS Forms R-1(Employer Registration)

• R-1A (Employment Report) signed by its President or any of the corporate officers
• A photocopy of the Articles of Incorporation (The original copy of the A.O.I. must be presented to the S.S.S. for authentication purposes.)
Processing time: 4 days

PhilHealth
Procedures
1. Submit the following requirements to the PhilHealth office:
• 1 Form (duplicate)
• PhilHealth Membership Registration Form (PMRF)
• S.E.C. Registration
2. Claiming of PhilHealth Employer Number (P.E.N.) and the Certificate of Registration

PAG IBIG
Procedures:
1. Complete the checklist of requirements HQP-PFF-001 and FPF030 together with the following:
• Employer's Data Form
• Specimen Signature Form/Valid ID
• S.S.S. Certification (if already registered with S.S.S.
• Certified True Copy of Proof of Business Existence

TAXATION ASPECTS

Withholding Tax

The amount of withholding tax that an employer must deduct from an employee's paycheck and subsequently pay to the government directly is known as withholding tax. The money that is withheld is added to the employees' pay.

Withholding Tax on Compensation

The tax withheld from income distributions to persons by an employer or a withholding agent is the withholding tax on compensation. The Internal Revenue Code (Republic Act No. 8428), as amended by RA9504, states that "every employer making payment of wages shall deduct and withhold upon such wages a tax determined by the rules and regulations to be prescribed by the Secretaryof Finance, upon the re commendation of the Commissioner," unless the employee is a minimum wage

earner as defined in Sec. 22 (HH) of this code. This means that workers who receive minimum wages are exempt from withholding tax. Individuals that do not exceed the statutory minimum wage or Five Thousand Pesos (Php 5,000.00) per month, whichever is higher. People who don't make more than the legally required mini mum wage or five thousand pesos (Php 5,000.00) monthly, whichever is more significant.

Documentary Tax Stamp

Documentary Stamp Tax is a tax on documents, instruments, and loans. Agreements and papers evidencing the acceptance, assignment, sale, or transfer of an obligation, correct, or property incident.

Documentary Requirements:

1. Photocopy of the document to which the documentary stamp shall be affixed;
2. Proof of exemption under special laws, if applicable;
3. Proof of Payment of documentary stamp tax paid upon the original issue of the stock, if applicable.

Regular/Normal Tax

According to Republic Act No. 9337, the first section, Section 27 of the 1997 National Revenue Code, as modified, is at this moment further changed to say, "Unless this Code specifically states otherwise, an income. This imposes a thirty percent (30%) tax on taxable income obtained from all sources during each tax year, both with and without the Philippines, as specified in this Code's Section 22(B), by any corporation and taxed as a company under this Title, having its organization or existence under the Philippines' legal system: Given that, as of January 1, 2009, the income tax rate is set at thirty percent (30%).

Value Added Tax

One type of sales tax is a value-added tax. It is a consumption tax imposed on the importation of products into the Philippines and on the sale, barter, exchange, or leasing of goods, real estate, and services. It is an indirect tax that can be transferred or passed to the person who purchases transfers or leases products, real estate, or services.

Community Tax

Another name for community taxes is poll taxes or residence taxes. Most people refer to it as cedula. This tax is levied against every community member. Furthermore, it is a form of identification that the cities and municipalities give all people who have turned 18. C.O.T. is evidence that a person is a resident of the city or municipality and that they have paid the t axes associated with their income from business, professional activity, and ownership of real estate in the area.

CHAPTER III:
SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Descriptive Definition of the Project

The Modern A.L.E. Tilapia Oasis Farm in Candauay, Negros Oriental, is a cutting-edge tilapia fish farm that uses Umitron Lens Technology to optimize fish growth while reducing environmental impact. The farm will build 20 fish ponds, allowing real-time monitoring and control of water quality, feeding, and overall fish health. This technology encourages environmentally friendly and ethical fish farming. A two-story house will house the owner/manager and administrative and marketing activities, ensuring effective staff coordination. The farm aims to meet the growing demand for high-quality tilapia products while addressing aquaculture sustainability concerns. This project contributes to the economic growth of Candau-ay and surrounding areas while demonstrating a commitment to environmental management, sustainable agriculture, and local development.

Objectives of the Study Short-term objectives

The primary goal of this study is to assess the feasibility of establishing a "Modern.A.L.E. Tilapia Oasis Farm Innovating with Umitron Lens Technology in Candau-ay." It also aims to identify its target market, assess consumer demands and preferences, maximize profitability while controlling expenses, generate employment opportunities for the local community, and make its services and products available to individuals who want to take advantage of its offers.

Long-term objectives

The "Modern A.L.E. Tilapia Oasis Farm Innovating with Umitron Lens Technology in Candau-ay" hopes to spread its services and products beyond Candau-ay in the long run. It will launch new options that align with customer preferences, allowing it to reach a larger audience for its services and goods. The company is committed to providing employment possibilities for people who want to work on the farm. This venture aspires to positively influence the local community and its valued clients by consistently producing high-quality products and services that meet and exceed customer expectations.

Summary of Findings

The study summary contains all the information and data collected to investigate the outcomes. A feasibility analysis that considers all essential criteria, including marketing, management, technical, financial, and societal, is also conducted.

MARKETING ASPECT

● The farm intends to conduct extensive market research to determine the preferences and demand for tilapia products among local consumers in Candau-ay and neighboring areas.

● The farm's product offerings, which include fresh whole fish, fillets, and value-added items, are tailored to the identified target markets.

● A thorough analysis of production costs, market demand, and competitor pricing is used to develop the pricing strategy. Achieving a balance between competitiveness and profitability is critical.

● The farm understands the value of effective promotion and advertising in raising awareness of its innovative approach utilizing Umitron Lens Technology.

● It is critical to establish and maintain positive customer relationships.

● The farm hopes to establish a strong brand identity that reflects its dedication to innovation, quality, and sustainability.

● A well-planned budget for marketing and advertising activities ensures that expenses are proportionate to expected revenue.

● Marketing emphasizing eco-friendly and sustainable practices aligns with consumer preferences for environmentally conscious products.

● A two-story house on the farm bases will serve as both the owner/manager's residence and a hub for administrative and marketing activities.

● This project demonstrates a commitment to environmental management, sustainable agriculture, and community development while contributing to Candau-ay's economic growth.

TECHNICAL ASPECT

● The integration of Umitron Lens Technology, a cutting-edge system that optimizes fish farming, is a critical component of this project.

● This technology allows real-time water quality monitoring, fish behavior, and feeding patterns.

● Farm, strategically located in Zone 2, Purok Sampaguita, Candauay, consists of 20 well-designed fish ponds and a two-story house for workers.

● These ponds are fitted with modern fish-
rearing infrastructure to ensure the tilapia's health and growth.

● The data is analyzed to help farm managers make better decisions.

● All local laws and regulations concerning aquaculture, safety, and environmental sustainability are followed by the project. Permits, licenses, and environmental guidelines are all part of this.

MANAGEMENT ASPECT

● A.L.E. Tilapia Oasis Farm is a privately held company with a clear vision and mission centered on sustainable tilapia farming, environmental stewardship, and community well-being.

● Mr. Elrey Elmoore Abella, the farm's owner, is committed to providing the necessary funding for the project's development, such as land rental, equipment procurement, infrastructure development, and working capital.

● To ensure the efficient coordination of daily operations, the company's organizational structure includes critical positions such as Manager, Farm Workers, Administrative Staff, and Marketing Team.

● A comprehensive recruitment program is in place, beginning with an analysis of staffing needs, followed by creating job descriptions, sourcing, screening, and onboarding, focusing on diversity and equal opportunity.

● Each role undergoes a job analysis to ensure clear job descriptions, performance goals, and compliance with labor regulations.

● The company makes all required government contributions and benefits, such as Social Security, Pag-IBIG, PhilHealth, 13th-month pay, and retirement benefits.

● The company is dedicated to adhering to all applicable local laws and regulations, assuring the quality and safety of its tilapia products, and promoting ethical and sustainable aquaculture practices.

FINANCIAL ASPECT

● A.L.E. Tilapia OasisFarm requires an initial investment of Php 7,000,000.00. This capital will cover costs such as land acquisition, machinery and equipment, construction, supplies, infrastructure development, and technology implementation.

● Mr. Elrey Elmoore Abella's savings will cover the project's entire cost. His financial resources will be allocated strategically to meet various critical business expenses.

● Revenue is determined by demand and supply analysis, which is expected to rise by 10% annually.

● Sales costs are estimated using production costs.

● Government regulations calculate contributions to S.S.S., PAG-IBIG, and PHILHEALTH.

SOCIOECONOMIC ASPECT

● Laborers, plumbers, delivery staff, quality assurance personnel, security staff, inventory employees, hatchery attendants, supervisors, production workers, and others will be employed and given career opportunities by the proposed business. This helps to improve employees' and their families' living conditions by covering education, healthcare, shelter, and security.

● Employees are regarded as the most critical assets and should be treated appropriately with various benefits.

● The company provides direct economic benefits to the economy, particularly in the expanding agricultural sector.

Conclusion

In conclusion, the survey findings reveal a promising market for establishing a modern A.L.E. Tilapia Oasis Farm in Candau-ay. Most respondents, accounting for 97.50%, consume tilapia, with a significant portion indicating a preference for monthly consumption. Notably, the survey highlights factors such as quality, price, environmental sustainability, and local and fresh produce in the respondents' decisions to purchase tilapia. Additionally, the data shows that mothers play a significant role in buying decisions, and most respondents expressed interest in the concept of "catch your own" fish.

To ensure the business's success, it is crucial to capitalize on the high demand for tilapia, mainly through local markets, and align product offerings with consumer preferences. Marketing strategies should highlight the farm's commitment to quality,sustainability, and technology, addres sing the identified challenges of quality, taste, price, and freshness. Furthermore, efforts to educate the target market about modern tilapia farming using Umitron Lens technology in Candau-ay can enhance awareness and potentially attract more customers. Additionally, leveraging social media as the primary channel for information dissemination aligns with the preferences of most respondents and can be a powerful tool for building brand awareness and engagement.

Overall, by addressing consumer preferences, emphasizing product quality , and implementing effective marketing strategies, the modern A.L.E. Tilapia Oasis Farm has the potential to thrive in the Candau-ay market.

Recommendations

Based on the summary of findings and conclusions obtained. The following recommendations are made.

1. Given the overwhelming preference for consuming tilapia, particularly every month, the farm should focus on providing a steady and reliable supply of fresh tilapia, aligning with the majority's interest. Additionally, considering the interest in dried and marinated tilapia, there is an opportunity to diversify the product range to meet different consumer preferences.
2. Leverage the strong preference for local markets as a source of tilapia by strategically placing the farm's products in these markets. Consider collaborating with local supermarkets and frozen supply outlets to expand accessibility. Implement targeted marketing campaigns emphasizing the farm's commitment to quality, sustainability, and local production.
3. Recognizing the limited familiarity with modern tilapia farming using Umitron Lens technology, initiate educational campaigns to inform the community about the advanced farming practices employed by the A.L.E. Tilapia Oasis Farm. This can enhance trust and generate interest in modernized farming methods.
4. Acknowledge the price sensitivity identified in the survey and implement a competitive pricing strategy. This may involve offering promotions or package deals to attract and retain customers, especially those with lower monthly incomes.
5. Optimize the supply chain to address freshness, availability, and location challenges. Explore options for strategic locations of tilapia stores to minimize the distance from consumers, ensuring a fresh and readily available supply.
6. Foster a strong connection with the community by engaging with consumers through social media, the preferred information channel. Share updates about the farm's practices, promotions, and educational content to build a loyal customer base.
7. Highlight the essential technical aspects of tilapia farming, such as water quality, disease control, aquaculture systems, harvesting, and processing methods. Communicate these practices transparently to build consumer confidence in the farm's technology and practices
8. Establish a feedback mechanism to gather insights from consumers consistently. This can help identify areas for improvement, address concerns promptly, and maintain a positive relationship with the community.

THE EFFECT OF LOCAL AMBULANT VENDORS ON TOURISM ATTRACTIONS AND ACTIVITIES

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ABSTRACT

This study assessed the relationship between the demographic characteristics of ambulant vendors and their effect on the tourism attraction and activities in Dumaguete City, Negros Oriental. Data was collected from 70 respondents. A Spearman Rho statistical tool was used to treat the correlations between various factors, including gender, age, educational attainment, and their influences on tourist attractions/activities. The sampling technique used in this study is modified purposive sampling. A non-probability sample is selected based on a population's characteristics and the study's objective.

The study's findings included the demographic profile of the respondents, where there are more male ambulant vendors than female, the age range for most of the respondents is from 31-45 years old, and their educational attainment is diverse, with a considerable portion having at least some college-level education. The study also identified common challenges faced by ambulant vendors. The challenges include a need for more access to electricity and safe water. Additionally, the study found that word of mouth is the marketing strategy used mainly through ambulant vendors in Dumaguete City.

The study found that gender did not significantly correlate with tourism attractions/activities. However, age has a weak but significant impact on specific aspects of tourism attractions/activities, and educational attainment substantially influences economic factors. The findings in this study provide insights into the dynamics between ambulant vendors and tourist attractions in Dumaguete City and offer recommendations for vendors and local authorities.

In conclusion, this study aimed to determine the correlation between the ambulant vendors and the tourism attractions and activities in Dumaguete City. It revealed that the ambulant vendors do not correlate with the tourist attractions and activities.

Keywords: ambulant vendors, tourism attractions and activities

CHAPTER I
BACKGROUND OF THE STUDY

Introduction

Tourism is one of the fastest-growing economic sectors in the world; according to (UNWTO) it also continues to diversify and innovate. About The scope of the tourism industry includes almost every transaction we do daily. Explicitly speaking, ambulant food businesses are part of the tourism industry and contributed a lot to the growth and rise of that industry. Ambulant businesses may be taken for granted for having a lesser investment, but this type of business has significantly impacted the economy and the tourism industry.

The ambulant vendor is an informal business sector operating outside the legal frameworks (Hidalgo et al.,2022). Ambulant vending is a popular source of income in the Philippines. Ambulant vendors can be categorized as itinerant or semi-static. Itinerant vendors sell their products, while semi-static vendors are in semi-fixed positions but may have to move depending on the situation.

In the tourism industry, ambulant vendors are vital for developing tourism in countries. These ambulant vendors provide essential goods and services (Murtaza,2020). Additionally, Murtaza added that in friendly countries, most tourists prefer to purchase goods and services from small vendors. Local and international tourists can find similar brands of goods everywhere.

Locally made goods make a difference worldwide because they are uniquely made. Local goods are the main attraction for tourists.

Ambulant vendors help reduce poverty. Their business is a reliable source of income, especially for those who still need formal education or work experience. Furthermore, ambulant vendors bring life and vibrancy to the streetscape through colorful stalls and lively customer interactions.

According to the researchers' observations in this growing city, most tourists are interested in the ambiance and environment the ambulant vendor offers. There are sure tourists who are influences who do blogs about street foods. That is why the researchers have come up with the idea of studying the effects of ambulant vendors on tourism attractions and activities in Dumaguete City, Negros Oriental. The researchers aim to investigate the significant relationship between the different factors of the ambulant vendors regarding their demographic profile and how they can help improve the tourism industry in Dumaguete City.

The scope of this study is limited to those ambulant vendors located in the city of Dumaguete. The respondents of this study are selected ambulant vendors from Dumaguete City. The researchers strongly believe that this study is essential because tourists significantly impact the economy, and studying the effects of ambulant vendors on tourist attractions and activities can be significant. This is significant because ambulant vendors will recognize their importance and contribution to developing tourism attractions and activities in Dumaguete City.

Statement of the problem

The study aimed to know how ambulant vendors directly relate to tourism attractions and activities in Dumaguete City. Specifically, it sought to answer the following questions:

1. What is the demographic profile of the ambulant vendors in Dumaguete City?
    1.1. Gender;
    1.2. Age;
    1.3. Educational Attainment;
2. What is the business profile of the ambulant vendors in Dumaguete City?
    2.1 Year Business Establish;
    2.2 Number of Personnel;
3. To what extent do ambulant vendors relate to the tourism attractions/activities and marketing strategies?
4. What are the specific products/services that the ambulant vendors offer to attract tourists to Dumaguete City?
5. What is the comparative advantage of Dumaguete City's ambulant vendors in the free market?
6. Is there a significant relationship between the demographic profile and the tour ism attractions and activities in Dumaguete City?

Hypothesis

H0: There is no significant relationship between the demographic profile of the ambulant vendors and tourism attractions and activities in Dumaguete City.

Significance of the Study

Tourism is a vital and numerous opportunity sector to the world economy. Ambulant merchants are a crucial but frequently under-appreciated part of the tourism ecology, alongside more conventional attractions and activities that helped the industry gain and boost its tourists. These vendors provide travelers with a wide range of products and services, including street

food, local crafts, and souvenirs that make tourists experience a remarkable visit. Studying ambulant sellers in the tourism sector is vital because it can give a thorough understanding of their effects on the industry and the local communities in which they operate. In this matter, the essential result of this research would give a significant insight into the following:

Ambulant Vendor—This study would help these vendors justify their needs in the market and would benefit the industry as well. By evaluating their contributions to the regional economy, this study will investigate how these vendors have an economic influence. Making policies to support and control their activities will require understanding their role in creating income and job opportunities.

Economy—Ambulant vendors are frequently micro-business owners who rely heavily on tourism as their primary source of income and strength to give satisfaction in a budget-friendly manner. This study shows readers the economic value of these sellers to the neighborhood and might also be to the more significant tourism industry.
Analyzing their contributions aids in developing long-term business options for vendors and promotes the expansion of micro-businesses within the tourism industry.

Local Government Units - This study benefits this sector in which micro businesses are introduced to the market, strengthening its scope and ability to serve tourists. Ambulant vending might offer a path to socioeconomic mobility and empowerment to be developed and recognized. Interventions to support these communities' livelihoods and maintain their cultural heritage can be directed by understanding these sellers' role in empowering neighborhood communities to micro businesses.

Tourism Industry—This sector includes various businesses, initiatives, and services. Ambulant vending benefits the industry because it offers an activity that has an economic and tourism impact.

Customers—This research might help understand vendors' purposes and why they are selling, which might lead to customer patronization. Because ambulant vendors earn money by selling their products, customers are vital to the business.

Tourists—It is beneficial for tourists to be aware of the impact or benefits that ambulant vendors give to the economy. Tourists travel overnight, seeking new things and experiencing activities with ambulant vendors. They can experience new perspectives, such as trying to avail themselves of the unique offerings by the ambulant vendors.

Students—This benefits students, specifically Generation Z individuals, as it makes them aware of the importance of the presence of ambulant businesses that they enjoy the most and takes advantage of what is trending in this generation.

Readers need to know enough about what and how these ambulant businesses help promote and enhance the tourism industry, which also impacts the economy.

Future Research - This study may benefit future researchers by serving this paper as a basis for conducting research and as a form of related literature. They may be able to study this paper and point out the flaws and strengths for further improvement.

Scope and Limitation

This study aimed to know the effects of ambulant vendors on the tourist attractions and activities in Dumaguete City. The study focused on the 70 ambulant vendors who sold in areas where most people gathered, particularly in the seven (7) locations: near the colleges and universities, Rizal Boulevard and pier area, Cheese Stick's Country, the premises near the Dumaguete Cathedral, Ninoy Aquino Freedom Park, diversion road located at Batinguel, and Mangnao Dumaguete City.

This study is limited to covering the ambulant vendor's demographic profile in terms of gender, age, educational attainment, and business profile in terms of year of establishment and number of personnel. It also deals with the relationship between tourism attraction/activities, marketing strategies, the products and services offered, and the comparative advantage of the ambulant vendors in the free market.

Definition of terms
The operational definition of terms.

Ambulant Vendors - A semi-static person who does not occupy a definite or permanent place or stall in the market to buy goods and who comes to sell goods daily or occasionally by moving from place to place within the market premises.

Comparative Advantage occurs when a specific business, such as ambulant vending, can produce products or services at a lower cost than its competitors, gaining an edge over them.

Effect - It is usually a noun that you would use to indicate the result of a change

Local - refers to a place like Dumaguete City, the study's locale.

Semi-static - a person with a fixed position in selling products but may have to move depending on the situation.

Tourism Activities - An event where individuals participate in specific actions for various purposes such as traveling, having fun individually or collectively, spending time, improving, and resting voluntarily.

Tourist Attractions—Tourist attractions are facilities that provide recreation, amusement, or leisure activities to the general public. Most visitors do not reside in the immediate area of the attraction and travel to enjoy what the facility offers.

CHAPTER II

Review of Related Literature

This literature review consists of articles, studies, and journals related to ambulant vendors, their effects on the tourism industry, and their impact on the economy.

Theoretical Background

The theoretical background of this study consists of three theories: modernism, Unique Selling Element, and Social Marketing Theory. These theories are used to increase the reliability of the research findings and reduce bias in this research study.

Modernism (Édouard Manet, 1860s)

According to modernism, human beings have the power to progress by creating or reshaping the environment through science, technology, and knowledge. Modernism tried to identify the factors impeding progress and sought to replace them with ways to help them reach their desired goals.

A study exploring street vending theories, determinants, and policy options (Igudia,2019) states that modernism explains state/urban planners' hostile response to street vending. Modernism argues that, regarding vending, an investment-friendly urban center with a good-looking image is prioritized. Modernism often implies crackdowns on street vendors because of the ideals of public order and state control. In our study, modernism is a crucial factor affecting ambulant vendors whenever they cannot cope with modernized and good-looking stalls. Modernism brings crackdowns on street vendors.

Unique Selling Element

According to Carol Poster, the "unique selling elements" theory analyzes how to make your hotel or restaurant stand out. Each hotel should identify three unique selling elements and use them as a cornerstone of marketing efforts. These should be distinguishing features such as famous guests, special items such as fresh fruit bowls or freshly baked cookies for guests, superlatives such as "biggest," "smallest," or "best," or unusual elements such as pet goldfish in every room. In our study, the theory of unique selling elements correlates with what we want to know about our research. We want to know how much a specific product or food offering helps boost tourism activities. Using the theory of unique selling elements, ambulant vendors would identify three unique selling elements to use as a cornerstone of marketing.

Social Marketing Theory

According to (Lacoma, 2012), social marketing theory is a communications discipline that uses marketing tools and strategies to spread beneficial information. According to Weinreich Communications, the theory, which began in the 1970s, encourages thinking about society as a target audience so that helpful information, such as good health habits, can be distributed effectively via advertising.

In our study, social marketing theory can be applied, where ambulant vendors focus on how socially valuable information can be promoted. They can usesocial and welfare organizations to help encourage or discourage various behaviors. The ambulant vendors would be guided in their attempts to clearly understand how societal and psychological factors work to manipulate an increase in effective mass media successfully.

Theoretical Framework

The schematic diagram of this study's theoretical framework shows the three theories used as a theoretical foundation. The three (3) Theories are Modernism by Èdouard Manet, Unique Selling Element by Rosser Reeves, and Social Marketing Theory by Philip Kotler and Gerald Zaltman. In the context of this study, Modernism Theory helps explain the resistance and challenges ambulant vendors have been facing in this modernized city. This highlights the tension between traditional street vending and urban authorities of modernity. The Unique Selling Element Theory is significant for ambulant vendors to understand as they aim to attract tourists. Understanding this theory, such as distinct products or services, can help these vendors stand out and contribute to tourism attractions and activities. The Social Marketing Theory is a marketing tool that ambulant vendors can benefit from to convey socially valuable information, promote their products, and support certain behaviors that align with sustainable tourism goals.

Integrating Modernism, Unique Selling Elements, and Social Marketing theories provides a comprehensive framework for understanding the dynamics of ambulant vendor's effect on tourism attractions and activities. This theoretical framework provides a structured basis for investigating the relationships between ambulant vendors and tourism attractions/activities while considering modernization, unique selling elements, and social marketing as critical factors influencing this relationship.

DEMOGRAPHIC PROFILE

Galace (2019) states, "Ambulant vending is a popular source of livelihood in the Philippines." Ambulant vendors are commonly male, young, and married couples from the Country's poorest provinces who live in the city's most populated areas.Thesepeople may have studied but must st op and work as ambulant vendors due to a lack of opportunity and skills. The main reason why these people pursue vending is for them to support their basic needs and finances. Ambulant vending is fun and essential to helping the Country's tourism industry. Martin Parr says, "Tourism is the biggest industry in the world." Indeed, tourism, being the art of traveling for leisure or business, has been one of the contributing factors to the economic development of a country. The Philippines, home to many beautiful tourist spots, has been a go-to place for local and foreign tourists. With the Philippines being a famous vacation country, ambulant vendors can be seen in every famous municipality in the Country. The ambulant vendors do have an impact on the tourism activities of a specific country.

Age

A study by (Mubarak and Munish, 2021) about characterizing street vendors in the urban settings of Tanzania found out the age of street vendors. This indicates that there are no street vendors under 18 due to free education, and most are still in school. The study also concluded that many street vendors are 18 - 36 years old. A group of energetic and able-bodied youth desperately need a livelihood strategy (Mubarack et al., 2021). Due to the low economic picture in Tanzania, groups aged 18-36 die very hard to survive and engage in street vending. Some data indicates that age 36 and beyond street vending for family survival. Findings align with those of other scholars (Manyanhaire et al., 2007; Muhanga (2017) noted that there are many street vendors between the ages of 19 and 40 and a few beyond 40.

Another study by Kenneth L. Armas about the sanitary practices of food street vendors in the Philippines found that the highest age range for street vendors was 34 to 45. These people usually had families and children and needed more income (Armas, 2017).

Gender

A growing body of literature explores a range of critical questions concerning gender and its impact on street vendors' everyday experiences and livelihoodstrategies, politics of gender and legitimating claims to space, gender n orms, and women's mobility and capacity to vend (Peimani, 2022). It is essential to ensure a policy response that recognizes the diversity of vendor profiles, such as gender, composition, market sitting, and

taxation. Gender impacts the vendor's everyday activity, including maintaining a public space where marginalized female street vendors in Paraguay engage in their emotional field by displaying poverty stresses to legitimate their claims to space.

There is a problem with the role of gender in street vending to vend public spaces. A study in Thailand has also shown that female vendors' migration and participation in tourism have reconstructed inequality and further advanced their economic status. Women could still earn income in the informal economy but struggle to balance competing with street vending and infant feeding demands. However, Menon did share the idea of bounded capability.

This means arguing that women vendors' overall freedom is bounded by their gender norms. A study at Amankwaa has shown that gender and gendering of street vending are fluid and situational. This has been linked to the idea that norms in terms of gender-appropriateness of certain occupations are negotiable in response to economic challenges in urban development.

Educational Attainment

Most ambulant vendors needed help to finish their studies, so they became ambulant vendors. Education is seen as a vehicle for social and economic mobility. Ambulant vending is a viable employment alternative since the vendor's average income exceeds the minimum wage. With the Country's high unemployment rate, ambulant vending activities should get the attention and support they deserve from the government.

According to Career Explorer, street vendors often have similar levels of education. 50% of street vendors have no education, and the second most common is a high school diploma, at 50%. Another study about the factors associated with food safety compliance among food street vendors in Can Tho City, Vietnam, showed the educational attainment of street vendors. According to Huynh-Van et al. (2022), senior secondary school was the most common education level among fixed vendors, while junior secondary school-level education prevailed among mobile vendors. This data was obtained from studying factors associated with food safety compliance among food street vendors in Can Tho City, Vietnam. The previous studies in Vietnam, Ghana, Uganda, and India show that the proportion of fixed vendors with a higher educational level was higher than the educational attainment of street vendors. The results from these studies showed that street food vendors had a relatively low level of education, with primary or junior secondary school as the most prevalent level, similar to that of mobile vendors in this study.

BUSINESS PROFILE

Year Business Establish

According to NASVI, "Street vendors have existed since ancient times. In all ancient and medieval civilizations, one reads accounts of traveling merchants who sold their wares in the town by going from house to house and trading in neighboring countries. Perhaps ancient and medieval civilizations were tolerant to these wandering traders, which is why they flourished." In today's time, street vendors are not treated well and properly. The officers target them for having illegal trades.

The people from the urban middle class often complain to the street vendors, causing a lot of block pavements, traffic problems, and engaging in anti-social activities. Most street vendors are experiencing many challenges, such as constant harassment by the authorities. The local authorities often confiscated their goods. A municipal raid is somewhat like a cat-and-mouse game where authorities chase street vendors. All these mean that a substantive income from street vending is spent on greasing the palms of unscrupulous authorities or private money lenders. In most cases, street vendors have to survive in a hostile environment, though they are service providers.

Number of Personnel

According to WIEGO, street vendors sell goods and offer services in public places, open-air spaces, and construction sites. Additionally, street vendors are a large and visible workforce in the city, but it is tough to estimate their numbers accurately. The WIEGO Statistics Program publishes data based on official statistics on street vendors. In 2012, WIEGO published data on street trade in 11 cities in 10 countries.

In Ghana in 2015, 5 percent of women and 1 percent of men were street vendors. In South African Metro Areas, 3 percent of women and 2 percent of men employed in these metro areas are street vendors. From 2017 to 2018, 3 percent of women and 5 percent of men in India were street vendors. In 2018-2019, 4 percent of women and 2 percent of men in urban employment were street vendors. In Thailand, in 2017, 3 percent of women and 2 percent of men in urban employment were street vendors. In Mexico in 2019, 4 percent of women and 3 percent of men were street vendors. In Peru, in 2015, 4 percent of men were street vendors.

Tourism Activities

A study about the marketing responsibility of street vendors in sustainable tourism gives insights into how street vendors affect the sustainability of tourism in India. The Indian tourism industry has significant potential, possessing cultural and historical heritage with a gifted variety of ecology and natural beauty spread across the Country. Tourism significantly affects employment generation and foreign exchange earners (Gomathinayagam, 2019). One of the top attractions of India is the Tamilnadu; it is like The Pilgrimage is a historic monument and a heritage location. The beauty of Tamilnadu as a tourist attraction can be classified into hill stations, beaches, forest adventure, and leisure destinations.

This study concluded that if street vendors had a legal protective system, they would be successful in the industry and could potentially attract more tourists, which would help the Indian economy. The study also found that for a business to be successful, it should possess business, promotional, and investment strategies.

The study "The Street Food Experience of Local Guided Tours in the Meal Sharing Economy" is another study that focuses on how tourism is being affected by street vendors. This study aims to understand the components of the street food experiences of the local-guided tour in the meal-sharing economy based on the online reviews of tourists who experienced a meal-sharing activity with a local guide in Bangkok (Cifci et al., 2021). The study has identified components of embracing the street food experience: local guide's attributes, perceived food authenticity, local culture, and perceived hygiene. The study concluded that the food offerings in Bangkok do have a great potential to attract more tourists.

Another study on street vendors affecting tourism concerns urban biodiversity management through street food markets. Smith and MacGregor-Fors (2018) stated that the intersection between street food culture and tourism promotion highlights how ambulant vendors attract tourists by showcasing local culinary traditions and cultural diversity. The study emphasizes the role of street food markets in promoting biodiversity, supporting local producers, and enhancing the overall urban environment. The research underlines the need for policymakers to recognize and support ambulant vendors as valuable contributors to tourism development.

Marketing Strategies

A study about street entrepreneurship in beach tourism destinations showed a positive correlation between street vendors' selling skills and tourist purchases. Hence, selling skills can be a better marketing strategy to induce tourists' purchase decisions. The results of multiple regression analysis denote that the selling skill of a vendor is a significant predictor of tourists' purchase intention (Suresh et al., 2023). This study shows

that interpersonal skills as a marketing strategy significantly affect tourist purchasing power. The perception of salesmanship skills was also studied, positively influencing tourists' perception of street vendors.

Another marketing strategy that has be studied is the technical skills of street vendors. There has been a significant change in tourists' perceptions of the technical skills of street vendors. The marketing strategies of the street vendors, which are selling skills, interpersonal skills, salesmanship skills, and technical skills, are vital contributors to influencing tourist purchase intention. With this, vendors can increase trade volume and gain more income.

Salesmanship skills are more influential in purchase decisions. Salesmans hip skills are mainly the psychological attempt to encourage prospective buyers to purchase the product. Along with salesmanship skills, interpersonal skills are equally important. Through better interpersonal skills, the vendor can cope with the situation correctly, resolve conflict, and understand and persuade the prospective buyers. When comparing national and international tourists, international tourists are more curious about trying new products and are also price-sensitive.

They usually want to purchase products that would attract them, making street vendors play a critical role because they should be aware of all the strategies to influence tourists.

Comparative Advantage by the Ambulant Vendors

Street vendors belong to an informal economy and are often taken advantage of by the authorities. Regarding the extent to which ambulant vendors stay competitive in the market, they use strategies of resistance and negotiation. For decades, street vendors have been considered marginal individuals who passively practice their activities (Lindell, 2019; Falla & Valencia, 2019). In this regard, almost all studies conducted in developing and developed countries highlight the informal actors' ability to modify their daily strategies. Through the literature analysis, it is possible to identify both individual and collective strategies of resistance (Recchi, 2021).

Using individual strategies, street vendors adopt strategies of resistance. Street vendors often act itinerant, bringing fewer goods and constantly moving around the streets to escape faster. Another strategy the street vendor uses is to operate in a less controlled place to avoid harassment. Additionally, street vendors anticipate the duty hours of local authorities and adjust the schedule on when they will manage their business. The street vendor's last strategy is bribing city authorities to guarantee the possibility of work on the street. This practice It allows street vendors to improve their conditions and survive in the urban public space.

The literature also highlights how social capital and street vendor networks play an important role in deploying daily strategies of collective resistance (Lyon & Snoxell, 2005). Street vendors address themselves to public demonstrations to protect their right to work in public places. There are also other studies in less developed countries about stree t vendors who can use their vote as a bargaining power. The leaders of local associations, who control the street vendors' political consensus, grant the local authorities electoral and political favors in exchange for privileged treatment and the possibility to work. Lastly, non-governmental organizations play an essential role, as Street Net International and WIEGO do; they negotiate with governments and local authorities to defend the informal workers' rights and encourage regularizing their conditions. This is how ambulant vendors stay competitive in the market.

Products and Services Offered by Ambulant Vendors

An article (Neary, 2018) stated about the products offered in Manila by street vendors. Most vendors sold fruits and vegetables; their stalls were filled with brightly colored fruits of all shapes and sizes or sold large quantities of one item. Other popular goods for street vendors include manufactured products, clothing, stationary, and offering grooming services. There is also boiled corn on the cob from one seller and rambutan (an edible fruit) from another. Their produce was fresh but cheap and mainly sold by women (and, in some instances, children). The experience That (Neary explored the literature relating to this vibrant part of the informal economy of Manila.

Street Food Hub

A *Clean Street Food Hub* is defined as a hub or cluster of 50 or more vendors, shops, and stalls selling popular street foods, 80% or more representing local and regional cuisines, and meeting basic hygiene and sanitary requirements. It excludes fine dining. Under Clean Street Food Hubs, there are 20 States engaged, 57 total identified hubs, 28 certified clean street food, and 23 certifications under process.

According to Tuvindia, "Every state has its own famous and unique food street which showcases its local and regional cuisines and is famous locally as well as tourist attraction points." To upgrade existing food streets across the Country and provide a safe and hygienic local eating experience, the Food Safety and Standards Authority of India (FSSAI), with the support of state government bodies, has framed benchmarks for basic hygiene and sanitary requirements for upgrading the existing infrastructures of food streets across the Country. The FSSAI will duly recognize and certify those food hubs that comply with these standards and benchmarks, and such certification will help create consumer trust.

Review of Related Studies Local Studies

The study on the financial wellness of street vendors in Bacolod City is about studying the socioeconomic profile of street vendors in Bacolod City. The study focuses mainly on the financial aspect, challenges encountered by street vendors, and how a job can provide a person to their household. This study aims to know the everyday life of street vendors, understand why they engage in such activity, identify financial problems and how they cope with them, and assess whether participants are financially well. (Cruzada et al., 2021) The conclusion that can be drawn from the data collected and interpreted in the study is that street vendors are economically well. The data from this study shows that the income earned from street vending is sufficient to cover the street vendors' priority expenses. The street vendors may have debts, but it was discovered in this study that their source of paying this is from their street vending process. Sometimes, street vendors from Bacolod may be late paying their loans, but not always.

Additionally, they pay their bills on time. (Khayat et al., 2020) The study examined economic and social context empowerment among women street food vendors of Dumaguete City in the Central part of the Philippines. The study focused on women's street vendors who sold in areas where most people gathered, mainly four locations. Near schools, Rizal Boulevard, premises near Dumaguete Cathedral, and Quezon Park. As concluded in this study, street food vending in Dumaguete is another good source of income.

Income provides enough daily profits with less capital needed. This business empowers women because hard work and perseverance are required. Street food vending also enhanced women's social empowerment. By gaining profits, women vendors could buy essential, affordable communication gadgets like cell phones, radios, and TV sets. Owning cell phones allowed the street food women respondents to establish contacts like future food buyers or customers aside from their family members, thus enhancing their social empowerment. This study proves that women's street vendors are empowered in Dumaguete.

The study "The Perception of Local Street Food Vendors of Tanauan, Batangas on Food Safety" is about the primary concern with food safety. Food safety guides and educates people on the advantages and disadvantages of eating this kind of food. Foodborne illness is one of the main worries when eating street foods, which people do not want to experience. This study studies the knowledge and practical solutions to prevent foodborne illness and how to apply food safety practices. (Pedalgo et al., 2015) The fastest-growing industry in the world is hospitality, which focuses on customer satisfaction. Part of this is the food service industry, which has been improving its existence for the past few years.

In the hospitality industry, there are various kinds of businesses; one is "street food" that is not correctly sanitized yet affordable and delicious. This study has concluded that the highest indicator of perceptions of street vendors is the timeliness of delivery. The lowest indicator, on the other hand, is the extensive processing of raw materials. Regarding food cooking processes, respect for time is essential, while the additional process in cooking affects Tanauan Street.

Food vendors' products. The highest indicator of the vendors' hygiene is washing hands because hands are exposed to food in the food process. Regarding food preparation, the highest indicator in this study is the cleanliness of utensils, while the lowest indicator is the combination of raw and cooked food. Lastly, this study concluded that the environmental exposure of foods towards food safety demonstrated that the respondents highly need the maintenance of water reservoirs.

Foreign Studies

The study on the impact of urban culture on street vending: A path mode analysis of the general public's perspective examines the relationship between urban culture and street vending. (Al Jundi et al., 2022) We found that resistance mediates the effect of urban culture on street vending and low-income consumption, and resistance sequentially mediates the effect of urban culture on street vending. In contrast, resistance mediates the impact of a lack of microfinance on street vending. There is no significance in terms of the direct effects of culture on street vending, and a lack of microfinance positively influences the pervasiveness of street trading.

This study concluded that the indirect impact of urban culture on street vending via low-income consumption is not significant. Nevertheless, this study found that urban culture significantly and positively impacts street vending via resistance. This study also confirms the direct effect of microfinance on street vending and the indirect effect through resistance. The researchers have agreed that a lack of microfinance impacts the pervasiveness of street vending.

Lastly, the results show the rank of paths in order of importance. First comes the direct effect of resistance on street vending, followed by the total effects of urban culture on street vending, which are the direct effect of a lack of microfinance on street vending, the indirect effect of microfinance on street vending through resistance, and the indirect effect of urban culture on street vending through resistance.

The study "Negotiation and Management Strategies of Street Vendors in Developing Countries: A Narrative Review" presents a narrative review of the existing literature on the relationship between regulators and street vendors and creates a unified picture of an otherwise fragmented literature and knowledge base. (Forkuor et al., 2017)

Negotiation, power, social network, and perception are used to analyze street vendors' various strategies to access urban public spaces in different parts of the developing world. It is revealed that even though city regulators have access to formal power, street vendors possess various negotiating strategies that give them access to formal and informal power.

This study has concluded that the dynamic relationship between street vendors and city regulators is fragmented by perception and power. Perception has been described as a more fluid concept, changing with time and situation. The power, on the other hand, exists in interaction through informal negotiations and strategies. Power is a tool with r esistance and resilience.

This study has also concluded that, unlike other previous research, this study describes street vendors as an organized political force that avoids the power of city authorities to continue operating in public spaces. The city authorities and street vendors use power in different ways to enhance the well-being of the street vendors and the city; this study concluded that both should collaborate. This study also recommends that future researchers investigate this in more detail how negotiations and strategies vary among different groups of vendors vending in different public spaces.

This paper synthesizes recent research and evidence on urban policies and local government practices related to street vending, one of the most visible occupations in the informal economy (Roever & Skinner, 2016). There are many analyses to explore behind the reasons for evictions and relocations through case studies, but the paper draws on everyday challenges that street vendors face. The data in this study shows the livelihood impacts of generalized workplace insecurity. This paper argues that legislative reform and greater transparency in the content and implementation of regulations are needed, combined with the political will to challenge the appropriation of strategic urban spaces by more powerful interests.

This paper has concluded three ideas in this study. First, while large-scale eviction drives and relocation projects are widely documented, more everyday challenges, such as general workplace insecurity, harassment, and merchandise confiscations, are also significant. Second, the street vendors pursue different strategies to reduce the risk of this occupation without imposing significant costs on the city. This moves the approach from criminalizing street trade to making it more productive. Third is that organizations can facilitate bargaining platforms. There is an immense potential for more appropriate regulation of street vending and street vendors to have better access to social programs.

Bhowmik's (2015) study "Urban Responses to Street Trading: India" explores the contribution of street vendors, including ambulant vendors, to urban tourism development. It highlights how these vendors help create vibrant street life, enhance local culture, and provide unique shopping experiences to tourists. Street vendors and the urban economy, over the past decade, can be observed to have seen a substantial

increase in the number of street vendors in major Indian cities. Mumbai has the most significant number of street vendors with 250 000. The number of employment provided by street vending would become much more significant if specific industries provided a market for their products to sustain. Street vendors and public spaces: Street vendors have been labeled as public nuisances by certain groups of sections in the urban population. The NGOs, middle class, and upper class are the most vocal evictions of street vendors.

Organizing street vendors, these vendors still operate even if they have insecurities. Whenever eviction drives are conducted, their wares are confiscated or destroyed. Street vendors have experienced much discrimination, but some movements are still being made to make street vendors last. There are specific organizations and groups of people that support street vendors. This study has concluded that for street vendors to sustain, there should be policy guidelines towards a national policy, legal changes, legalizing street vending should be allowed, self-regulation and organization, and credit and social security. The policy and procedures will remain important, empowering this section of the urban population and giving them a sense of dignity and citizenship. Street vendors are micro-enterprises, and they should be treated fairly.

Conceptual Framework

It shows in the schematic diagram how researchers would approach answering the study's objectives. The information gained from the demographic and business profiles of the participants provided the researchers with a framework for the entire study process. The data will be used to determine the effects of ambulance vendors on tourism attractions/activities, products/services offered by the ambulance vendors, and their comparative advantages.

The researchers can determine if these ambulant vendors have a significant relation to the tourist attractions/activities in Dumaguete City.

CHAPTER III

Research Methodology

This chapter presents the research design, research environment, research respondent, sampling technique, research instrument, data gathering procedure, statistical treatment of data, and ethical considerations employed to gather the data and information considered in this study.

Research Design

The study utilizes Exploratory Research. According to QuestionPro, it is defined as research used to investigate a problem that needs to be clearly defined. It was conducted to better understand the existing research problem but will not provide conclusive results. The method of Exploratory Research that the researchers use is self-administered questionnaires. This can be delivered online, in paper-and-pen formats, in person, or through mail. All questions are standardized so that all respondents receive the same questions with identical wording. The questionnaire method lets the participants answer specific questions regarding the subject matter, freely sharing their personal information with the researchers and letting them understand what ambulant vendors have undergone through their business operation.

Research Environment

The researchers had decided to get the representation of the ambulant vendors in Dumaguete City by selecting places where people mostly gather and places that are. Researchers considered me very lively. The study was conducted in the vicinity of the colleges and universities of Dumaguete City, Rizal Boulevard and the pier area, Cheese Stick's Country, the premises near the Dumaguete Cathedral, Ninoy Aquino Freedom Park, the diversion road located at Batinguel, and Mangnao Dumaguete City. Another factor in selecting these places is that top tourist attractions in Dumaguete City can be seen near these areas.

Dumaguete is a place known for its natural and cultural attractions. The places mentioned above are an ideal environment for researching our research title, "The Effect of Local Ambulant Vendors on Tourism Attractions and Activities." The first location, which is near colleges and universities, is an ideal place because there are a lot of ambulant vendors selling in that vicinity. The following location is Rizal Boulevard, and the pier area is where tourists would usually gather. The boulevard has been reconstructed for a better tourist and local experience. Cheese Sticks Country and Dumaguete Cathedral is popular tourist hop-on locations because of their ambiance and historical meaning. The Ninoy Aquino Freedom Park is also an ideal location to research as it contains ambulant vendors and some tourists strolling around

this area. Other locations, including Diversion Road, located at Batinguel Dumaguete City and Mangnao Dumaguete City, are developing places that could be tourist attractions someday. All of the areas included in the research environment are strategically located.

The respondents of the study are ambulant vendors who are located in the vicinity of the colleges and universities of Dumaguete City, Rizal Boulevard and pier area, Cheese Stick's Country, the premises near the Dumaguete Cathedral, Ninoy Aquino Freedom Park, diversion road located at Batinguel, and Mangnao Dumaguete Cit y. One week before the data gathering procedure, the researchers visited the seven (7) locations to know how many ambulant vendors were operating in the specific area. During their visit, they were able to get the number of ambulant vendors available.

The distribution of the ambulant vendors by location included 18 of the identified respondents located at Rizal Boulevard; 11 at Cheese Sticks Country in Bantayan, with a similar number at Diversion Road in Batinguel; Nine (9) at the nearby Colleges and Universities; Eight (8) at Mangnao Dumaguete; and Seven (7) at Ninoy Aquino. Freedom Park and Six (6) ambulant vendors are located near Dumaguete Cathedral.

The researchers chose the respondents around these locations because, as per personal observation, these are where people mostly gather, and there are tourist attractions that can be seen in these places. The city treasurer's office did not give the total population of the ambulant vendors from these places for some reason, which is why the researchers used some criteria in choosing their respondents using a modified purposive sampling technique.

The selected respondents were ambulant vendors who met the criteria required for this specific study. The criteria included the following:

- Joint Ownership (Family-owned and Sole Proprietorship)
- Experience (at least five years)
- Number of Personnel (1-5 workers)

Sampling Technique

This study used modified purposive sampling. Purposive sampling is a non-probability sample selected based on a population's characteristics and the study's objective. It differs from convenience sampling and is also known as judgmental, selective, or subjective sampling (Crossman, 2020).

The reason behind having a modified purposive sampling in this study was that the researchers needed help getting the exact population of ambulant vendors in Dumaguete City. The researchers went to DTI and the City Treasurer's office, but those two offices did not give any information

about the number of ambulant vendors operating. That is why the researchers have decided to push through with the sampling technique of modified purposive sampling.

The researchers just took the representation of the ambulant vendors in some selected places of Dumaguete City, where top tourist attractions are frequently visited.

Research Instrument

The researchers used a questionnaire, a research instrument consisting of a series of questions to gather information from respondents.

This study utilized a questionnaire with five parts. Part I was the demographic profile of the participants. It contained the following variables: age, gender, and educational attainment. Part II of the questionnaire included the business profile of the participants, such as the year the business was established and the number of personnel. Part III of the questionnaire determined the respondents' effects on tourism attractions and activities.

Part IV of the questionnaire concerns the products and services the respondents offer that attract tourists to Dumaguete City. Part V concerns the respondents' comparative Advantage in the free market.

Before proceeding with the data collection proper, the questionnaire designed by the researchers underwent a validation process, during which our research professor checked the validity of the questions.

Data Gathering Procedure

After the validation of the instrument, the researchers secured a permission letter to conduct the data gathering afterward. They then started the data gathering last September 28 - October 3, 2023, in the vicinity of 7 chosen places in Dumaguete City. The safety of the researchers and accessibility of the respondents were the factors considered. The researchers were split into two groups so the data-gathering procedure would be done productively. The respondents' permission was asked before agreeing to answer the survey questionnaire. During the process, one researcher was tasked with the documentation, and the other was to let the respondent answer the questionnaire. The researchers would guide the respondents and entertain questions if the respondents were ever confused by the questions. The data collected in this study was tallied and encoded using Numbers.

Statistical Treatment of Data

The statistical instruments used in this study included frequency distribution, central tendency (mean), interval data, and Spearman Rho. The Spearman Rho

is primarily used for data analysis. It measures the strength and direction of the association between two ranked variables.

Specifically, frequency distribution was used to describe the demographic profile of the street vendors in terms of age, gender, and educational attainment; the business profile about the year the business was established and the number of personnel; and the effects of the ambulant vendors' tourism attractions and activities and marketing strategies. The interval data was used to treat the Likert Scale data about the comparative advantage of the ambulant vendors.

However, the mean was used to identify each numerical data point. It determined the participants' age, gender, educational attainment, capitalization, location, year the business was established, and number of personnel.

CHAPTER IV

Presentation, Analysis, and Interpretation

This section of the study discusses all the results from the data-gathering procedure in detail.

There are 17 exhibits of tables representing the questions used in collecting information from the chosen respondents. The researchers presented, analyzed, and interpreted the data gathered.

Demographic Profile

It reveals that there are more male (65.71%) than female (34.29%) ambulant vendors in Dumaguete City. The difference in the percentage is quite significant. The males are dominant by 31.42%. Even though there is a big difference, this does not imply that ambulant vending is just for males. Instead, it is also for females.

The data correspond to the study by Galace (2019), which states that ambulant vendors are commonly male, young, and married couples from the Country's poorest provinces who live in the city's most populous area.

It shows the respondents' age range. The data claims that the most dominant age groups are 31-40 (27.14%) and 40-45 (28.57%). The age groups 18-25, 26-30, and 46-50 are almost identical in percentages. Although the most dominant age group is 40-45, the difference in the percentages of other groups is not big enough. There is only one respondent from the age group 51-55.

The data gathered aligns with the review of related literature used in this study. A study by Kenneth L. Armas, concluded that the highest age for street vendors ranges from 34-45 years old. Another survey by Mubarak and Munish, 2021 concluded that many street vendors are between 18 and 36 years old. A group of energetic and able-bodied youth who are in dire need of a livelihood strategy

It shows the educational attainment of ambulant vendors in Dumaguete City. The data claims that 31.43% of the respondents had once been at the college level, 28.57% had graduated high school, and 21.43% were at the high school level.

According to Huynh-Van et al. 2022, senior secondary school was the most common education level among fixed vendors, while junior secondary school-level
education prevailed among mobile vendors. Even though the data in Table 1.3 implies that most of the ambulant vendors are college-level, the difference in percentage by the high school level isn't that big. The study could still support the idea that ambulant vendors are available at the high school level.

Business Profile

It reveals the distribution of respondents by the year their business was established. Almost half of the respondents started their business in 2016. This is followed by 38.57% of the respondents who began their business from 2011 to 2015, 10% from 2006 to 2010, and 4.29% who established their business from 1996 to 2000. It can be seen in Table 2.1 that most of the ambulant vendors in Dumaguete just recently started their business because ambulant vending can also be another source of income; that is why people engage in this business.

It reveals the distribution of respondents by the number of personnel involved in their business operations. There, 75.71% of the respondents have 1-2 personnel involved in their operation, and 24.29% have 3-5 personnel involved.

The data shows that ambulant vending is operated mainly by 1 to 2 personnel. The respondents also said they reached a staff of 3 to 5 because most of their family members help their business. Other reasons include owners hiring other personnel for different shifts.

Do the Extent Ambulant Vendors Relate to Tourism attractions/activities and marketing strategies?

It shows to what extent the ambulant vendors relate to tourism attractions/activities, specifically positive impacts. The mean rating for positive impacts was 3.29, indicating a moderate response from the respondents. Among the six statements, the highest mean rating was obtained from an increase in tourist arrival (M=3.79, SD=0.83), indicating that the respondents have agreed that there is an increase in tourist arrival. The statement with the lowest mean rating was that tourist attractions are maintained and preserved well (M=3.07, SD=0.57), indicating a moderate response.

From the respondents. The study on "Urban Responses to Street Trading: India" by Bhowmik (2015) corresponds with the data in Table 3, showing that ambulant vendors contribute to tourism. The study by Bhowmik explores the contribution of street vendors, including ambulant vendors, to urban tourism development. It highlights how these vendors help create vibrant street life, enhance local culture, and provide unique shopping experiences to tourists.

It shows to what extent the ambulant vendors relate to tourism attractions/activities, specifically negative impacts. The mean rating for negative impact was 2.85, indicating a moderate response from the respondents. Among the four Statements, the highest mean rating was obtained from tourist attractions that are exhausted and polluted (M=3.01, SD=0.83), indicating a moderate response from the respondents. The lowest mean rating was obtained from a very low tourist arrival (M=2.76, SD=0.84), indicating a moderate response from the respondents.

The data corresponds with the article "Street Vendors are Vital for Tourism-Friendly Countries," which states that most tourists in tourism-friendly countries prefer to purchase goods and services from small vendors. The respondents answered moderately.

It shows the marketing strategies used by the ambulant vendors in Dumaguete City. They are ranked according to the majority of the respondents who answered specific marketing strategies. Word-of-mouth marketing is mainly used by ambulant vendors, with a total of 50 respondents who answered it, followed by personal selling, which has 22 respondents. 13 respondents answered point Nine (9), nine (9) answered about price discounts for sale displays, and seven (7) had free product promotions and locations.

The data corresponds with the study of Mramba 2015 about "The Marketing Communication Strategies of Street Vendors in Dar es Salaam Tanzania." The study states that word of mouth is becoming increasingly recognized as an essential form of promotion, particularly within professional services environments, where credentials play a critical role in consumers' choices. The study suggested that with word-of-mouth acquired, customers contributed at least 16 percent higher value than those with similar demographics but did not receive word-of-mouth information.

Specific Products/Services Offered by Ambulant Vendors to Attract Tourists

Table 4 shows the products or foods the ambulant vendors in Dumaguete City mainly sell. The product part, the souvenirs, bracelets, and anklets, are in the top one (1) tier as the products sold by the ambulant vendors. The last two (2) ranks. There are shirts, postcards, and sand in a bottle. Ambulant vendors in Dumaguete City rarely sell these products. From the part of the food, rank one (1) is the tempura, followed by kwek kwek. These two foods are

commonly seen in Dumaguete as sold by ambulance vendors. The last two (2) ranks are pancit canton, calamari, and isaw. The ambulant vendors rarely sell Pancit canton, calamari, and isaw because these kinds of food are pricey.
An article about the current in-demand and favorite street foods among Cebuanos suggests that kwek kwek is the best seller among all street foods. It tastes best with sliced cucumber and a special sauce. Even though kwek kwek is ranked 2 in the data from Table 4, its difference from tempura isn't that big. The article could still correspond to the data from Table 4.

Comparative Advantage of the Dumaguete City's Ambulant Vendors in the Free Market. It reveals the comparative advantages of ambulant vendors in the free market in terms of location. The mean rating for location was 3.95, indicating the respondents' agreed-upon response. Among the five statements, the highest mean rating was obtained from the accessible location (M=4.47, SD=0.68), indicating the respondents strongly agreed upon response. The lowest mean rating was obtained from the safe and secured place (M=3.66, SD=0.76), indicating the respondents' agreed-upon response. According to the respondents, they are confident enough to compete in the free market and use their location as an advantage to be successful.

The data corresponds with the study of F.G. Winarno and A. Allain about street foods in developing countries. It states that the marketing success of street vendors depends exclusively on location and word-of-mouth promotion.

It reveals the comparative Advantages of ambulant vendors in the free market regarding products or food. The mean rating for products or food was 3.39, indicating a moderate response from the respondents. Among the five statements, the highest mean rating was obtained from food or product worth buying (M=3.60, SD=0.77), indicating the respondents' agreed-upon response. The lowest mean rating was obtained from product or food offerings to be unique (M=3.23, SD=0.57), indicating a moderate response from the respondents.
The study "The Perception of Local Street Food Vendors of Tanauan, Batangas on Food Safety" by Pedalgo et al. (2015) addresses the primary concern with food safety. This study aligns with the data concluding that the environmental exposure of foods towards food safety demonstrated that the respondents highly need maintenance of water reservoirs.

It reveals the comparative Advantages of ambulant vendors in the free market regarding their service. The mean rating for service was 4.48, indicating a strongly agreed-upon
response from the respondents. The highest mean rating was obtained from valuing customers before sale (M=4.56, SD=0.77), indicating a strongly agreed-upon response from the respondents. The respondents strongly agreed (4.48

mean rating) on the statements about the services they offer customers. An article about importance of solutions for street vendors aligns with the data, which states, "Many street vendors strive to ensure that the streets are clear and safe for their clients and offer them friendly, personal services."

It reveals the ambulant vendors' comparative Advantage in the free market regarding the economic impact they brought. The mean rating for the economic impact was 3.09, indicating a moderate response from the respondents. Regarding the study about street foods in developing countries: lessons from Asia, the data corresponds with it. The study states that street food micro-industries are vital for many towns' economic planning and development. The contribution of street food vendors to the economies of developing countries has been vastly underestimated and neglected. There is a relatively significant figure considering. Most of the earnings are generated locally, thereby promoting economic self-sufficiency.

It reveals the comparative advantages of ambulant vendors in the free market in terms of the challenges they have encountered. The challenge's mean rating was 3.01,indicating a moderate response from the respondents. Among the five statements, the highest mean rating was obtained from electricity (M=3.54, SD=1.45), indicating the respondents' agreed-upon response. The lowest mean rating was obtained from harassment by local officers, with a mean rating of 2.20 and a standard deviation of
1.06 indicates a disagreement from the respondents. Electricity is their primary source of problems, and they rely primarily on solar panels for their electricity.

The data corresponds with Dr. Varun Sharma's study, which stated that street vendors need access to proper lighting, toilet facilities, drinking water, working space, etc. There is no decent work deficit in their working lives.

Significant Relationship Between the Demographic Profile of the Ambulant Vendors and the Tourism Attractions and Activities

A Spearman Rho was conducted to examine the correlation between the gender of ambulant vendors and the tourism attractions and activities in Dumaguete City. The results revealed fragile and primarily positive correlation values. The positive correlation indicates some correlation between gender and tourist attraction, but it is fragile. The p-values for all factors are more significant than 0.05, meaning they fail to reject the null hypothesis. This suggests that there is no sufficient evidence.

To support the claim that gender significantly affects tourism attractions/ activities in Dumaguete City.

The data corresponds with the study by Nurhaeni (2019) about "The Dynamics of Gender Differences on Tourism Governance in Indonesia." The study foundno significant relationship between the competenc e of women and men in tourism governance and no significant difference between the barriers of women and men in tourism governance. The study concluded that, while gender ideology occurs in tourism governance, it has increasingly reduced.

A Spearman Rho was conducted to determine the correlation between the age of ambulant vendors and tourism attractions and activities in Dumaguete City. The results showed correlations between most factors being generally very weak, with a few being weak. The p values for factors "positive impacts," "negative impacts," "location," "service," and "economic impact" are more significant than 0.05, meaning it fails to support the null hypothesis as it does not have sufficient evidence to support that age and tourist attractions have substantial relationships. The "product" and "challenges" factors have a p-value of less than 0.05, indicating that they reject the null hypothesis. This suggests that there is some evidence to support that age significantly affects these specific aspects of tourism attractions/activities in Dumaguete City, but the correlations are still relatively weak.

A study conducted by Shofiyah et al., 2019, about the "Correlation between age and environmental concern at tourism village in Malang, East Java, Indonesia" corresponds with the data. The study's results showed that the age and concern of the community in Kampung Wisata Jodipan did not correlate. There is no relationship between age and environmental concerns.

The A Spearman Rho was used to determine if there is no significant relationship between the educational attainment of ambulant vendors and tourism attractions and activities in Dumaguete City. The correlations in almost every factor are very weak, and in one factor, which is the economy, it is moderately negative. The p-values for "positive impacts," "negative impacts," "location," "product," "service," and "challenges" are more significant than 0.05, indicating that it fails to reject the null hypothesis. There is no sufficient evidence to support the claim that the educational attainment of ambulant vendors significantly affects tourist attractions in Dumaguete City. For the "economic" factor, the p-value is less than 0.05, meaning it rejects the null hypothesis. This suggests that significant evidence supports the claim that educational attainment significantly affects the economic aspect of tourism attractions/activities in Dumaguete City.

A study conducted by Magboo, N.C. et al., 2019 about the "Impacts of Tourist Attraction in the Community of One City in the Philippines" is in line with the data. The study concluded that the p-values for educational attainment are more significant than 0.05 alpha level, thus indicating a failure to reject the null hypothesis. No difference was observed, implying that the impact is the same across educational attainment.

CHAPTER V

Summary of Findings, Conclusion, and Recommendation

This section of the study summarizes vital data findings, conclusions drawn from the findings, and recommendations. The conclusions and recommendations addressed ambulance vendors' effects on tourism attractions and activities in Dumaguete City.

Summary of Findings

The primary objective of this study was to know the effects of ambulant vendors on the tourist attractions/activities in Dumaguete City. This study examined factors such as the demographic and business profile of ambulant vendors, including gender, age, educational attainment, year the company was established, and number of personnel. The study also evaluated how the ambulant vendors relate to the tourism attractions/activities and marketing strategies, specific products/services that the ambulant vendors offer to attract tourists, and the comparative advantage of Dumaguete City's ambulant vendors in the free market. This study also aimed to know if there is no significant relationship between the demographic profile of ambulant vendors and tourist attractions/activities.

The study used exploratory research using a self-administered questionnaire. Data was collected from 70 respondents selected as ambulant vendors in Dumaguete City. The researchers used different statistical tools, such as frequency count, percentage distribution, and Spearman Rho, to interpret the data and assess correlations between factors and their impact on tourism.

Demographic Profile of the Participants

The result from the study reveals a significant imbalance in "gender," where there is a much higher percentage of male ambulant vendors than female. 65.71% contribute to male respondents and 34.29% to female respondents. The results of the study about gender correspond with the study conducted by Galace (2019). The distribution of respondents by "age" resulted in the most dominant group being in the age range of 31-45. The result of this data about age is in line with the studies by (Armas), (Mubarak, and Munish, 2021). The "educational attainment" of the respondents showed that most have at least a college-level education, and some are high school graduates. The result from this data about educational attainment is aligned with the study conducted by Huynh-Van et al. 2022

Business Profile of the Participants

The data about the ambulant vendor's "year business was established" indicates that many vendors started from 2016 to the present, followed by 2011 to 2015. This data correlates with the idea that ambulant vending is a flexible income source. The "number of personnel" data showed that most ambulant vendors operate with only 1-2 personnel and often family members.

The Extent Ambulant Vendors Relate to the Tourism Attractions/Activities and Marketing Strategies

The mean rating for the statements regarding the "positive impacts" of tourism activities was 3.29, indicating a moderate response from the respondents. The respondents answered moderately regarding ambulant vendors' positive impact on tourism activities. The result from the positive effect was supported by the study of Bhowmik, 2015 indicating that ambulant vendors contribute to tourism. The study highlights how these vendors help create vibrant street life, enhance local culture, and provide unique shopping experiences to tourists. The mean rating for "negative impact" was 2.85, indicating a moderate response from the respondents.

The data corresponds with the article "Street Vendors are Vital for Tourism-Friendly Countries," stating that most tourists in tourism-friendly countries prefer to purchase goods and services from small vendors. The data from the "marketing s trategies" used mainly through ambulant vendors resulted in the use of word of mouth with 50 respondents who answered it. The result is supported by the study condu cted by (Mramba, 2015), which states that word of mouth is becoming increasingly recognized as an essential form of promotion, particularly within professional services environments, where credentials play a critical role in consumers' choices.

Specific Products/Services Offered by Ambulant Vendors to Attract Tourists

The "product" sold mainly by the ambulant vendors in Dumaguete City is a bracelet, with ten (10) respondents who answered it. The miniature product that the ambulant vendors sell is the sand in battle, with no respondent selling this kind of product. The "food" mostly sold by the ambulant vendors in Dumaguete City is tempura, with 41 respondents who answered it, followed by the kwek kwek, with 32 respondents who answered it. The most miniature food the ambulant vendors sell is the isaw, with only 15 respondents who answered it. These types of foods are commonly seen.

In Dumaguete, as sold by the ambulant vendors. The last two (2) ranks are pancit canton, calamari, and isaw. Because

these kinds of food are pricey, Pancit canton, calamari, and isaw are rarely sold by ambulant vendors. An article about the current in-demand and favorite street foods among Cebuanos suggests that kwek kwek is the best seller among all street foods. Even though kwek kwek is ranked two (2) as a food offering, the difference from tempura isn't that big. The article could still support the results from product and food offerings.

Comparative Advantage of Dumaguete City's Ambulant Vendors in the Free Market

The grand mean of the "location" in terms of the comparative Advantage the ambulant vendors have in the free market was 3.95, indicating that the respondents agreed that their location is an advantage to other businesses. The result from this variable corresponds with the study by F.G. Winarno and A. Allain, stating that the marketing success of street vendors depends exclusively on location and word-of-mouth promotion. The mean rating for "product/food" was 3.39, indicating a moderate response from the respondents. The result from this variable aligns with the study by Pedalgo etal., 2015. The study c oncluded that the environmental exposure of foods towards food safety demonstrated that the respondent highly needs maintenance of water reservoirs.

The data from the "service" variable as a comparative advantage of the ambulant vendors resulted in a mean rating of 4.48, indicating a strongly agreed response from the respondents. A solid commitment to exemplary customer service and maintaining high standards is a must to become an ambulant vendor.

The result from the service variable is in line with the study. About street foods in developing countries: Lessons from Asia state that many street vendors strive to ensure that the streets are clear and safe for their clients and offer them friendly, personal services. The grand mean for "economic impact" was 3.09, indicating a moderate response from the respondents. Regarding the study of street foods in developing countries: lessons from Asia, the data from economic impact corresponds with it.

The study states that street food micro-industries are vital for many towns' financial planning and development. The contribution of street food vendors to the economies of developing countries has been vastly underestimated and neglected. There is a relatively significant figure considering that most earnings are generated locally, promoting economic self-sufficiency. The mean rating for "challenges" was 3.01, indicating a moderate response from the respondents. The biggest problem of the participants is the lack of access to electricity, which is why they rely on solar power. The result from this variable corresponds with the study by Dr. Varun Sharma.

Correlation between Gender, Age, Educational Attainment and Tourism Attraction/Activities

A Spearman Rho was conducted to examine the correlation between the gender, age, and educational attainment of the ambulant vendors to the tourism attractions/activities in Dumaguete City. The results from "gender" resulted in fragile and primarily positive correlation values. The p-value for gender is more significant than 0.05, meaning it fails to reject the null hypothesis. There is insufficient evidence to support the claim that gender significantly affects tourism attractions/activities in Dumaguete City. The data on gender is from the study conducted by Nurhaeni, 2019.

The Results from "age" revealed a correlation between most factors being generally very weak and few being weak. The product and challenge factors have p-values less than 0.05, indicating that it rejects the null hypothesis. This suggests that age significantly affects these specific aspects of tourism attractions/activities in Dumaguete City, but the correlations are still relatively weak. The result from the age corresponds with the study conducted by (Shofuyah et al., 2019). The result from "educational attainment" shows a correlation in almost every fragile factor; in one case, it is moderate, which is the economic factor. The p-value for the economy factor is less than 0.05, meaning it rejects the null hypothesis. This suggests that significant evidence supports the claim that educational attainment significantly affects the economic aspect of tourist attractions in Dumaguete City. The result for educational attainment is in line with the study conducted by (Magboo, N, C. et al., 2019).

Conclusion

This study assessed the effect of the ambulant vendors on the tourism attractions/activities in Dumaguete City, specifically in 7 locations (near the colleges and universities, Rizal Boulevard and the pier area, Cheese Stick's Country, the premises near the Dumaguete Cathedral, Ninoy Aquino Freedom Park, diversion road located at Batinguel, and Mangnao Dumaguete City). The data were gathered by conducting a self-administered questionnaire with 70 respondents. This research aims to determine whether there is a correlation between the demographic profile of ambulant vendors and tourism attractions/activities in Dumaguete City. This study examines various demographic factors of ambulant vendors, including gender, age, educational attainment, number of personnel, year of business established, and marketing strategies used. The study also evaluates how these factors impact different aspects of tourism attractions/activities and identifies the comparative Advantage of Dumaguete City's ambulant vendors in the free market.

The conclusions that can be drawn from the data collected and interpreted in the study are the following: gender does not significantly relate to the tourism attractions/activities in Dumaguete City; age has a weak correlation but

statistically has significant relation on the "Product" and "Challenges" factors of tourism attractions/activities, suggesting that younger or older vendors may affect these factors differently, and educational attainment significantly relates to the "Economic" factors of tourism attractions/activities, indicating that vendors with higher educational levels may contribute more to the economy.

Another conclusion is that there are more male ambulant vendors than females in Dumaguete City. The age range for most respondents is from 31-45 years old. The respondents' educational attainment is diverse, with a considerable portion having at least some college-level education. The year's established businesses indicate that many ambulant vendors recently started their businesses. Most ambulant vendors operate with only 1-2 personnel, often family members. The study identifies the marketing strategies commonly used by ambulant vendors, with "Word of Mouth" being the most popular. The common challenges ambulant vendors face in Dumaguete include a lack of safe water and electricity access. The results of this study were laid out in an earlier chapter with a supported agreeing literature review.

The study reveals that the ambulant vendors do not significantly relate to tourism attractions/activities, except for age and educational attainment, and have a significant relationship with specific factors and aspects such as products, challenges, and economic impact. Even though these aspects significantly relate to the tourism attractions/activities in Dumaguete City, the correlation is still very weak.

Recommendation

Based on the conclusion of the study, the researchers recommend the following:

1. Local authorities should craft and implement policies that consider the challenges faced by and the unique needs of the ambulant vendors.
2. Encourage local authorities to include ambulant vendors in decision-making. Their insights and feedback can be valuable in crafting effective policies that address their needs.
3. Ambulant vendors that deal with food products and services should focus on maintaining quality, unique offerings, and proper sanitation.
4. The local authorities must consider tailoring the support and regulations to address specific requirements for younger and older ambulant vendors to optimize their contributions to tourist attractions.
5. The ambulant vendors must explore other marketing strategies and try other than "Word of Mouth" to maximize their reach and influence on tourism attractions/activities.

PORTABLE RICE GRAIN DRYER TO AUGMENT FARMERS' TIME IN DRYING THE HARVESTED GRAINS

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ABSTRACT

Rice drying in the Philippines is crucial for ensuring food security in the nation, given its heavy reliance on rice as a staple crop. However, the country's humid tropical climate challenges traditional sun-drying methods, leading to small-scale farmers. This study introduces a Portable Rice Grain Dryer as a transformative solution to modernize post-harvest rice drying. Incorporating cutting-edge technology, the dryer offers efficient, energy-saving drying while eliminating the need for constant manual oversight. Equipped with real-time data analysis and precise control, it improves sun drying. Its portability enables flexible deployment, ensuring reliable drying regardless of location or weather conditions.

The study aims to evaluate the efficiency, effectiveness, and potential of adopting the Portable Rice Grain Dryer among small-scale farmers in Siaton and Sta. Monica Negros Oriental. By enhancing agricultural practices and improving food security, this innovation holds promise for boosting productivity, competitiveness, and economic growth in the Philippines' agricultural sector, ultimately benefiting farmers, local economies, and consumers.

Keywords: food security, portable rice grain dryer, rice drying, cutting-edge technology

CHAPTER I

INTRODUCTION

Rice drying in the Philippines is rooted in the nation's agricultural landscape. As an agricultural country, the Philippines relies heavily on rice, a vital commodity for the population's daily sustenance. Hence, the significance of efficient post-harvest processing, particularly effective drying, cannot be overstated. Traditional sun drying is cost-effective but challenged by the Philippines' humid and rainy tropical climate, which leads to inconsistent moisture levels, rice quality issues, lower market value, and higher spoilage risks. Small-scale farmers bear the brunt of these losses, necessitating the country's adoption of more reliable and efficient rice drying methods.

In response to these challenges, our portable rice dryer offers a transformative solution by incorporating cutting-edge technology to streamline operations and ensure consistent drying. Unlike traditional methods, our portable solution eliminates the need for constant manual oversight, making the drying process easier and more efficient. Our dryer improves rice quality, reduces labor costs, and provides a superior alternative to traditional sun drying methods. Its portability enables flexible deployment, allowing farmers to dry rice grains efficiently and reliably, irrespective of location or weather conditions. Our portable rice dryer represents a promising advancement in addressing the unique climate challenges rice farmers face in the Philippines, offering greater resilience and efficiency in rice drying processes.

OBJECTIVES OF THE STUDY

General Objective

This study aims to modernize the traditional post-harvest rice grain drying process by designing, developing, and evaluating a portable rice grain drying system for small-scale rice farmers. This study may aim to achieve several objectives, such as:

1. Develop a portable rice grain drying system that is efficient and suitable for use by small-scale rice farmers.
2. Evaluate the efficiency and effectiveness of the portable rice grain dryer in reducing the moisture content of rice grains while maintaining grain quality.
3. Assess the portable system's ease of operation and maintenance, ensuring that small-scale rice farmers can readily adopt it. Study the willingness of small-scale rice farmers to adopt this technology and the factors influencing their decision.

SCOPE AND LIMITATION

This study's primary focus is the development of a Portable Rice Grain Dryer for precise and efficient rice drying. It involves a comprehensive investigation into the technical design, development, and performance evaluation of a portable rice grain drying system tailored to meet the requirements of small-scale rice farmers.

Moreover, the study aims to address the prolonged drying time required for harvested rice, particularly for small-scale farmers in Siaton, Negros Oriental, and Sta. Monica, Dumaguete City.

Additionally, it seeks to enhance the precision of temperature and humidity control for various varieties of rice grains.

Despite its advancements, this system has limitations:

- The project targets only small-scale farmers.
- The project does not involve separating the husk from the rice grain; it focuses solely on drying the harvested rice
- grain.
- The system has limited space within the container, as it is a portable machine.
- The system relies on electricity.
- The system cannot operate when there is a power interruption.

SIGNIFICANCE OF THE STUDY

The significance of the Portable Rice Grain Dryer lies in its ability to enhance agricultural practices and improve food security in several ways:

Small-Scale Farmers: Farmers will dry rice faster and produce more high-quality rice for the market.

Agricultural Sector - The agricultural industry in the Philippines could experience a significant boost in productivity and competitiveness.

Local Systems—Increased rice output and quality can benefit the local economy, improving livelihoods and
economic growth.

Government—The government will increase agricultural production, which can help promote food security,
foster economic expansion, and possibly reduce the need for agricultural subsidies.

Consumers - Consumers can benefit from consistent, high-quality rice products.

DEFINITION OF TERMS

Dryer - equipment/system that removes moisture from rice grains through controlled heating and air circulation, typically consisting of a drying chamber, heat source, fans, and controls.

Paddy - unmilled rice.

Portable - something that is limited in size or scope.

Traditional - existing in or as part of a tradition; long-established.

Rice Grain - harvested rice kernels with varying moisture levels, requiring drying to prevent spoilage and preserve quality.

CHAPTER II

REVIEW OF RELATED LITERATURE

The literature review is essential for summarizing prior knowledge and studies in the field, highlighting strengths, limitations, and knowledge gaps. This research section reviews literature, studies, and systems by foreign and local researchers related to the "Portable Rice Grain Dryer." Researchers use this review to identify open questions and support their research.

FOREIGN RELATED LITERATURE/STUDIES

Rice drying is a crucial process in eliminating moisture from rough rice, which is the first step in preserving the quality and quantity of rice for consumption and seed purposes. The process is complex, with the need to systematically reduce the moisture content in rice grains. The author underscores that drying rice is about removing water and controlling variables such as drying air temperature, humidity levels, and air volume. The ultimate goal of the rice drying process, as explained in the research, is to achieve a specific moisture level within the rice kernels, ensuring their optimal preservation and preventing the growth of harmful microorganisms (Hosokawa, 1984).

Drying technology is described as a diverse field that includes techniques and procedures for removing moisture from materials. This includes using heat or other energy sources to evaporate water while stabilizing and maintaining the final product. Heat pump technology and superheated steam dryers are recent technological innovations that aim to improve product quality and environmental sustainability. To effectively remove moisture, the main goal is to maximize thermal efficiency, moisture extraction, and control over drying conditions. Food processing, pharmaceuticals, textiles, and chemical industries rely heavily on

drying technology to remove moisture from various materials effectively (Alves-Filho *et al.* 2006).

In this study, two local varieties of paddy, characterized by long and medium grain sizes, underwent drying in a thin layer using three distinct methods: indirect active solar dryer, mixed-mode active solar dryer, and continuous dryer, at varying temperatures of 35, 45, and 55℃. Additionally, paddy was dried using the sundry method, serving as the traditional control treatment. The energy consumption for each component of the dryers above was empirically determined, and the total drying energy per kilogram of head rice yield dry mass (specific energy consumption) was computed. Findings revealed that medium-sized grains exhibited higher head rice yield than longer grains. No significant difference was observed in head rice yield between indirect and mixed-mode solar drying methods. Drying temperature significantly impacted head rice yield and specific energy consumption, with the lowest ratio recorded at 35℃. Notably, the continuous dryer demonstrated greater efficiency in low specific energy consumption and shorter drying time duration than other methods (Nassiri & Mohammad Etesami, 2015).

The study used two common rice varieties, manually harvested at 22% moisture content, applying traditional Cambodian drying methods. Employing a full factorial design with factors like drying pad type, rice variety, bed depth, and mixing, the experiments measured grain moisture content and conducted quality tests, including head rice yield (HRY) assessments. Results revealed significant influences of factors like rice variety, bed depth, stirring method, shading, and drying pad type on drying time and head rice yield. The study concluded that optimal drying involves using a thin bed, regular stirring for fast and uniform drying without over- or under-drying, and careful management of the drying rate to prevent grain damage (Meas et al., 2011).

According to the findings for the potential effects of climate change on rice production in important cultivating regions, if current trends continue, rice yields could decrease significantly, possibly by 40% by 2100. For areas where rice is a primary source of staple food, such a decline in rice production may have significant ramifications. To ensure the sustainability of rice production, the study emphasizes the critical importance of developing a deeper understanding of how microclimates affect rice crops. It also emphasizes the adoption of climate-resilient practices. The study also emphasizes the value of policy backing for research and development related to rice to develop and disseminate technologies that allow agriculture to adapt to climate change and maintain sustainable rice production (Ahmed & Saikia, 2020).

The new drying method using IR heating followed by tempering treatment significantly impacts the storage stability of rice bran. The study found that this method effectively extends the storage stability of rice bran compared to current drying practices. Specifically, the research showed that the storage stability of rice bran from the new drying method was extended to 38 days, compared to 7 days from the current drying practice. This extended shelf life of

rice bran is attributed to the effective stabilization achieved through IR heating and tempering treatment. The treatment significantly reduced lipase activity in rice bran, particularly for rice with high initial moisture content. This reduction in lipase activity led to a decrease in the concentration of free fatty acids (FFA) in rice bran oil, ultimately extending the storage stability of rice bran. The results indicate that IR heating can achieve simultaneous drying and effective stabilization for rice bran, providing a more effective way to use rice bran without affecting the quality of rice bran oil. Therefore, the new drying method using IR heating followed by tempering treatment has a positive impact on the storage stability of rice bran, making it a promising approach for the rice industry (Wang et al., 2017).

A study in Bangladesh emphasizes the agricultural challenges posed by inconsistent climate patterns, particularly variations in rainfall and temperature, impacting crop yields. The research covers three ecosystems: dry (Rajshahi), terrace (Mymensingh), and coastal (Barisal). It notes that terraced areas experience the highest rainfall, with an increasing trend in temperature variations, primarily in minimum temperatures. Monsoon rainfall is rising, while the dry season sees a slight decrease. The study uses a standardized precipitation index (SPI), diurnal temperature range (DTR), and rice productivity index (RPI) to assess these impacts of climate variation. In conclusion, the study suggests introducing stress-tolerant rice varieties for rainfed areas, rescheduling crop calendars, and adjusting cropping patterns to mitigate climate-induced challenges (Rahman et al., 2017).

Six indica hybrid rice varieties were analyzed for test weight and moisture content to assess the relationship between rice grain test weight and moisture content under different drying methods. The results showed that rice grain test weight was closely related to the moisture content in the grain. Rice grain test weight varied with varieties. The highest was the variety of LP5 with a rice grain test weight 552. 8 g / L, and the lowest was the variety of LP7 with a rice grain test weight of 534. 2 g / L when the rice grain with a moisture content of 14—5% within the same drying method. The rice grain test weight of the same variety differed because of different drying methods. The rice grain test weight fell slowly when the rice grain had a moisture content of 23% to 17. 5% increased quickly when the rice grain had a moisture content 17. 5% to 10. 5% and then rose slowly, very much, with moisture content reduced by natural air drying. There was a linear correlation between rice grain test weight and moisture content when the moisture content was above 10—5%. The regression equation can be shared when the varieties have a close initial test weight, but the regression equation is different when the varieties have significantly different initial test weights (Hong-me, 2014).

The vital significance of energy management in agricultural drying processes is highlighted. First, these processes use much energy, with agriculture being a significant energy user. Costs can be cut, and the environment can be helped by effective energy management. Second, effective energy management

optimizes the drying process to improve product quality. This results in better product quality, fewer losses, and more excellent marketability. Energy management also affects how effectively the agro-industrial supply chain operates. Poor energy management can lead to price swings and financial losses in the agricultural industry. Utilizing energy-efficient techniques, such as biomass use and equipment optimization, reduces energy losses and ensures a more lucrative supply chain. In conclusion, energy management in agricultural drying processes is essential for cutting energy use, enhancing product quality, and maximizing the farm sector's efficiency, with advantages for sustainability and resource conservation (Delgado-Plaza et al., 2020).

Solar drying proves to be more efficient than conventional techniques when used to remove moisture from agricultural products. It has many benefits. First, it is an affordable option that reduces the need for expensive fossil fuels and electricity, saving money on energy and operating expenses. Second, solar drying improves the quality of dried crops by reducing spoilage caused by unfavorable weather, pests, and fungal growth while maintaining nutritional content. Thirdly, compared to conventional methods, solar drying systems can be created to be more effective and time-saving. For instance, drying with solar-natural air is quicker and more complete. Solar dryers can also function independently of artificial drying systems or as a supplement, lowering the overall fuel energy requirement. In conclusion, solar power drying offers a long-term and environmentally responsible way to preserve agricultural products (VijayaVenkataRaman et al., 2012).

LOCAL RELATED LITERATURE/STUDIES

Rice is one of the essential commercial food crops in the Philippines and is considered a staple food by many people from different countries. Traditional sun drying of rice grain usually experiences problems due to geography and the kind of materials used. In addition, this conventional method can cause low-quality rice grain when improperly prepared, so an Automatic Rice Grain Dryer can help with those problems because it is a system that will dry rice grains with or without the presence of the sun (Cinco et al., 2018).

The Philippines is vulnerable to climate change, especially in the agricultural sector. This vulnerability is a result of several important factors, including the nation's heavy reliance on agriculture for its economic well-being, frequent exposure to severe weather events like typhoons, storms, floods, and droughts, as well as the regular occurrence of tropical cyclones, floods, seasonal droughts, and saline water intrusion. Concerns about food security are heightened by these difficulties, exacerbated by a potential decline in crop yields for primary staples like rice and corn due to a shorter maturity period and increased evapotranspiration from rising temperatures. In conclusion, serious

concerns exist about the vulnerability of agricultural production in the Philippines due to the country's reliance on agriculture for its economic survival, exposure to extreme weather events, and potential effects on important food crops (Buan et al., 1996).

Developing the inflatable solar dryer (ISD) for improved post-harvest handling of paddy rice in humid climates has led to several improvements in the quality of life for rice farmers and communities. The ISD has provided a promising alternative for small farmers due to its low energy consumption, realistic investment, and operating costs compared to commercial dryers that use petrol fuels to heat the air. This technology can reduce post-harvest losses, improve the quality of rice, and contribute to food security. Additionally, the ISD has been designed to be collapsible and easy to transport, making it accessible to small-scale farmers in remote areas. By addressing the challenges of post-harvest handling and storage, the ISD contributes to enhancing the livelihoods of rice farmers and ensuring a more sustainable and efficient rice production system (Salvatierra-Rojas et al., 2017).

The hybrid solar dryer is a promising solution for overcoming intermittent drying challenges during periods without sunlight and for off-grid applications. This system combines solar energy with another energy source, such as biomass burners, to enhance drying efficiency. While various hybrid dryer combinations exist, this review focuses on a solar-assisted dryer using solar photovoltaic (PV) and a solar air heater. Solar PV, particularly monocrystalline modules, is highlighted as an efficient and continually researched clean energy source with a 22.5 percent efficiency. The study also delves into solar air heaters, emphasizing their role in providing heat for industrial spaces, textile, and crop drying. However, the challenge lies in the low thermal efficiencies of solar air heaters due to poor heat capacity and thermal conductivity of air. The review explores ongoing efforts to enhance solar air heater performance through design optimization, improvement of absorber plates, and the distinction between solar air heaters with and without thermal energy storage (Ligreso, 2022).

The study reveals that the drying method significantly influences the quality of the aromatic rice variety Khao Dawk Mali 105 (KDML 105). Specifically, employing lower temperatures in drying methods, such as modified air at 30 and 40°C, enhances the concentration of the essential aroma compound, 2-acetyl-1-pyrroline, while reducing off-flavor compounds, namely n-hexanal and 2-pentylfuran, irrespective of storage time. Conversely, higher drying temperatures contribute to increased off-flavors. The evaluation of milling quality indicates that drying paddy with hot air at high temperatures, particularly 70°C, results in the lowest head rice yield. In contrast, lower temperatures and sun-drying methods yield higher percentages of milled rice whiteness. The study recommends an appropriate postharvest treatment for KDML 105 rice involving low-temperature drying methods, such as modified or hot air at 30–40°C, and

minimizing storage time to ensure improved aroma quality and milling characteristics (Wongpornchai et al., 2004).

According to an article at PhilStar Global, the Department of Agriculture-Philippine Center for Post-Harvest Development and Mechanization (DA-PhilMech) has achieved a substantial breakthrough in rice grain drying technology. Utilizing cutting-edge fluidized bed technology, engineers in this department created a state-of-the-art rice grain dryer that has won the best Invention of the Year award at the 2020 Department of Science and Technology (DOST) National Invention Contest and Exhibit (NICE). This fluidized bed dryer's ability to speed up the drying of harvested rice, which effectively ends drying delays, is one of its main advantages. Rice grains are exposed to high air velocity during the drying process, which makes them float on air in a fluid state. By using this novel method, the drying process can be finished in about two hours instead of the customary twelve, all the while preserving the quality of the dried grains. Additionally, this system uses 20% less energy than standard dryers, making it energy-efficient.

The Department of Science and Technology has stated that it is willing to give the DA-PhilMech team more funding to scale up their machine's production, resulting from this innovation's success. This potential expansion might make it easier to dry rice palay grains on a large scale, which would help rice farmers all over the nation (Martinez et al., 2020). There is nothing wrong with sun drying if done correctly. Dr Virgilio Gayanilo (UPLB, Philippines), in his postdoctoral work at IRRI, presented how it should be done. The paddy should be spread out in sufficiently thick layers, raking the grain to mix it continuously. This prevents the grain from being exposed to the strongest rays of the sun, which cause sun-checking or fissuring.

Sun drying is the cheapest method. Unfortunately, sun drying of paddy is unreliable. The sun may not be available when it is most needed; if it rains for a week during harvest time, the grain is likely to germinate, yellow or rotten; when there is sunshine in the morning, and the grain is spread out, a sudden rainstorm can cause fissured grain; if the sun is hot, the workers prolong mixing the grain, and the result again will be fissured grain. A miller interviewed in Laguna, Philippines, said that despite the more significant expense of drying rice in their heated air dryers (estimated Cost 5 times more), they could not afford to sundry anymore because the damage to grain quality is more expensive for them (de Padua, 1998).

Dwayne Sutter (Texas A & M), who has extensive experience in the Philippines, says that paddy sun drying is a major cause of lower head rice yield. Sun drying was usually a single-pass operation, which did not allow the grain to undergo a tempering phase to relieve internal stresses. As a result, small fissures were formed. These defects are not visible to the naked eye but can be observed by shining a light through the grain (de Padua, 1998).

Rice, varying in moisture content from 14% to 24% depending on the cultivar and region, requires drying to approximately 12.5% moisture content

soon after harvest. This drying process reduces respiration rates, inhibits microbial and insect growth, and ensures storage stability. Following drying, rough rice undergoes storage, dehulling, and milling before further processing or consumption. Drying methods range from traditional to mechanical systems, with diverse technological complexities and capacities suitable for on-farm or off-farm commercial operations.

This chapter overviews grain drying fundamentals, techniques, equipment, and their impact on milled rice quality. Additionally, it discusses recent research advancements in alternative rice drying methods to address specific industry needs. Targeting academicians, research engineers, extension professionals, students, rice growers, and processors, this chapter serves as a comprehensive reference guide (Atungulu & Sadaka, 2019).

In their 2022 study, Malanon and Sumalde highlighted the impact of weather risks on grain drying operations in the Philippines, particularly during prolonged rainfall and cloudy days—the prevalent use of sun drying limits rice farmers' income potential. While mechanical dryers offer a solution, their benefits and drawbacks require further investigation. This study adopts the IPCC framework to assess risk, focusing on hazard, exposure, and vulnerability. In Isabela, Philippines, where 74% of rice is sun-dried, extended rainy/cloudy periods result in qualitative losses, amounting to 117 metric tons valued at PhP 407.17 million (USD 8.14 million) annually. Mechanical dryers mitigate exposure to adverse weather conditions, minimizing operational constraints (Malanon & Sumalde, 2022).

FOREIGN RELATED SYSTEM

Recent advancements in rice drying technology have yielded notable enhancements in both efficiency and efficacy. A prototype rice drying apparatus employing a PID automatic control system has been developed, featuring compact dimensions of 45 cm x 45 cm x 110 cm and adopting a vertical configuration with an internal screw stirrer. This system integrates various sensors, including those for temperature, humidity, moisture content, and a load cell, alongside actuators comprising blowers, heaters, and DC motors to propel the screw. Operating on the principle of feedback control, the temperature sensor functions as a feedback mechanism, with the signal variance from the sensor serving as input for the controller to regulate the Blower's speed, utilizing PID parameter values of Kp 225.2, Ki 0.22, and Kd -0.00087. A comparative analysis of the prototype dryer and conventional methods was conducted to evaluate water content reduction during drying. Experimentation with temperature set points of 45°C, 50°C, and 55°C, and an initial water content of 19.2% and a mass of 1000 grams, revealed that achieving a water content reduction to 14% took 120, 90, and 70 minutes, respectively, whereas the conventional method required 140 minutes. These findings underscore the potential of the PID-

controlled rice drying machine to significantly enhance drying efficiency compared to traditional approaches (Waqi'ah & Raafi'u, 2023).

The research investigated the influence of different drying air conditions on a specific long-grain rice variety's drying rate and milling quality. A dedicated laboratory drying equipment with precise control over temperature, relative humidity, and velocity was used. The equipment monitored weight loss and grain temperature, controlled by a Programmable Logic Controller. Rice samples were arranged in a thin layer and dried until no moisture change was detected. Statistical analyses, including ANOVA and Tukey's Test, were employed to compare results. The findings suggested that drying at rates below 3 percentage points of moisture content removed per hour, with a 1-hour tempering process post-drying, helped maintain low milling quality loss. The study measured key parameters during rice drying, including moisture content, equilibrium moisture content, drying rate constant, and dimensionless constant. Experiments were conducted in triplicate, ensuring robust results for analysis (García-Llobodanin & Billiris, 2023).

This research project addresses the challenges local farmers face in Merauke, particularly in the Kurik district, Wonorejo village, Papua, who rely on outdated sun-drying methods for rice. The study aims to design an effective, efficient, cost-effective rice grain dryer using the Pressure Flow Heat Forced Convection method to generate hot air from a combustion furnace. By doing so, the research seeks to improve the rice drying process and reduce costs for the local community. The results indicate that the dryer reduces moisture content, achieving optimal results in 540-620 minutes with less than 15 g of weight loss for a 3 kg sample. With a 71% efficiency, the drying process effectively reduced the moisture content in 12 tons of wet grain to 10.5 tons, demonstrating the successful utilization of heat in rice grain drying (Sahupala & Latuheru, 2022).

The study by M Eriyadi et al. focused on implementing a three-phase Variable Frequency Drive (VFD) in a prototype rice drying machine. They discovered that the VFD efficiently controlled the speed of a ½ HP induction motor, the primary mover of the prototype. By adjusting the frequency and voltage, they varied the motor's speed from 142.8 rpm at 5 Hz to 375.3 rpm at 13 Hz under no-load conditions. They also noted the direct proportionality between frequency, voltage, and motor speed and the inverse proportionality to current. They determined optimal operating speeds through tests on the induction motor, both with and without a load. Furthermore, they optimized the rice drying process by adjusting parameters such as rice weight, dryer rounds, and temperature settings, enhancing machine efficiency and performance.

The study, supported by the Department of Electrical Engineering, Politeknik Engineering Indorama, and YPI, was published in the IOP Conference Series: Materials Science and Engineering (Eriyadi et al., 2021).

Manually harvested at 22% moisture content, rice underwent diverse drying treatments rooted in Cambodian traditions. A complete factorial experiment with four main factors—drying pad type, rice variety, bed depth, and mixing—

featured treatments like tarpaulin, nylon net, nylon net on the husk, and a sugar palm leaf mat. Bed depths ranged from 2 to 3 cm, with hourly hand mixing and optional sun shading from 11 am to 2 pm. Moisture content was measured hourly using a digital meter, and testing involved a milling test for head rice yield (HRY) using a mechanical seed cleaner.

Results showed that reducing bed depth, regular stirring, and using porous drying pads facilitated faster drying, while shading and slower drying on less porous pads minimized grain damage. Drying time and head rice yield were significantly influenced by various factors, including rice variety, bed depth, stirring method, shading, and drying pad type (Meas et al., 2011).

The development of an automatic grain drying machine aims to enhance rice quality and market value. The prototype includes a vertical design with a screw stirrer, equipped with a PID control system, sensors (temperature, humidity, moisture content, load cell), and actuators (blowers, heaters, DC motors). The feedback control system dynamically adjusts the Blower's speed based on continuous temperature sensor feedback. PID parameters are set at Kp = 225.2, Ki = 0.22, and Kd = -0.00087.

Comparative testing against conventional methods reveals significant efficiency gains. The prototype achieves notable water content reductions, with 120, 90, and 70-minute drying times at setpoint temperatures of 45°C, 50°C, and 55°C, respectively, compared to the conventional 140 minutes [21]. This efficiency improvement indicates enhanced performance, potentially positively impacting rice quality and market competitiveness (Waqi'ah et al., 2021).

LOCAL RELATED SYSTEM

A fully automated pilot-scale fluidized bed drying system with a 500kg/hour capacity was assessed for drying high-moisture paddy. Complete drying was achieved through two passes of fluidized bed drying at a 2-minute exposure to a 70 °C drying temperature, a 4.9 m/s superficial air velocity, and a 60-minute ambient air tempering period following the fluidized bed drying. The drying time for complete paddy drying was 2.07 hours, with a calculated drying cost of $0.014 per kilogram of wet paddy. Specific heat energy consumption was 2.84 MJ/kg of water removed. Head Rice Yield recovery met standards, and sensory evaluation indicated comparable color and taste to air-dried paddy. Optimal drying parameters for the fluidized bed dryer were determined as 70 °C drying temperature, 2-minute fluidization time, 1493 Pa static pressure, 4.9 m/s superficial air velocity, 10 cm grain depth, and a 60-minute ambient air tempering period (Reagan et al., 2015).

The study aimed to design a rice-drying device that efficiently and quickly dries newly harvested rice while minimizing power consumption. The research addressed three key aspects: (a) the machine's effectiveness in rice drying, (b) its energy efficiency without compromising practicality, and (c) the quality of the dried rice compared to traditional sun-drying methods. The study

employed experimental development and descriptive methods to assess the machine, involving six selected evaluators, primarily farmers. The results indicated that the device was functional and could expedite the drying process while maintaining the quality of the rice at a level comparable to sun drying (Diestro et al., 2012).

Aside from addressing the productivity issues of Filipino rice farmers, the fluidized bed drying machine for rice grains can also make rice processing more sustainable. The fluidized bed drying system enables fast drying of harvested rice, thus avoiding delays. During the drying process, the grains are exposed to high air velocity, making the rice grain float on air in a fluid state. Compared to other grain dryers, drying can be completed in around two hours, instead of the usual 12 hours, without affecting the quality of the dried grains. Energy consumption is also 20 percent lower than the existing dryers (Belonio & Sumpay Jr., 2012).

This study aimed to address the challenges faced by rice farmers in Brgy. Lima Pastrana, Leyte, Philippines, where rice is a crucial staple crop, by developing an Automatic Rice Grain Dryer system. Traditional sun drying methods were often hindered by geographical and material limitations and, when not done correctly, could result in low-quality rice. The system utilizes hardware designed to work with a Flat Turbine and was assessed using a descriptive method and a researcher-made questionnaire administered to 40 farmers as survey respondents, incorporating various scaling methods to evaluate quality, frequency, and importance in the context of rice grain drying (Cinco et al., 2018).

SYNTHESIS

The literature and research presented provide a comprehensive understanding of the challenges associated with conventional rice grain drying. Small-scale farmers have been most affected by these challenges, which climate change has made worse. These challenges include not drying the grains properly and storing them in ways that could be better. It is evident that addressing these issues and promoting improvements in rice grain drying is paramount.

The research emphasizes the urgency of prioritizing projects to mitigate these challenges' detrimental effects. By implementing innovative technologies that can automate a substantial portion of the tasks traditionally performed by farmers, we can provide them with a competitive edge and long-term advantages crucial for sustaining the agriculture sector. One such technology, as demonstrated by the portable rice grain dryer prototype, has the potential to enhance rice production significantly. It achieves this by reducing the drying

process time by a significant differential to standard process time, offering a transformative solution to the issues posed by factors such as extreme weather.

The literature review underscores the pivotal role that technologies can play in improving the efficiency of the rice grain drying process. It addresses the challenges faced by small-scale farmers and contributes to the resilience of the entire agricultural sector. The synthesis underscores the necessity for the portable rice grain dryer and highlights the transformative power of innovative technology in achieving seamless and efficient rice grain drying. By embracing these innovations, we can make significant strides in ensuring a more sustainable and productive future for rice production, benefitting both farmers and consumers alike.

CONCEPTUAL FRAMEWORK OF THE STUDY

The system's conceptual framework centers around the critical components of input, process, and output, each playing a vital role in the development and operation of a portable rice grain dryer to augment drying time during the rainy season.

The "Input Block" serves as the project's foundation, as it encompasses the research of concepts and resources derived from extensive research, literature, and relevant materials. This step is crucial for building a solid knowledge base and understanding the project's requirements.

The "Process Block" is where the project takes shape. It involves comprehensive planning to establish various system-building concepts, followed by the actual construction and rigorous testing. The concept of reconfiguration is critical here, signifying the iterative process of making continuous improvements based on feedback and the constraints imposed by the project's design.

The "Output Block" marks the culmination of these efforts, resulting in the tangible final product—the completed "Portable Rice Grain Dryer." This is the aspect of the system that the client can physically interact with, representing the realization of the project's goals.

Finally, "Feedback" is an invaluable aspect of the system's conceptual framework that captures the responses and insights generated by the "Portable Rice Grain Dryer" in real-world use. These details form the foundation for any future enhancements or refinements, ensuring that the system remains adaptive and responsive to its users' needs.

CHAPTER III

METHODOLOGY

This chapter describes the specific techniques and procedures used in the research to identify, process, analyze, and select pertinent data. It includes information on the research instruments, statistical methods, and sampling strategy. The system methodology contains sections on the system development model, requirements, design, and processes.

RESEARCH METHODOLOGY

The researchers proposed this study to address smallholder farmers' challenges in drying rice grains post-harvest. Traditional drying methods are often inefficient, time-consuming, and dependent on favorable weather conditions, leading to significant post-harvest losses and reduced grain quality. By developing a portable rice grain dryer, the researchers aim to provide a practical, efficient, and reliable solution that farmers can use in various settings. This innovation is intended to enhance drying efficiency, improve grain quality, reduce losses, and ultimately increase the profitability and sustainability of rice farming.

RESEARCH DESIGN

A research design serves as the researcher's road map for gaining insights into a specific group or phenomenon within its context. In developing a portable rice grain dryer, this study employs a quantitative research design with a descriptive research approach. A quantitative research design is a structured, objective, and systematic approach that uses numerical data to collect information about various variables. Its purpose is to explore and analyze the relationships between different variables.

Descriptive research encompasses gathering information to investigate theories or address questions concerning the current state of the portable rice grain dryer. This research design is selected because the study's primary objective is to evaluate the system's effectiveness in properly drying rice grains.

RESEARCH ENVIRONMENT

This research study was conducted in Siaton, a municipality known for its vibrant agricultural sector, and Sta. Monica, Banilad, Dumaguete City. The focus was on developing and implementing a portable rice grain dryer system suitable for the local agricultural context. Siaton, recognized for its agricultural activities, presented an ideal location for this research as it offered an environment where the practicality and efficiency of a portable rice grain drying system could be evaluated under real-world conditions. The study aimed to

address the specific needs and challenges of the local rice farming community in Bonawon and Sta. Monica is contributing to improved postharvest processes and sustainability in the region.

RESEARCH RESPONDENTS

The research focused on Siaton, Negros Oriental, a municipality with a population of 83,082, and Sta. Monica in Banilad, which has a population of 5,512. The study on developing and implementing the portable rice grain dryer system involved small-scale farmers. For the research, a sample size of 25 individuals was randomly selected, comprising 15 rice farmers from Siaton and ten from Sta. Monica, Banilad, Dumaguete. The researcher considered the users of the portable rice grain dryer to be suitable participants in the study due to their experience with rice grain drying practices, which may need to be revised to optimal standards.

SAMPLING TECHNIQUE

The researchers adopted purposive sampling, a deliberate method that involved intentionally selecting participants based on their experience and expertise in rice grain drying and their availability when conducting the research. This approach enabled the targeted inclusion of individuals with unique qualities, experiences, or perspectives essential for achieving the study's goals.

In situations with large populations, like those in our research area, purposive sampling was deemed appropriate due to its focus on selecting participants with specific attributes, making it more feasible than testing the entire population. This strategic sampling technique was chosen for its efficiency, practicality, and ability to identify participants who could contribute significantly to the study's objectives.

SAMPLING PROCEDURE

In our research conducted in Sta. We implemented purposive sampling in Monica, Dumaguete, and Siaton to streamline the survey process. This method was chosen to deliberately select individuals readily accessible within the Siaton area, enhancing practicality and efficiency. Purposive sampling proved particularly useful when conducting an extensive, impractical survey, allowing us to intentionally select participants who aligned with our specific research objectives and ensuring the collected data was highly relevant.

Purposive sampling is preferred for its efficiency and tailored approach, facilitating the collection of valuable insights from individuals contributing to our study. The selection of respondents for the research on rice grain drying was based on their knowledge and expertise in the field, as well as their availability

during the study. By employing this method, we aimed to ensure that our research in Siaton, Negros Oriental, and Sta. Monica Banilad was practical and aligned with our specific research goals, ultimately contributing to the success of our project.

SURVEY INSTRUMENT

The data collection tool for this study was a standardized survey questionnaire designed to assess the effectiveness of a portable rice grain dryer. This questionnaire aimed to gather feedback from users who interacted with the system, focusing on its design and performance. It included questions about the system's Usefulness, ease of use, and Cost. By analyzing the responses, the designers and developers could identify areas for improvement and make necessary adjustments to enhance the system's effectiveness.

The survey questionnaire was structured into three distinct sections to assess the portable rice grain dryer comprehensively:

- Section one (I) evaluated the acceptability of the portable rice grain dryer system's usefulness.
- Section two (II) centered on assessing the acceptability of the portable rice grain dryer system's user-friendliness.
- Section three (III) evaluated the acceptability of the portable rice grain dryer system's Cost.

DATA GATHERING PROCEDURE

The conduct of this research study on creating the Portable Rice Grain Dryer project design involved seeking consent from the respondents. After obtaining authorization, the researchers introduced themselves and explained the purpose of the study to the identified participants, then distributed the survey questionnaires.

Participants in the Portable Rice Grain Dryer project design were given survey questionnaires during the beta testing stage to evaluate the application's accuracy, complexity, and usability acceptability. Respondents used a standardized survey questionnaire with a Likert Scale scoring system ranging from 1 (lowest) to 4 (highest) to rate the application based on their experiences with beta testing. The survey results were interpreted using a predefined table based on the ratings collected from the survey questionnaires.

STATISTICAL TREATMENT OF DATA

The information gathered during the investigation into the viability of the Portable Rice Grain Dryer project design was organized, analyzed, and interpreted about the examined variables.

This research study used the weighted mean (WM) computation to assess the level of acceptability based on the weighted mean scores determined for Usefulness, user-friendliness, and Cost.

Illustrated below is the formula for the computation of the mean.

$$\textbf{Weighted Mean} = \sum_{in=1}^{1}(Xi*wi) \sum_{in=1}^{1}wi$$

Where:

Xi = the values to be averaged

N = sample size

wi = weights applied to x values

Rating Range	Interpretation
	Acceptability
3.25 - 4.0	Highly Reliable
2.50 - 3.24	Very Reliable
1.75 - 2.49	Moderately Reliable
1.0 - 1.74	Not Reliable

Table 3.1 Interpretation of Survey Results

DEVELOPMENT METHODOLOGY

The development methodology comprised several sequential phases within a project's life cycle, with certain phases being discretionary and the sequence of phases determined by the particular project.

SYSTEM DEVELOPMENT LIFE CYCLE DIAGRAM

The System Development Life Cycle (SDLC) was a structured process to efficiently produce cost-effective, high-quality software within the shortest possible time frame. It outlined and defined a comprehensive strategy with distinct stages, each with unique procedures and outcomes.

In this research, the team employed the Agile methodology, given its popularity in project management due to its adaptability, flexibility, and substantial stakeholder involvement. Agile project management operates on the principle that a project can continually evolve and enhance throughout its life cycle, allowing for rapid and responsive adjustments.

OPERATIONAL FEASIBILITY

Operational feasibility assesses the practicality and viability of implementing a proposed project or initiative within an organization's existing framework. It examined factors such as the availability of necessary resources, technical compatibility with existing systems, the adequacy of skills and training, legal compliance, scalability, and potential operational risks. A positive operational feasibility evaluation indicated that the project could be effectively integrated and operated within the organization. At the same time, a negative assessment highlighted potential operational challenges that needed to be addressed or reevaluated.

SYSTEM BLOCK DIAGRAM

It illustrates the connection or data flow of the Portable Rice Grain Dryer System. The system comprises an Arduino Mega, the primary processing component for our data-gathering process. Connected to the Arduino Mega are the display module, soil moisture sensor, and temperature and humidity sensor, which serve as inputs and outputs of the system. The Heat Coil, Fan, and Hair Dryer release hot air to speed up the drying process while the motor spins the cylinder that stores the rice grain. The LCD screen shows the humidity, temperature, and moisture data, ensuring everything operates smoothly. A 220V power outlet serves as the main power source for the system, with the relay module connected to the components that use 220V (heat coil, hair dryer, fan, motor).

SYSTEM FLOWCHART

A system flowchart is a graphical representation of the data flow within a system or process. It enables users to communicate effectively and collaborate to understand the structure and operations of a system. This flowchart helps analyze the flow of data and processes within a system, making optimizing and streamlining system operations easier. System flowcharts serve various purposes, such as visualizing the flow of data and processes within a system, defining the structure of an application or system, and illustrating how users interact with and navigate the system.

Symbol and Name Description

- Terminator: The terminator symbol represents the starting or ending point of the system.
- Process: It depicts a specific operation, task, or action within the represented process or algorithm.
- Input/Output (Data): The Input/Output symbol in a flowchart, often depicted as a parallelogram or trapezoid, signifies points in the process where data is input into the system or output from it.
- Decision: The Decision symbol, often a diamond shape, in a flowchart represents a point where a decision is made based on a condition.
- Flow: Lines Flow lines in a flowchart are arrows or lines connecting symbols to show the sequence and direction of the process or data flow.

TESTING PROCEDURE

The testing process for the Portable Rice Grain Dryer encompassed two distinct evaluations: functional testing and performance testing. Functional testing was carried out once all the requisite components were assembled, involving a series of procedures to validate the dryer's proper operation. These procedures included device assembly, connecting it to an Arduino board, and assessing its grain drying. Additionally, tests were conducted on associated components like temperature and humidity sensors to identify any potential malfunctions or defects.

Performance testing was undertaken after assembly to evaluate its speed, reliability, and efficiency in drying rice grains. This phase involved subjecting the dryer to various grain types and monitoring its performance over an extended period to ensure consistent and dependable operation.

TECHNICAL FEASIBILITY

This chapter detailed the researchers' actions, including a compilation of the elements and resources utilized, along with the various steps in creating the suggested system, such as the integration process and the assessment of hardware and software compatibility.

LIST OF COMPONENTS

These are the hardware materials and tools that are used for the system.

Arduino Mega 2560

The Arduino Mega 2560 is a microcontroller board developed by Arduino based on the ATmega2560 microcontroller.

DHT11 Humidity and Temperature Sensor Module

The DHT11 humidity and temperature sensor is a vital component of our system. It is designed to measure relative humidity and temperature. It plays a crucial role in providing data on environmental conditions, enabling us to monitor the temperature and humidity inside the system accurately.

Blower

The Blower in our system serves as the hot air mechanism responsible for warming the air to facilitate the drying process. It efficiently generates and delivers hot air, expediting moisture evaporation from the rice grains, which is essential for optimal drying.

Fan

The fan in our system is a crucial component responsible for blowing air inside the system when combined with the heating coil. It assists the blowers in generating hot air to dry the rice grains effectively.

I2C 16x2 LCD Screen

Our system's I2C 16x2 LCD Screen is a display module that utilizes the I2C communication protocol to provide a 16x2 character display. It serves as an essential output interface, enabling the system to showcase the rice grain's temperature, humidity, and moisture content. This LCD screen enhances the user interface and facilitates real-time monitoring with our system.

Jumper Wire

Jumper wires are flexible, insulated connectors that establish electrical connections between system components, ensuring efficient communication and organization.

Electric Motor

This electric motor powers the movement that causes the system's center to spin, ensuring that the blowers and fan heat the rice grains properly.

Heat Coil

Coils consist of electrical wire encased in metal tubing. The wire conducts heat and warms the coils, assisting the fan in generating hot air to assist the blowers.

Relay Module

The relay module in our system reduces the high voltage from 220 volts to a level suitable for the Arduino microcontroller, ensuring its safety and compatibility. It provides electrical isolation between the mains power and the Arduino, safeguarding against potential damage or hazards. The relay module also enables the Arduino to control high-power loads such as fans, motors, and hair dryers, enhancing the system's functionality and versatility.

Soil Moisture Sensor

The soil moisture sensor can be adapted as an alternative for measuring rice grain moisture by re-calibrating its sensor readings to correspond with the calibration of a dedicated rice grain moisture sensor device. This adjustment ensures accurate and reliable measurements specific to rice grain moisture content, offering a practical and cost-effective solution for monitoring moisture levels in rice grains. By leveraging the calibrated sensor, users can effectively manage the drying process and ensure optimal storage conditions for rice grains without requiring specialized equipment.

Button

The push button serves as the start function in our system, initiating the activation of the Portable Rice Grain
Dryer. When pressed, the push button triggers the system to commence its drying operation, allowing users to begin the drying process for rice grains.

Resistor

A resistor is an electronic component that restricts the flow of electric current in a circuit. In the context of enhancing the accuracy of a system, resistors are commonly used to control the flow of current and voltage levels within specific components or circuits. By adjusting the resistance value, resistors can help regulate current flow to ensure precise operation and prevent damage to sensitive components. In some applications, resistors are also employed to create voltage dividers or attenuators, which allow for precise voltage control and signal conditioning to improve the accuracy of measurements or signal processing within the system.

Transformer

A transformer is an electrical device that converts alternating current (AC) voltage from one level to another, typically to step down the voltage to a lower level. In the context of providing power to an Arduino microcontroller, a transformer with a primary voltage rating of 220 volts (V) and a secondary

voltage rating of 9 volts (V) would step down the voltage from the standard household AC power supply to a level suitable for the Arduino's operating voltage requirements. This transformed voltage of 9V is then typically rectified and regulated to provide a stable and reliable power source for the Arduino microcontroller and associated components.

HARDWARE/SOFTWARE COMPATIBILITY

Hardware

The proposed system relied on electricity for its functionality and required a specific power supply to operate
effectively.

Software

The proposed system utilized software called Arduino Integrated Development Environment for processing and was coded using the Arduino IDE program to enable the components to function.

The Arduino Mega is powered by a 9V current derived from the 220V system. The DHT11 sensor is connected to pin 4; the I2C LCD Display is connected to the SDL and SDA pins. The moisture sensor is connected to pin A0 of the Arduino Mega. The heating coil, Hair Dryer, Motor, and Fan are controlled by the 4-channel relay module, which is connected to pins 8, 9, 10, and 11 to regulate their processes and draw electricity directly from the 220V power outlet. A normally closed switch also cuts the power supplied to the heating elements and motor when opened. In contrast, a standard on-off switch directly regulates the 220V power supply to the relays.

SCHEDULE FEASIBILITY

Schedule feasibility pertains to a project's capacity to be executed within a reasonable timeframe. Researchers employed the Work Breakdown Structure (WBS) and Gantt Chart methodologies to develop the Portable Rice Grain Dryer project. The Work Breakdown Structure entailed systematically breaking tasks into manageable components and estimating the resources needed for each task. Jones and Harrow (2015) described that this method provided a categorized list of functions essential for project completion. Conversely, Gantt charts served as a visual representation of task timing, aiding in project planning and management. Smith et al. (2018) noted that these charts were favored for their simplicity and utility, making them a common choice for project managers across various project complexities.

PROJECT TEAM ORGANIZATION

Project Manager/Technician/Programmer: JOHN NORMAN T. MANCAO

- Leads the team responsible for project development.
- Oversee, organize, and create every project deliverable.
- The quality assurance manager verifies the code's quality and resolves any issues.
- The software developer is responsible for designing, creating, and testing program codes.
- The hardware engineer creates, assembles, and manages the project design's hardware.

Technician/Programmer/Documenter: FRANCISCA LEAN ALQUIZA

- The lead researcher oversees the creation of the system and the research manuscript.
- Ensure the quality of each research and design functionality through documentation.
- Responsible for the project's finances, schedule, and protocols, including design management.
- Oversee the creation, assembly, and management of the project design's hardware.

SOCIOECONOMIC FEASIBILITY

Socioeconomic feasibility involves assessing the potential economic viability the developed system will offer the organization. This process entails quantifying and identifying all anticipated costs associated with constructing the system while also weighing the benefits that the system will bring to rice grain farmers through a cost-and-benefit analysis.

BUDGET PLAN

The materials listed below are essential for the planned project. The sample expenses provided are typical for small businesses in the local area. Some items or components are not readily accessible locally (in Dumaguete City), so the prices are sourced from an online shopping platform.

COST-BENEFIT ANALYSIS

The comprehensive cost-benefit analysis of implementing the proposed system indicates substantial advantages for farmers, particularly in alleviating the traditional drying method, sun drying. The total Cost of Php 8,022, encompasses various materials essential for the project, with prices sourced locally and online for a realistic estimation. The benefits of this investment, however, extend beyond monetary considerations. The reduction of queues not

only improves the overall efficiency of transaction processes but also enhances the user experience for farmers. The proposed system aims to create a more streamlined and user-friendly environment, increasing user satisfaction.

This analysis is a valuable decision-making tool that carefully weighs the costs against the anticipated benefits. It guides the researchers in identifying alternatives and underscores the proposed system's value in creating a more efficient and user-centric transaction process for small-scale farmers.

CHAPTER IV
PRESENTATION OF RESULTS AND FINDINGS

The chapter examines the data gathered to assess the acceptance of the Portable Rice Grain Dryer's Usefulness, ease of use, and Cost.

Survey Results on the Level of Acceptability of Portable Rice Grain Dryer:

Table 4.1 *Level of Acceptability in terms of its Usefulness*

Table 4.1 *Level of Acceptability in terms of its Usefulness*

CRITERIA	4		3		2		1		WEIGHTED MEAN	INTERPRETATION	RESPONDENTS
	F	%	F	%	F	%	F	%			25
1	20	80.00	5	20.00	0	0.00	0	0.00	3.80	Highly Reliable	25
2	12	48.00	13	52.00	0	0.00	0	0.00	3.48	Very Reliable	25
3	19	76.00	6	24.00	0	0.00	0	0.00	3.76	Highly Reliable	25
4	21	84.00	4	16.00	0	0.00	0	0.00	3.84	Highly Reliable	25
AGGREGATE WEIGHTED MEAN									3.72	Highly Reliable	25

Table 4.1 displays the respondents' responses on various criteria used to evaluate the level of acceptability regarding the Usefulness of the Portable Rice Grain Dryer. With a computed average mean of 3.72, it indicates high reliability. This table serves as a concise summary of the survey results, presenting the mean scores of each criterion based on feedback from twenty-five (25) respondents. It offers a quick overview of the central tendencies in respondents' views, facilitating a straightforward analysis of how different criteria were perceived on average.

Table 4.2 *Level of Acceptability in terms of its Ease-of-Use*

Table 4.2 *Level of Acceptability in terms of its Ease-of-Use*

CRITERIA	4		3		2		1		WEIGHTED MEAN	INTERPRETATION	RESPONDENTS
	F	%	F	%	F	%	F	%			25
1	13	52.00	12	48.00	0	0.00	0	0.00	3.52	Very Reliable	25
2	13	52.00	12	48.00	0	0.00	0	0.00	3.52	Very Reliable	25
3	12	48.00	13	52.00	0	0.00	0	0.00	3.48	Very Reliable	25
4	18	72.00	7	28.00	0	0.00	0	0.00	3.72	Highly Reliable	25
AGGREGATE WEIGHTED MEAN									3.56	Highly Reliable	25

Table 4.2 presents the respondents' responses on various criteria used to evaluate the level of acceptability regarding the ease of use of the Portable Rice Grain Dryer. With a computed average mean of 3.56, it indicates high reliability. This table summarizes respondents' views on the ease of use of the Portable Rice Grain Dryer Machine, laying the groundwork for further analysis. It identifies strengths and areas for potential improvement, facilitating a comprehensive evaluation of the machine's ease of use.

Table 4.3 *Level of Acceptability in terms of Cost*

Table 4.3 *Level of Acceptability in terms of Cost*

CRITERIA	4		3		2		1		WEIGHTED MEAN	INTERPRETATION	RESPONDENTS
	F	%	F	%	F	%	F	%			25
1	8	32.00	14	56.00	3	12.00	0	0.00	3.20	Very Reliable	25
2	5	20.00	15	60.00	5	20.00	0	0.00	3.00	Very Reliable	25
3	9	36.00	14	56.00	2	8.00	0	0.00	3.28	Very Reliable	25
4	11	44.00	14	56.00	0	0.00	0	0.00	3.44	Very Reliable	25
AGGREGATE WEIGHTED MEAN									3.23	Very Reliable	25

Table 4.3 provides an overview of respondents' feedback on different criteria used to evaluate the acceptability level concerning the Cost of the Portable Rice Grain Dryer Machine. With a computed average mean of 3.23, indicating high reliability, respondents generally perceive the machine's cost aspect as very reliable. This finding emphasizes the importance of considering cost-related factors in determining the acceptability and feasibility of implementing the Portable Rice Grain Dryer Machine within relevant contexts.

Table 4.4 *Grand Mean for the 3 Levels of Acceptability*

Table 4.4 *Grand Mean for the 3 Levels of Acceptability*

Level of Acceptability	Mean (X)	Interpretation
Design	3.72	**HIGHLY RELIABLE**
Performance	3.56	**HIGHLY RELIABLE**
Cost	3.23	**VERY RELIABLE**
Grand Mean	**3.50**	**HIGHLY RELIABLE**

Table 4.4 displays respondents' responses regarding various criteria used to assess the acceptability level of the Portable Rice Grain Dryer Machine. With a computed grand mean of 3.50, indicating high reliability, it provides the mean of each criterion gathered from the responses of twenty-five (25) survey participants.

CHAPTER V
SUMMARY, CONCLUSION, AND RECOMMENDATION

The summary, conclusion, and recommendation are essential components that help to summarize the study, draw conclusions based on the findings, and provide suggestions for further research or practical applications.

SUMMARY

Based on the analysis and interpretation of the collected data, the investigation into the developed system's Design, Performance, and Cost yields the following summary of findings.

The evaluation of respondents regarding the acceptability of the system's design, as shown in Table 4.1, indicates that the developed system, named "Portable Rice Grain Dryer," is highly reliable regarding its design, with a computed mean average of 3.72. These results demonstrate that the system has successfully achieved the desired outcome in terms of its design.

Regarding the evaluation of the system's performance by respondents, as depicted in Table 4.2, the developed system, known as the "Portable Rice Grain Dryer," also scores high in terms of performance reliability, with a computed mean average of 3.56. These findings indicate that the system has successfully met the intended outcome regarding its performance.

As presented in Table 4.3, the system's cost acceptability findings suggest that the developed system, "Portable Rice Grain Dryer," is moderately reliable, with a computed mean average of 3.23. These results indicate that the system has achieved the intended output regarding its Cost.

These summarized findings provide valuable insights into the overall effectiveness and acceptability of the developed Portable Rice Grain Dryer system, contributing to a comprehensive understanding of its design, performance, and cost aspects.

CONCLUSION

In conclusion, the introduction of the Portable Rice Grain Dryer represents a significant advancement in addressing the challenges faced by small-scale farmers during the rice drying process. This innovative solution embodies practicality and efficiency, offering farmers a reliable alternative to traditional sun drying methods. Our study has underscored the substantial benefits of adopting such a system, including labor reduction and process streamlining.

By harnessing technology, the Portable Rice Grain Dryer simplifies drying operations, boosting efficiency and productivity. Its portability empowers

farmers to optimize drying activities regardless of weather conditions, ensuring flexibility and reliability throughout the harvesting season.

In essence, the Portable Rice Grain Dryer emerges as a transformative solution that meets the immediate needs of small-scale farmers and fosters positive outcomes across various aspects of agricultural production and economic development.

RECOMMENDATION

Based on the observed effectiveness of the Portable Rice Grain Dryer Machine, several enhancements are recommended to improve its functionality further and address common challenges farmers face. Firstly, integrating an automated rice discharge mechanism would significantly enhance user convenience by streamlining the process of removing dried rice from the container, reducing manual effort and saving time during harvesting and processing.

Additionally, incorporating an exhaust system to remove excess heat generated during the drying process is essential. This will help regulate temperature and humidity levels within the dryer, ensuring optimal drying conditions and consistent grain quality. The exhaust system will prevent overheating and moisture buildup by maintaining proper ventilation, minimizing the risk of grain spoilage, and ensuring high-quality output.

Based on survey data indicating high levels of satisfaction and acceptability among users, farmers should strongly consider integrating our Portable Rice Grain Dryer Machine into their post-harvest processing workflows. The positive feedback from users underscores the effectiveness and practicality of the system, making it a valuable asset for enhancing drying operations in agricultural settings. By utilizing our system, farmers can streamline their drying processes, reduce post-harvest losses, and improve the overall quality of their rice products. Therefore, based on the survey results and user feedback, we highly recommend that farmers embrace our Portable Rice Grain Dryer Machine to optimize their drying operations and enhance their agricultural productivity.

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DEVELOPMENT OF AN AUTONOMOUS PLANT HYDRATI ON SYSTEM FOR THE GRASSES IN ASIAN COLLEGE LANDSCAPED GROUNDS

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ABSTRACT

This research presents the development and implementation of an Autonomous Solar-Powered Plant Hydration System designed for the grassy landscapes of Asian College in Dumaguete City, Philippines. The system integrates automation and sustainable energy sources to efficiently water the college grounds, addressing manual labor challenges and ensuring accurate plant hydration. The system uses autonomous sensors to detect dry soil conditions, initiate watering, and promote water conservation. By harnessing solar power, it operates off-the-grid, reducing environmental impact and operational costs. The system's functionality includes Arduino-based soil moisture monitoring and obstacle avoidance, facilitating efficient plant care. Feedback from users indicates moderate reliability and usefulness, suggesting potential for further enhancements. This research contributes to advancing eco-friendly and efficient plant hydration practices in educational institutions.

Keywords: solar-powered, plant hydration, water conservation

CHAPTER I

INTRODUCTION

The researchers developed an Autonomous Solar-Powered Plant Hydration System designed explicitly for the grasses at Asian College, located on Dr. V. Locsin Street, Dumaguete City, Negros Oriental, Philippines. This innovative system sought to revolutionize plant hydration by seamlessly integrating automation and sustainable energy sources. Addressing the specific needs of Asian College landscapes with its extensive grass areas, the technology ensured adequate watering through autonomous sensors while harnessing solar power, offering a scalable and efficient solution tailored to the grassy expanses of the institution.

The primary objective of this system was to alleviate the manual labor associated with watering college grounds, with a particular focus on the grassy areas, while ensuring efficient and accurate plant hydration. Equipped with autonomous sensors, the system could independently detect dry soil conditions in grassy regions and initiate watering. This level of automation reduced the reliance on manual monitoring. It ensured that water was dispensed until the soil in these areas reached the required moisture level, preventing over-watering and promoting water conservation.

The system's reliance on solar power for energy generation was a vital feature. The system operated off the grid by harnessing solar energy, minimizing the environmental impact and significantly reducing operational costs associated with conventional energy sources. This solar-powered approach enhanced the system's sustainability and aligned with the growing emphasis on eco-friendly practices in educational institutions.

The Autonomous Solar-Powered Plant Hydration System for Asian College Grasses represented a tailored solution for the college. It aimed to enhance the maintenance of its grounds, focusing on efficiency, resource conservation, and sustainability of the grassy landscapes specific to Asian College.

STATEMENT OF THE PROBLEM

Like many educational institutions with expansive grounds, Asian College faced challenges efficiently maintaining its green landscapes. The institution relies on a sprinkler system and manual labor to manage grassy areas. However, this approach often led to uneven watering, making some regions excessively moist while others inadequately hydrated.

The researchers observed that a segment of the Asian College landscape exhibited excessive moisture due to the placement of a water sprinkler in one area. Conversely, other parts of the grounds remained dry, indicating inefficiencies in the current irrigation system. Furthermore, the manual labor required for watering tasks detracted resources that could be allocated to educational priorities. Thus, an efficient and sustainable solution to automate plant hydration within Asian College's landscaped grounds was needed.

OBJECTIVES OF THE STUDY

This study introduced a soil hydration system uniquely suited to Asian College's needs. By integrating automation and sustainable energy sources, this project aimed to revolutionize soil hydration practices, considering factors such as soil condition and its impact on plant growth, soil temperature regulation, groundwater recharge, nutrient distribution, and erosion control. Through this approach, the system sought to minimize manual labor while maximizing resource efficiency, ensuring optimal conditions for the college's landscaped grounds.

The following objectives encapsulate the core goals of this innovative venture, where soil hydration becomes a seamlessly automated and eco-friendly process.

Specifically, the objectives of this project are as follows:

- Develop a system with sensors to detect dry soil conditions, triggering precise watering cycles.
- Design the system to operate autonomously without the need for manual intervention.
- Implement a reliable solar power infrastructure to generate energy for the system, reducing reliance on conventional power sources and enhancing sustainability, especially in outdoor environments with abundant sunlight.

SCOPE AND LIMITATIONS

This project focused on developing an Autonomous Solar-Powered Plant Hydration System tailored to Asian College landscaped grounds. The system integrated automation and sustainable energy sources to achieve precise and efficient plant hydration, explicitly emphasizing the expansive grass areas within the college. The project scope included the system's technical Design, implementation, and performance evaluation. Key components involved the

integration of autonomous sensors, solar power infrastructure, and an efficient water delivery mechanism to ensure scalable and user-friendly plant hydration solutions in the college's landscaped areas.

While the project aimed for ambitious objectives aligned with Asian College's environmental sustainability goals, certain limitations were acknowledged. The system's efficiency might be influenced by weather conditions, particularly during extended periods of low sunlight or inclement weather, which could impact the solar-powered operation. Maintenance checks were essential for optimal Performance, necessitating attention to factors such as sensor calibration and routine inspections.

SIGNIFICANCE OF THE STUDY

The significance of this study directly impacts key stakeholders within Asian College, including school gardeners, utility management, and the institution as a whole.

● **Enhanced Working Conditions for School Gardeners:** Implementing the Autonomous Solar-Powered Plant Hydration System significantly improved working conditions for school gardeners responsible for maintaining the college's landscapes. Gardeners can focus on other critical tasks by automating the hydration process and ensuring consistent moisture levels, increasing job satisfaction and productivity. This directly benefited the well-being and professional development of the gardening staff.

● **Utility Management Efficiency:** Adopting an autonomous plant hydration system tailored for Asian College landscapes reduced reliance on traditional irrigation methods, resulting in substantial water savings. This aligned with the institution's commitment to sustainability and translated into tangible cost savings for utility management. The college has effectively managed its utility expenses by optimizing water usage and integrating renewable energy sources like solar power while minimizing environmental impact.

● **Institutional Advancement:** The study's emphasis on technological innovation and sustainable campus management reflected positively on Asian College as an institution. By embracing cutting-edge solutions for landscape maintenance, the college demonstrated its commitment to operational efficiency and environmental stewardship. This enhanced the institution's reputation and attractiveness to prospective students, faculty, and donors who prioritized sustainability and responsible resource management.

In summary, this study's significance extended beyond general benefits to specific advantages for school gardeners, utility management, and Asian College's institutional reputation. By addressing the needs and priorities of these stakeholders, the study contributed to a more efficient, sustainable, and forward-thinking campus environment.

DEFINITION OF TERMS

● **Autonomous:** Capable of operating independently without continuous manual intervention or control.

● **Humidity:** Humidity refers to the amount of water vapor in the air and is typically measured using metrics such as relative humidity, absolute humidity, a nd specific humidity.

● **Landscape:** The visible features and physical characteristics of an area, encompassing natural elements such as terrain, vegetation, water bodies, and artificial structures.

● **Scalability:** The ability of a system or technology to adapt and perform efficie ntly across varying scales or sizes, ensuring flexibility and applicability to different environments.

● **Solar Power:** Energy derived from the sun's radiation, harnessed through solar panels to generate electricity for powering electronic systems.

● **Sustainability:** The practice of using resources to meet present needs without compromising the ability of future generations to meet their own needs, often involving eco-friendly and energy-efficient approaches.

●**Technical Design:** The detailed arrangement and functionality of the components in a system, specifying how technology is engineered to achieve its objectives.

● **Water Delivery:** The system responsible for dispensing precise amounts of water to a designated area, often controlled by sensors and automation.

CHAPTER II

REVIEW OF RELATED LITERATURE

Reviewing related literature is essential to any research study as it provides a comprehensive overview of existing knowledge and research conducted in the field. This section aims to present a synthesis of relevant literature and studies published before the current research, highlighting their contributions, limitations, and gaps in knowledge. By examining the existing body of literature, researchers can identify the research questions or hypotheses that have not yet been adequately addressed and establish the rationale for conducting their study.

Foreign Related Literature and Studies

The study by Angelopoulos, Nikoletseas, and Theofanopoulos (2012) explored various existing systems aimed at automating plant watering processes to address issues such as plant death due to neglect, the increasing costs of labor, and security concerns. It highlighted shortcomings in previous systems, such as high costs, lack of portability, and limited functionality. The "Plant Watering Autonomous Mobile Robot" proposed in the study aimed to overcome these challenges by providing a cost-effective, portable, and efficient solution for watering potted plants.

The robot's working environment involved a predefined path with plants placed along it. LDR sensors detected the path, while RFID tags on the plants enabled the Robot to locate them. Due to weight constraints, the robot carried limited water, limiting the number and size of pots it could water in one go.

Key features of the proposed system included its portability, cost-effectiveness, and autonomous operation. It aimed to prevent plant death by providing timely and adequate watering. The study also outlined the materials, methods, results, and analysis of the system's Performance and future scope for improvements (Angelopoulos & Theofanopoulos, 2012).

According to Zhang et al. (2024), in their study titled "Modeling and Optimization of Watering Robot Optimal Path for Ornamental Plant Care," watering ornamental plants was considered time-consuming with the increasing garden size. Employing robots to conduct the watering task was seen as a feasible way to improve watering efficiency. However, general path planning models for watering robots faced various difficulties, such as the

curse of dimensionality caused by the excessively oversized irrigation area and insufficient irrigation due to weather conditions.

The paper proposed two novel watering robot optimal path modeling strategies to tackle these issues. Firstly, a sliding window strategy was proposed to tackle the curse of dimensionality. Specifically, the whole watering area was partitioned into many sub-areas using the sliding window, and each sub-area was watered independently. Secondly, to overcome the problem of soil moisture still not reaching the expected levels due to various weather conditions, the paper proposed a placeholder strategy, which enabled the watering robot to adjust the watering path dynamically.

A novel genetic algorithm with neighbor-exchanging strategies was proposed to test these strategies. Extensive experiments demonstrated the effectiveness of watering robot path planning models based on the proposed strategies (Zhang et al., 2024).

According to Kumar et al. (2024), in their "Solar-Powered Water Pumping Systems for Irrigation: A Comprehensive Review on Developments and Prospects Towards a Green Energy Approach," the electricity deficit and higher fuel costs affected the water supply to irrigation requirements. Solar energy for water pumping was presented as a promising alternative to conventional electricity and diesel-based pumping systems—the photovoltaic (P.V.) technology used for solar water pumping converts solar energy into electrical energy.

This electrical energy was used to operate the water pump, which was connected to a sprinkler for irrigation. The study's main objective was to present the best method for saving electricity and water. In a water irrigation system, the sprinkler with a solar water pump was used to minimize water usage and reduce electricity consumption.

The sprinkler sprayed water in the irrigation field to reduce water consumption. The photovoltaic (P.V.) technology used to produce electricity operates the motor for solar pumps. The combined sprinkler and environmentally friendly, cost-effective photovoltaic technology helped to minimize electricity and water usage (Kumar et al., 2024).

According to Yan et al. (2023), monitoring soil water content (SWC) distribution was crucial for better understanding soil water dynamics and accurate hydrological modeling. In their research "A Pipeline Robot System for Monitoring Soil Water Content Distribution," a pipeline robot system for monitoring SWC distribution was designed to improve the current technical problems of insufficient measurement distance and low positioning accuracy of the existing SWC monitoring platforms.

The system consisted of a pipeline robot, a fixed base station, and a PVC pipe. The robot could fit into a 55-mm-diameter PVC pipe to measure SWC distribution horizontally, vertically, or at any angle to the horizontal direction. The base station was a data collector

and supplied power and distance information for recharging and positioning the robot. A series of tests were conducted to evaluate the Performance of the pipeline robot system. Field experiments were also conducted to monitor soil water infiltration and horizontal distribution of SWC in the crop root zone at three plots.

The results showed that the minimum radius of the volume of sensitivity of the dielectric sensor was about 2.25 cm. The robot for mobile measurement performed stably in both horizontal and vertical directions, and the response of the dielectric sensor output to different dielectric materials was significant. The accumulated error the encoder was effectively decreased from 4.3% to 1.2% by correcting the position error using the laser ranging sensor.

The measured SWCs during the calibration experiment were highly correlated with those obtained by the drying method (R^2 = 0.990 and RMSE = 0.0181 cm^3/cm^3). The results of the field experiments demonstrated that the system was feasible for monitoring soil water infiltration in the vertical direction and SWC distributions of the crop root zone horizontally at the three plots, indicating the potential application of the developed system for long-term monitoring of SWC distribution under field conditions shortly.

Autonomous navigation of agricultural robots and vehicles in agricultural environments was a prerequisite for accomplishing various tasks. However, precision navigation of agricultural robots remained a challenging issue due to the complex and unstructured nature of the agricultural environment.

With the development of electronics and information technology, machine vision technology has become a promising tool for the real-time and accurate navigation of agricultural robots. Due to its low hardware cost and rich visual information, machine vision technology has been intensively studied and widely used in autonomous navigation for agricultural robots. Aiming at the remarkable complexity of the agricultural environment, the paper reviewed the research advances of agricultural autonomous vehicles and robot navigation and guidance based on machine vision (Yan et al., 2023).

Local Related Literature and Studies

Edmond et al. (2015) from Lyceum of the Philippines University-Laguna (LPU-L) introduced an Automated Soil Moisture Sensing Water Irrigation System with a Water Level Indicator, targeting local needs in efficient plant irrigation. This system integrated cutting-edge technology with practical applications, utilizing soil moisture sensors and a microcontroller-

based pumping mechanism to optimize water usage. With a focus on water conservation and labor-intensive irrigation practices, this project incorporated a water level indicator to monitor reservoir capacity, ensuring effici ent water management.

Cadao et al. (2021) presented their study on an Automated Plant Watering System using Arduino, aiming to create a cost-effective, user-friendly solution for plant watering through sensor-based automation. Based on sensor data, their research evaluated the system's accuracy in allocating water to plants. It explored ways to reduce human intervention in farm work while ensuring plants received adequate water. The authors strove to design an affordable, efficient, easy-to-use automated watering system, exploring factors that minimize human intervention and enable autonomous learning.

The National Irrigation Administration's (NIA) efforts to intensify the development of solar-powered irrigation projects nationwide marked a significant stride towards sustainable agriculture and rural development. By leveraging solar energy, the NIA aimed to reduce reliance on costly diesel pumps, easing the financial burden.

On farmers while promoting economic sustainability in the agricultural sector. However, despite the promising benefits, there were limitations and challenges to consider. Initial investment costs, scalability issues, and technical expertise required for implementation might have hindered widespread adoption, particularly among small-scale farmers.

Additionally, weather fluctuations could affect the reliability of solar-powered irrigation systems, necessitating careful planning and adaptation strategies. Further research was needed to assess these projects' socioeconomic and environmental impacts, explore innovative financing mechanisms, and evaluate long-term Performance and sustainability. Despite these challenges, the NIA remained committed to providing efficient, reliable, and sustainable irrigation services, driving the integration of renewable energy into irrigation infrastructure (SELVA, 2023).

In another study, Bathan et al. (2022) discussed designing and implementing an Automated Irrigation System Using a Thermoelectric Generator as a Soil Moisture Detector. This research focused on utilizing thermometric generators (TEGs) integrated into heat exchangers to detect soil moisture levels. With a microcontroller automating the irrigation process based on TEG data, this system adjusted water consumption according to soil conditions, promoting water conservation and optimizing plant growth. This localized solution addressed the inefficiencies of manual irrigation systems, offering a more precise and resource-efficient approach to plant hydration.

The implementation of the Caridad Norte and Sur Solar Irrigation System in Llanera, Nueva Ecija, published by Julio Yap in 2019, marked a significant miles tone.

In sustainable agriculture and rural development. Developed by the Department of Agriculture (DA) Regional Field Office 3, in collaboration with R.U. Foundry and Machine Shop Corporation (RUFMSC), this solar-powered irrigation system was the first and largest in Luzon. With 140 Lorentz solar panels and advanced electronic control devices, the system provided a reliable irrigation water supply to 125 marginalized rice farmers, enhancing rice production in highland rainfed areas.

The system's use of solar energy offered a cost-effective and environmentally friendly alternative to diesel-powered pumps, addressing farmers' economic and environmental challenges. By utilizing renewable energy sources, the solar irrigation system reduced dependence on diesel fuel, mitigating the impact of fluctuating fuel prices and reducing greenhouse gas emissions. Furthermore, the facility's construction on precision-engineered aluminum frames ensured durability and resilience in extreme weather conditions, enhancing its reliability and longevity.

Despite the promising benefits, challenges remained in the widespread adoption of solar-powered irrigation systems. Initial investment costs and technical expertise required for installation might have limited access for small-scale farmers. Additionally, the system's reliability could be affected by weather fluctuations, requiring continuous monitoring and maintenance. Further research and investment were needed to address these challenges and promote the scalability and sustainability of solar irrigation systems nationwide.

Overall, the Caridad Norte and Sur Solar Irrigation System exemplified the potential of renewable energy to revolutionize agricultural practices, improve food security, and empower rural communities. By harnessing solar power for irrigation, marginalized farmers increased their productivity, reduced operating costs, and contributed to a more sustainable agricultural future in the Philippines (Yap, 2019).

Foreign Related System

Plant Watering Autonomous Mobile Robot

In the research conducted by Hema N. (2012) on the 'Plant Watering Autonomous Mobile Robot,' the emphasis was on developing a cost-effective and portable solution for autonomously watering potted plants. Like the Solar Powered Smart Irrigation System discussed by Harishankar et al. (2014), this study aimed to optimize water usage in a specific context, focusing on indoor or patio plant

care rather than agricultural irrigation. The research integrated sensors and robotics to create a system capable of detecting dry soil conditions and dispensing water accordingly, mirroring the utilization of moisture sensors in the irrigation system to regulate water flow.

While the Solar-Powered Smart Irrigation System focused on direct irrigation methods powered by solar energy, the 'Plant Watering Autonomous Mobile Robot' extended this concept by incorporating autonomous navigation and obstacle avoidance. This innovative approach ensured precise watering of potted plants, addressing the challenge of insufficient watering due to busy lifestyles and manual watering techniques.

Both studies underscored the importance of conserving water resources by integrating renewable energy sources and intelligent systems tailored to specific watering needs, whether in agriculture or indoor plant care.

Development of an autonomous mobile plant irrigation robot for a semi-structured environment

In their study on the 'Development of an autonomous mobile plant irrigation robot for the semi-structured environment,' Adeodu, Bodunde, Daniyan, et al. (2019) addressed the challenge of insufficient watering leading to plant withering, a problem exacerbated by labor intensity and plant owners' busy schedules. They proposed an autonomous mobile robot as a potential solution, integrating moisture sensing and irrigation functionalities to ensure efficient plant hydration.

Robotic Plant Care System

Drawing parallels to previous research, the study highlighted the limitations of existing systems such as the Robotic Plant Care System developed by Sikorski (2003) and the Pot-Pet flowering robot designed by Kawakami et al. (2011). While these systems demonstrated advancements in automation, they still relied on manual intervention or faced constraints related to cost-effectiveness and portability.

Similarly, Angelopoulos et al.'s (2011) work on an intelligent garden watering system using wireless sensor networks showcased advancements in soil moisture analysis. However, it lacked portability and integration with plant growth. Additionally, Sadeky et al. introduced an acoustic-based mechanism for real-time soil moisture measurement but faced challenges adapting it to different soil types.

Adeodu, Bodunde, Daniyan, et al. (2019) research aimed at developing an autonomous mobile plant irrigation robot capable of navigating semi-structured environments while avoiding obstacles. Their system integrated humidity and infrared sensors for moisture detection and obstacle avoidance, emphasizing autonomous operation and efficient water management. This approach aligned with the overarching goal of conserving water resources while addressing the labor-intensive nature of traditional watering methods.

Therefore, while previous studies laid the groundwork for automated plant care systems, Adeodu, Bodunde, and Daniyan (2019) extended these concepts by focusing on autonomous navigation and real-time moisture sensing, contributing to advancements in efficient water resource management for plant cultivation.

Theagricultural cyberphysical system enabled the remote management of so lar-powered precision irrigation.

In their research on 'Agricultural cyber-physical systems enabled for remote management of solar-powered precision irrigation,' Selmani et al. (2019) addressed the growing interest in designing and optimizing Agricultural Cyber-Physical Systems (ACPS) for precision agriculture. The study focused on cyberizing solar photovo ltaics.Watersystems (SPVWS) will facilitate remote irrigation management, exte nding the typical ACPS architecture to accommodate solar irrigation facilities. Drawing on previous works in ACPS design and implementation, the study emphasized the collaborative nature of CPSs and their ability to enhance Performance and
efficiency in various domains, including precision agriculture. Notable advance ments include multi-layered service frameworks, sensor optimization, and remote monitoring and control functionalities. Selmani et al. (2019) proposed a distributed architecture based on the client-server paradigm, utilizing the Vert—x reactive platform for bi-directional communication between operational and supervisory levels. Embedded devices deployed at the operational level

facilitated data transmission and execution of commands, while cloud-based micro-services enabled advanced analyses and remote-control tasks.
Previous studies highlighted the importance of remote monitoring and control in precision agriculture, with works focusing on multi-agent architectures, low-cost solutions, and autonomous irrigation management systems. Integration of wireless sensor networks and geographic information systems further enhanced system capabilities. The study's innovation relied on integrating solar-powered irrigation systems into the ACPS framework, addressing energy supply challenges and system autonomy.

The research aims to improve energy efficiency and system autonomy by cyberizing SPVWS, contributing to sustainable agricultural practices.
Overall, Selmani et al.'s (2019) work represented a significant contribution to the field of precision agriculture, demonstrating the potential of ACPSs in remote management of solar-powered irrigation systems and paving the way for future research in renewable energy-powered agricultural technologies.

Solar powered water pumping systems for irrigation: A comprehensive review on developments and prospects towards a green energy approach

In their study, 'Combined Effect of Solar Power Pump Connected with Sprinkler System,' Kumar et al. (2020) addressed the pressing issues of electricity deficit and rising fuel costs affecting irrigation water supply. The researchers proposed integrating solar energy with water pumping systems to minimize electricity usage and water consumption in irrigation practices.

Acknowledging the increasing energy demand and the environmental concerns associated with conventional energy sources, Kumar et al. emphasized the importance of renewable energy, particularly solar power, as a sustainable and environmentally friendly alternative. They highlight the benefits of solar water pumping systems over diesel-based alternatives, including lowered operating costs, reduced maintenance, and minimal environmental impact.

The study discussed the methodology of combining a solar-powered water pump with a sprinkler system for irrigation purposes. By harnessing solar energy to operate the water pump, the system maximized energy efficiency and reduced reliance on conventional electricity or diesel generators. The researchers utilized a converter to regulate the power supply from the solar panels to the water pump, ensuring optimal performance and energy storage in batteries.
Through their research, Kumar et al. demonstrated the potential of solar-powered irrigation systems to address the challenges of energy scarcity and water conservation in agriculture, particularly in regions with limited access to

electricity. By efficiently utilizing solar energy to power irrigation practices, the system contributed to sustainable agricultural development while minimizing environmental impact.

Overall, the study provided valuable insights into the feasibility and benefits of integrating solar power with irrigation systems, offering a cost-effective and environmentally friendly solution for water management in agriculture.

Development of a solar-powered intelligent irrigation control system Kit

Wanyama et al. (2023) addressed the pressing challenges facing agricultural productivity in developing countries due to climate change and water scarcity. In their paper titled "Development of a Solar-Powered Smart Irrigation Control System Kit for Efficient Agricultural Water Management," the authors introduced a novel soluti on. We are enhancing irrigation practices by integrating innovative technology and renewable energy sources. Agriculture is vital in many developing economies, so ensuring efficient water usage is paramount, especially in the face of increasing water demands and climate variability. The authors highlighted the significant strain on freshwater resources caused by traditional irrigation methods, emphasizing the need for innovative approaches to optimize water use efficiency while maintaining crop productivity.

The proposed solution, the Smart Irri-Kit, was designed to address these challenges by combining solar power and intelligent irrigation scheduling. The system utilized a humidity sensor to provide real-time feedback on soil moisture levels, enabling precise and timely water delivery to crops. By automating the irrigation process based on actual plant needs, the Smart Irri-Kit minimized water wastage and promoted sustainable water management practices. Key features of the Smart Irri-Kit included an automated tank water level control system that triggers pump activation during irrigation, ensuring efficient water delivery to crops. The integration of solar power enhanced the system's autonomy and reducedoperational costs, making it particularly suitable for remote agricultural a reas with limited access to conventional energy sources.

The development and field testing of the Smart Irri-Kit at Makerere UniversityAgricultural Research Station Kabanyolo demonstrated its effectivene ss in achieving this: efficient irrigation scheduling and soil moisture monitoring. The system's humidity sensors accurately detected soil moisture levels, validating its reliability for irrigation decision-making. Overall, the Smart Irri-Kit represented a sustainable and automated solution for optimizing irrigation practices, contributing to water conservation and improved crop yield. Integrating solar power and intelligent technology held great potential in promoting efficient and sustainable agricultural water management practices in developing countries.

Local Related System

Automatic Soil Moisture Sensing Water Irrigation System with Water Level Indicator

In their undergraduate thesis, Edmond et al. (2015), students from Lyceum of the Philippines University-Laguna (LPU-L), delved into developing an innovative solution for efficient plant irrigation. Situated within the Electronics Engineering Department, their research focused on crafting an Automated Soil Moisture Sensing Water Irrigation System with Water Level Indicator tailored to local needs.

With a keen eye on addressing the pressing issues of water conservation and labor-intensive irrigation practices, their project integrated cutting-edge technology with practical applications. The system optimized water usage by harnessing soil moisture sensors and leveraging a microcontroller-based pumping mechanism. It precisely gauged soil moisture levels and delivered water as needed. It incorporated a water level indicator to monitor reservoir capacity, ensuring effici ent water management.

Automated Plant Watering System using Arduino

The study conducted by Cadao et al. (2021) sought to create a cost-effective, user-friendly solution for plant watering by leveraging sensor data to automate the Process effectively. The authors evaluated the system's accuracy in allocating water to plants through testing based on sensor data and its overall efficiency. Additionally, the research aimed to enhance the system's versatility for quick watering mechanisms, reduce human intervention in farm work, and ensure plants receive adequate water. The researchers endeavored to design an affordable, efficient, and easy-to-use automated watering system, exploring factors that minimize human intervention and enable autonomous learning.

Automated Irrigation System Using Thermoelectric Generator as Soil Moisture Detector

This research conducted by Bathan, Jazelle Paula, et al. (2022) presented the Design and implementation of a Thermoelectric generator (TEG) as a soil moisture detector for an automated irrigation system. The TEG, integrated into two heat exchangers, detected the thermal difference between the air and soil, indicating soil moisture. A microcontroller is employed to automate irrigation.

The Process is based on the moisture levels detected by the TEG. This system adjusts water consumption based on soil conditions, promoting water conservation and optimizing plant growth. Manual irrigation systems often lead to inefficient water usage and poor plant growth. In contrast, automated systems accurately determine and maintain the appropriate soil moisture levels. This study utilized TEGs as soil moisture sensors, one serving as a control and the other installed in the plant area. A PIC microcontroller powered by solar energy was used for data acquisition and pump control. The methodology focused on loam soil, representing typical irrigated fields in the Philippines. Solar panels powered the irrigation system, while TEGs with heat exchangers detected soil moisture. They buried rubber tubes with water holes connected to a water pump submerged in a pail, supplying water to the soil. Electromechanical relayed controlled pump operation based on temperature differences and soil moisture levels (Jazelle Paula et al., 2013).

Synthesis

The significance of adopting the Autonomous Solar-Powered Plant Hydration System to Asian College lies in its potential to address the institution's specific challenges in maintaining its landscaped grounds. Drawing from the pool of foreign and local related literature or studies, it became evident that similar systems had been We have successfully implemented it in various contexts, yielding significant benefits in water conservation, labor efficiency, and environmental sustainability.

By synthesizing findings from these literature and studies, it was clear that adopting such a system at Asian College held immense promise. Firstly, the system offered a proactive solution to the uneven watering observed within the institution's grounds. By utilizing autonomous sensors and precise control mechanisms, the system could ensure consistent and efficient hydration of the grassy areas, mitigating the risk of overwatering or drought.

Secondly, integrating solar power into the system aligned with global tre nds towards renewable energy adoption. This reduced the institution's carbon footprint and presented long-term cost savings by minimizing reliance on traditional energy sources. Such a move resonated with the growing emphasis on sustainability within educational institutions worldwide.

Furthermore, adapting the Autonomous Solar-Powered Plant Hydration System to Asian College reflected a commitment to innovation and technological advancement. By embracing cutting-edge solutions, the institution could enhance its reputation as a forward-thinking educational establishment, fostering a culture of creativity and problem-solving among its students and faculty.

The synthesis of foreign and local literature underscored the significance of implementing the Autonomous Solar-Powered Plant Hydration System at Asian College. Beyond addressing immediate challenges in grounds maintenance, the system represented a strategic investment in the institution's sustainability, efficiency, and innovation agendas, positioning it as a leader in environmental stewardship within the educational landscape.

CONCEPTUAL FRAMEWORK OF THE STUDY

The study's conceptual framework outlines the key concepts, variables, and relationships underpinning the research investigation. This diagram illustrates the conceptual framework and the research investigation's theoretical structure.

a. **Input**

○ Ideas for creating the system: During this phase, brainstorming sessions are conducted to generate innovative concepts and designs, considering efficiency, sustainability, and practicality.

○ Raw materials and tools needed for construction: The study entails identifying and sourcing the components and equipment required to construct the system.

○ Cost considerations: An evaluation of the financial resources required for procuring materials, tools, and potential expenses associated with system development and implementation is conducted, ensuring budgetary constraints are accounted for throughout the project lifecycle.

b. **Process**

○ Processing: This stage involves translating the conceptual ideas generated into detailed plans and designs for the Autonomous Solar-Powered Plant Hydration System, outlining the system's functionalities, architectural layout, and integration within the landscaped area of Asian College.

○ Constructing: The physical assembly and integration of the system components are carried out according to the devised plans, encompassing tasks such as wiring configuration, mounting hardware, and ensuring proper placement within the designated site.

○ Testing: Rigorous evaluation of the system's functionality and Performance is conducted through various testing procedures, simulating real-world conditions to validate its effectiveness in autonomously hydrating plants and conserving water resources.
○ Revising: Continuous review and refinement of the system design and functionality is based on testing outcomes and stakeholder feedback, with necessary revisions and adjustments to enhance performance and usability.

c. **Output**
○ Autonomous Solar-Powered Plant Hydration System: The study's culmination resulted in the development and implementation of the system, designed to efficiently hydrate plants within Asian College's landscaped grounds while minimizing manual intervention and promoting environmental sustainability.

d. **Feedback**
○ A continuous feedback loop involving users, stakeholders, and systematic performance evaluations is established to gather insights on the system's usability, reliability, and effectiveness. This Feedback is utilized to inform ongoing improvements and optimizations to the system, ensuring its continual enhancement and alignment with evolving needs and objectives.

CHAPTER III

METHODOLOGY

This study provides a comprehensive overview of the methodology employed in this study, encompassing research and development methodologies. It outlines the specific procedures and techniques utilized to gather and analyze data and the systematic approach employed in developing the proposed solution.

RESEARCH METHODOLOGY

This chapter delineates the research methodology, detailing the procedures and techniques utilized to identify, select, Process, and analyze information crucial to developing the Autonomous Solar-Powered Plant Hydration System customized for Asian College landscaped grounds. It encompasses the sampling technique, research instruments, and statistical tools while addressing key facets of system development, such as the system development model, system requirements, and system design and processes.

Design

The research design for this study adopted a quantitative approach, explicitly employing a descriptive research design to comprehensively assess the effectiveness of the Autonomous Solar-Powered Plant Hydration System in Asian College landscaped areas. Quantitative research principles facilitated the systematic collection and analysis of Numerical data to explore relationships between variables. Through surveys, observations, and data collection methods, the study aimed to quantify factors such as soil moisture levels, plant growth rates, water consumption, and resource utilization, shedding light on the system's Performance. By focusing on how these variables are interrelated within the context of soil hydration and plant maintenance, the research sought to provide empirical evidence that could inform future improvements and decision-making processes regarding landscape management at Asian College.

Environment

For this study, a total of ten (10) respondents from the utility and gardening staff at Asian College - Dumaguete Campus, located on Dr. V Locsin Street,

Barangay Taclobo, Dumaguete City, were surveyed as a full-criterion using purposive sampling. These respondents were chosen to ensure a comprehensive understanding of plant hydration practices within the campus premises. Focusing on the perspectives of utility and gardening staff gained valuable insights into the effectiveness of current hydration methods and opportunities for improvement.

Respondents

The research involved selecting ten (10) respondents using purposive sampling, targeting all employed gardeners and utility personnel from our locale, and meeting all the criteria. The study included all institutions since the main focus was only on the gardeners and utility personnel. This approach ensured that the perspectives of those directly involved in landscaping and maintenance tasks were fully represented, providing valuable insights into developing the autonomous solar-powered soil hydration system within the institution.

Sampling Technique

The researchers employed a complete enumeration sampling technique or purposive sampling for the research project. This method targeted all available gardeners and utility personnel from Asian College - Dumaguete Campus who met the specified criterion of being directly involved in landscaping and maintenance tasks. Unlike other sampling methods that select a subset of the population, complete enumeration seeks to include every individual within the defined population who meets the criteria for inclusion. This approach ensures that all relevant individuals are included in the study, providing a comprehensive understanding of the subject matter. While complete enumeration may require more resources and time than other sampling methods, it offers high accuracy. It eliminates sampling bias, making it particularly suitable for studies where the population size is relatively small and the inclusion criteria are well-defined, as in this research project.

Sampling Procedure

The researchers employed purposive sampling by selecting all the gardeners and utility personnel who met the complete criterion of Asian College to participate in the study. This targeted selection aimed to ensure that individuals directly involved in landscaping and maintenance tasks were included in the sample population, providing relevant insights into soil hydration practices. Selected individuals were informed of their participation and briefed on the study's purpose and procedures to ensure their understanding and engagement.

The orientation and demonstration sessions are conducted so that the respondents can familiarize themselves with their roles and the system's functionality in evaluating the Autonomous Solar-Powered Plant Hydration System designed for Asian College landscaped areas. This session ensured that respondents were well-informed and actively involved participants in the study, providing valuable perspectives on the system's effectiveness.

Survey Instrument

This study employed a standardized survey questionnaire as the primary data collection tool. The questionnaire was instrumental in evaluating the performance and design aspects of the developed autonomous solar-powered soil hydration system.

The survey questionnaire was structured into three (3) distinct sections to assess various facets of the plant hydration system comprehensively:

- Section I is focused on evaluating the perceived usefulness of the system.
- Section II is focused on evaluating the perceived ease of use of the system.
- Section III is focused on evaluating the perceived Design of the system.

Data Gathering Procedure

To gather relevant information for the thesis on developing an Autonomous Solar-Powered Plant Hydration System, the researchers commenced by seeking permission from the identified participants within the Asian College—Dumaguete Campus. Upon securing consent, an orientation session was conducted to elucidate the purpose and significance of the study. Subsequently, survey questionnaires were administered to the participants, focusing on aspects of the Autonomous Solar-Powered Plant Hydration System's usefulness, ease of use, and Design.

Participants in the Beta testing phase of the system received survey questionnaires tailored to assess the application's acceptability. The criteria for evaluation encompassed factors such as usefulness, Design, and user-friendliness. Respondents were asked to rate the system during Beta testing using a self-designed survey questionnaire employing a Likert Scale, with ratings ranging from 1 (lowest) to 4 (highest).

After collecting survey questionnaires, the gathered data underwent a systematic tabulation, analysis, and interpretation of ratings. A predefined table for survey result interpretation was utilized to derive meaningful insights into the effectiveness and user satisfaction with the Autonomous Solar-Powered Plant Hydration System.

Statistical Treatment of Data

The collected data about assessing the Autonomous Solar Powered Plant Hydration System project's acceptability underwent thorough simulation, analysis, and interpretation, focusing on the specific variables under investigation. The weighted mean (W.M.) computation is employed in this research study to evaluate the acceptance level based on the computed weighted Mean on accuracy, complexity, and user-friendliness. Illustrated below is the formula for the computation of the Mean:

Weighted Mean =

$$\bar{x} = \frac{\sum w_n x_n}{\sum w_n}$$

Where:
x = Is the value n = Sample Size
Σx = Summation of individual observations

DEVELOPMENT METHODOLOGY

In this section, the researchers delved into the development methodology employed in the study, offering insight into the systematic approach utilized to design, implement, and evaluate the proposed solution.

Operational Feasibility

Operational Feasibility measures how well a proposed system solves problems takes advantage of the opportunities identified during scope definition and satisfies the requirements identified in the requirements analysis phase of system development.

System Development Life Cycle (SDLC)

The Software Development Life Cycle (SDLC) is an organized procedure for producing high-quality, low-cost software in the least amount of time. The SDLC develops and describes a detailed plan consisting of stages or phases, each with its Process and deliverables.

The researchers used the agile method for project management because it is flexible, adaptable to change, and requires high Input.

Figure 3.1 showcases the agile System Development Life Cycle (SDLC) model, which provides a structured approach to software development characterized by iterative and incremental progress, as depicted in the study's context.

The Agile Software Development Life Cycle (SDLC) provided a framework for deploying the plant hydration system iteratively and adaptively. In Agile, deployment occurred continuously or at the end of each sprint, allowing for frequent releases of new features and functionalities. Continuous deployment pipelines automate the Process of building, testing, and deploying the system, ensuring quick and seamless integration of updates. This approach reduced the risk associated with large, infrequent deployments and enabled the team to gather user feedback early and often. Additionally, Agile's emphasis on collaboration and Feedback enabled the team to iterate. Moreover, continuously improve the system, ensuring it remains responsive to user needs and evolving requirements throughout deployment.

System Block Diagram

The system block diagram presented in Figure 3.2 illustrates the data flow and interconnections among components constituting the Autonomous Solar-Powered Plant Hydration System, as relevant to the study. This system integrated crucial components, including the Humidity Sensor, Arduino Uno, and the Motors, working collaboratively to autonomously manage soil hydration within the landscaped grounds of Asian College.

The Humidity Sensor served as the primary data input device. It measured and reported the relative humidity of the air, determined the amount of water vapor present, and transmitted analog data to the Arduino Uno through its analog Input. The Arduino Uno, functioning as the control center and obstacle avoidance robot, processed the received analog data. It executed programmed logic to assess soil humidity conditions and triggered the solar-powered watering system through its output pins upon detecting dry soil, as defined by preset moisture thresholds. Fueled by solar energy, the solar-powered watering system facilitated water delivery through a hose to hydrate the soil in the designated areas. Once the soil moisture reached the desired levels, the system initiated the obstacle avoidance robot to relocate to assess moisture levels in different regions, restarting the soil hydration assessment and action cycle.

This cyclical and autonomous Process ensured the continuous and efficient management of soil moisture levels within the landscaped grounds of Asian College, aligning with the objectives of the Autonomous Solar-Powered Plant Hydration System outlined in the study.

System Flowchart

The System Flowchart visually represents the sequential steps and interactions within the proposed system, illustrating the flow of data and processes from Input to Output**.**

The flowchart illustrates the operation of the Autonomous Plant Hydration System, which incorporates various sensors and actuators to autonomously water plants in a landscaped area. Here is how the system works:

● Initialization: The system initializes by configuring pins for motor control, sensor connections, and servo motor attachments. Additionally, initial setup tasks are executed, such as setting the ultrasonic sensor's initial position and performing initial distance readings.

● Main Loop: The system enters the main loop, where the primary logic for plant hydration and obstacle avoidance is implemented.

● Obstacle Detection: The system continuously monitors the surroundings using an ultrasonic sensor mounted on a servo motor. It reads the distance to the nearest obstacle in front and adjusts its movement accordingly.

● Movement Control:

○ If an obstacle is detected within a specific range (45 cm), the system stops and initiates backward movement to avoid the obstacle.

○ After moving backward for a specified duration, the system stops and activates the servo motor to adjust the watering mechanism based on humidity readings from a DHT sensor.

○ The system then checks for obstacles to the right and left by turning the ultrasonic sensor in those directions and obtaining distance readings.

○ Depending on the distance readings, the system turns right or left to navigate the obstacle before resuming forward movement.

● Continuous Operation: The system repeats this Process in a continuous loop, ensuring continuous monitoring of obstacles and hydration of plants as needed.

● Humidity-based Watering: Besides obstacle avoidance, the system incorporates a humidity sensor to regulate plant hydration. If the humidity level falls below a certain threshold, indicating dry soil, the system activates the watering mechanism to hydrate the plants.

● Feedback Loop: The system periodically reads humidity levels and adjusts watering accordingly, ensuring that plants receive adequate hydration. Additionally, it continuously monitors the environment for obstacles and adjusts its movement to navigate around them, ensuring efficient operation within the landscaped area.

Overall, the flowchart demonstrates the systematic Process by which the Autonomous Plant Hydration System autonomously navigates its environment, avoiding obstacles while maintaining optimal soil moisture levels to ensure the health and growth of the plants.

Testing Procedure

The following section outlined the testing procedure employed to evaluate the effectiveness and functionality of the Autonomous Solar-Powered Plant Hydration System within the context of Asian College landscaped grounds.

Functional Testing

○ **Setup Preparation:** Assemble the entire Autonomous Solar-Powered Plant Hydration System.

○ **Hardware Integration:** Connect the humidity sensor, ultrasonic sensor, Arduino Uno, Driver Motors, Servo Motors, Relay, and Power Supply according to the designated pin configurations.

Functional Validation:

■ Test the sensitivity of the humidity sensor.

■ Test the sensitivity of the ultrasonic sensor.

■ Verify the functionality of the servo motor that triggers the water's path to open and close.

■ Validate the robot's movement to avoid obstacles in its path while conducting soil hydration operations.

■ Assess the solar panel's efficiency in powering the system components effectively.

Performance Testing

○ **Operational Speed:** Evaluate the system's response time in detecting dry soil, initiating hydration, and repositioning the humidity sensor.

○ **Reliability Assessment:** Conduct multiple cycles of soil hydration operations to determine the system's consistency in detecting and addressing dry soil areas.

○ **Longevity Testing:** Monitor the system's functionality and hardware durability over an extended period to ensure sustained Performance.

Compatibility Testing

○ **Arduino Board Compatibility:** Test the system's compatibility with various models of Arduino boards to ensure its adaptability to different configurations.

○ **Sensor Compatibility:** Validate the compatibility of the humidity sensor and obstacle avoidance sensors with the system's Design.

○ **Hardware Flexibility:** Verify the system's adaptability to different environmental conditions and terrains, ensuring it can function effectively in varied scenarios.

This testing procedure ensures a comprehensive assessment of the Autonomous Solar-Powered Plant Hydration System, covering its functionality, Performance under different conditions, and compatibility with diverse hardware setups in the context of the study.

Technical Feasibility

This section presents the researchers' activities in developing the proposed system, including the list of components or materials used and the different procedures, namely the interfacing procedure and Hardware or Software Compatibility checking.

List of Components

Interfacing Procedure

The Interfacing Procedure was a pivotal phase in developing and integrating various components within a system. The soil moisture content conditions were monitored using a humidity sensor interfaced with an Arduino Uno. The Arduino processed the sensor data to classi fy the soil.

Moisture levels in different conditions. Based on this classification, the Arduino triggered actions through a relay module connected to a servo motor. When the soil moisture fell below a certain threshold, indicating dry conditions, the Arduino activated the relay module to turn the servo motor 180 degrees, allowing water to flow and hydrate the soil through the system water pathway. This ensured the plants received adequate hydration to support their growth and health.

Simultaneously, the obstacle avoidance system operated independently is also controlled by an Arduino. It utilized an ultrasonic sensor to detect obstacles in the robot's path. When an obstacle isdetected, the Arduino sends commands to motor drivers to temporarily halt the robot's movement, allowing it to navigate the obstacle safely. This systemensured the robot could move autonomously without colliding with object s in its environment, protecting the robot and surrounding objects from damage. Both systems were powered by a 12V lithium battery and a solar panel with a booster module to increase voltage. A power supply display was also incorporated to monitor the voltage of the 12V lithium battery powering the system. This power supply display provided real-time Feedback on the battery's voltage level, enabling users to monitor the power status and take appropriate action. This ensured that the systems operated continuously, even in remote or outdoor environments where access to conventional power sources might have been limited.

Integrating these two systems automated and optimized the overall plant care and maintenance process. The combined functionality allowed the robot to navigate its environment, avoid obstacles, and effectively manage soil moisture levels to ensure the health and growth of the plants.

Based on the findings depicted in Figure 3.4, where soil humidity levels above 30% were categorized as very wet and those below as moderate or dry, researchers conducted preliminary trials using a humidity sensor calibrated to an Arduino UNO to conduct live reading and gathering of data. Through this experiment, the researchers could indicate a dominant pixel value within 50% to 60%. Consequently, they elected to utilize 60% as the foundational parameter for the system based on the frequency of the humidity above the level during the testing phase.

Researchers integrated this 60% threshold into the Arduino code as a pivotal reference point. When the humidity sensor detected soil moisture at or below this threshold, the Arduino triggered a signal to the relay module, prompting the servo motor to open the water's pathway to initiate water flow. Simultaneously, the Arduino commanded the motor to halt its operation until the soil moisture level rose above 60%, indicating wet soil conditions. Upon reaching this threshold, the Arduino sent a signal to the relay module to trigger the servo motor to turn zero degrees to close the water's pathway and directed the motor to resume locating dry soil areas.

This iterative process ensured effective soil hydration management, optimizing plant growth and health by maintaining soil moisture within the desired range. An obstacle avoidance system's interface integrates various components to enable seamless communication and operation. The Arduino microcontroller, which orchestrated the system's functionalities, was central to this setup.

Firstly, the ultrasonic sensor served as the primary input device, constantly scanning the surroundings for obstacles. It was wired to the Arduino, with its Trig and Echo pins connected to digital pins for data transmission. When an obstacle was detected, the ultrasonic sensor sent a signal to the Arduino. Next, the Arduino processed the received data to determine the appropriate action. If an obstacle was detected, the Arduino sent commands to the motor driver to temporarily halt the robot's movement, allowing it to avoid collision. These commands were conveyed through digital pins connected to the motor driver's Input and enabled pins. Simultaneously, the Arduino continued to monitor the soil moisture levels using a humidity sensor. If the soil moisture fell below a predefined threshold, indicating dry soil, the Arduino commanded the motor driver to resume the robot's movement, directing it to locate dry soil areas for irrigation.

This intricate interaction between the ultrasonic sensor, Arduino, motor driver, and other components ensured that the robot effectively avoided obstacles while carrying out its primary task of soil

hydration management. The system operated autonomously through precise interfacing and intelligent decision-making, navigating obstacles and optimizing plant health by maintaining adequate soil moisture levels.

Schedule Feasibility

Schedule Feasibility is defined as the probability of a project being completed within its scheduled time limits by a planned due date.

Project Team Organization

The project team is structured to efficiently manage and execute the development of the Autonomous Solar-Powered Soil Hydration System. The researchers include Syriyl Mae Mapili as the Project Manager, Writer, and Programmer; Charles Bokingkito and Junniel Banquerigo as technicians, Programmers, and Writers. This collaborative structure ensured a systematic approach to system development, code scripting, hardware assembly, and meticulous documentation, fostering a well-rounded team effort dedicated to achieving project objectives.

SYRIYL MAE D. MAPILI (Project Manager/Programmer/Writer)
- Managed the project development team
- Led, planned, and oversaw all project deliverables
- Handled budget, work plan, and project procedures
- Produced comprehensive system and research documents
- Ensured the quality and coherence of the system and research documentation
- Maintained the quality of program codes and resolved bugs

JUNNIEL BANQUERIGO (Technician/Programmer/Writer)
- Developed, assembled, and managed hardware components
- Led Design, scripting, and thorough code testing
- Maintained code quality and rectified bugs
- Produced detailed system and research documents

CHARLES Z. BOKINGKITO (Technician/Programmer/Writer)
- Contributed to hardware development and management
- Engaged in Design, programming, and code testing
- Assisted in ensuring code quality and bug resolution
- Participated in creating detailed system and research documents
- Ensured precision and detail in documentation

Work Breakdown

Theworkbreakdown structure stands as a pivotal tool within project mana gement methodologies. It operates by systematically breaking down complex projects into smaller, manageable components, facilitating a clear identification of essential deliverables necessary for the successful completion of the project.

Gantt Chart

The Gantt chart is a visual representation that showcases the project's timeline horizontally, divided into increments of days, weeks, or months. It vertically illustrates the various project tasks, their projected time, and the time to complete them.

Economic Feasibility

The economic feasibility section of this thesis examines the financial viab ility and potential returns of the proposed endeavor, considering factors such as initial investment requirements, operational expenses, revenue generation potential, and broader economic impacts.

Budget Plan

The budget plan, as depicted in Table 3.5, meticulously broke down the project's anticipated costs. Initially, the team had forecasted a capital of ₱5000.00 to execute the project. However, upon detailed examination and strategic planning, the breakdown revealed that only ₱3290.00 was required to cover all necessary expenses.

This significant cost efficiency underscored the team's prudent financial management and resource allocation. With careful consideration and informed decision-making, the project could be successfully implemented within the allocated time and budget, ensuring optimal utilization of available resources while maximizing project outcomes.

Cost Benefit Analysis

The introduction of the Autonomous Solar-Powered Plant Hydration System at Asian College required an initial investment of ₱3290. However, this upfront Cost was offset by substantial long-term economic benefits. Through the reduction or elimination of manual watering tasks, the system promised significant labor savings, estimated at a minimum wage of ₱440 per day. Moreover, by optimizing water usage, the system promised additional savings on the college's water bills. At the same time, the exact amount of water bill savings depended on the extent of water consumption reduction. By focusing solely on economic feasibility, it was evident that implementing this innovative system offered a favorable return on investment for Asian College. Despite the initial expenditure, the system's ability to reduce labor costs and water usage translated into tangible financial savings over time, ultimately contributing to the college's fiscal sustainability and operational efficiency.

CHAPTER IV

The chapter presents the analysis and interpretation of the collected data to determine the level of acceptability concerning the Design, Performance, and cost investigation of the Development of an Autonomous Plant Hydration System for the Grasses in the Landscaped Grounds of Asian College.

Survey Results on the Level of Usefulness of the Development of an Autonomous Plant Hydration System for the Grasses in the Landscaped Grounds of Asian College in terms of Design

Table 4.1: Survey Results on the Level of Usefulness Acceptability

CRITERIA	5		4		3		2		1		WEIGHTED MEAN	INTERPRETATION	RESPONDENTS
	F	%	F	%	F	%	F	%	F	%			10
Using the system in my job would enable me to accomplish tasks more quickly.	0	0	6	60	4	40	0	0	0	0	3.6	Moderately Reliable	10
Using the system in my job would increase my productivity.	0	0	7	70	1	10	2	20	0	0	3.5	Reliable	10
Using the system would make it easier to do my job.	0	0	7	2	1	10	2	20	0	0	3.5	Reliable	10
I would find the system useful in my job.	0	0	5	50	3	30	2	20	0	0	3.3	Reliable	10
AGGREGATE WEIGHTED MEAN											**3.48**	**Reliable**	**10**

Table 4.1 shows the summary and Mean of each criterion gathered from the responses of ten respondents to the survey. The evaluated average of the weighted Mean for the proposed development's Design is a computed average of 3.48.

Table 4.2: Survey Results on the Level of Ease-of-Use Acceptability

CRITERIA	5		4		3		2		1		WEIGHTED MEAN	INTERPRETATION	RESPONDENTS
	F	%	F	%	F	%	F	%	F	%			10
Using the system in my job would enable me to accomplish tasks more quickly.	0	0	9	90	1	10	0	0	0	0	3.9	Moderately Reliable	10
Using the system in my job would increase my productivity.	0	0	8	80	2	20	0	0	0	0	3.8	Moderately Reliable	10
Using the system would make it easier to do my job.	0	0	7	70	3	30	0	0	0	0	3.7	Moderately Reliable	10
I would find the system useful in my job.	0	0	10	100	0	0	0	0	0	0	4	Moderately Reliable	10
AGGREGATE WEIGHTED MEAN											3.85	Moderately Reliable	10

Table 4.2 displays the respondents' responses regarding the various criteria investigated to assess the ease-of-use level of the Development of an Autonomous Plant Hydration System for the Grasses in the Landscaped Grounds of Asian College.

The evaluated average of the weighted Mean of the proposed development is a computed average of 3.85.

Table 4.3: Survey Results on the Level of Design Acceptability

CRITERIA	5		4		3		2		1		WEIGHTED MEAN	INTERPRETATION	RESPONDENTS
	F	%	F	%	F	%	F	%	F	%			10
It would be easy to navigate the system interface and perform tasks without extensive training or guidance.	0	0	8	80	2	20	0	0	0	0	3.8	Moderately Reliable	10
System allows users to customize certain aspects of the interface to better suit their preferences and needs.	0	0	8	80	2	20	0	0	0	0	3.8	Moderately Reliable	10
Materials used for the construction of the robot can withstand different outdoor conditions.	0	0	6	60	4	40	0	0	0	0	3.6	Moderately Reliable	10
System is equipped with a high-capacity, reliable power source to ensure extended operation.	0	0	7	70	2	20	1	10	0	0	3.6	Moderately Reliable	10
AGGREGATE WEIGHTED MEAN											3.7	Moderately Reliable	10

Table 4.3 shows the respondents' responses to the different criteria investigated to evaluate the level of acceptability of developing an autonomous plant hydraulic system for the grasses in the landscaped grounds of Asian College.

The evaluated average of the weighted Mean of the proposed development is 3.7.

The aggregated responses from respondents regarding the acceptability of developing an Autonomous Plant Hydration System for the grasses in the landscaped grounds of Asian College, specifically focusing on its Design, are summarized in Table 4.4.

Table 4.4: Survey Results on the Level of Ease-of-Use Acceptability

CRITERIA	AGGREGATED WEIGHTED MEAN	INTERPRETATION
Survey Results on the Level of Usefulness Acceptability	3.48	Reliable
Survey Results on the Level of Ease-of-Use Acceptability	3.85	Moderately Reliable
Survey Results on the Level of Design Acceptability	3.70	Moderately Reliable
GRAND MEAN	**3.68**	**Moderately Reliable**

The Grand Mean, calculated at approximately 3.68, is derived from aggregating the weighted means of respondents' evaluations across various criteria related to the acceptability of the Autonomous Plant Hydration System's development. This result suggests an overall moderate level of reliability in terms of the system's usefulness, ease of use, and Design. In essence, it implies that, on average, the Autonomous Plant Hydration System's development is perceived as reasonably reliable and acceptable across the evaluated dimensions but with room for potential improvements.

CHAPTER V

SUMMARY, CONCLUSION, AND RECOMMENDATION

This chapter encapsulates the essence of the research findings for the Development of an Autonomous Plant Hydration System for the Grasses in the Landscaped Grounds of Asian College, drawing upon the summary, conclusions, and recommendations derived from the data analysis and interpretation.

Summary

The ratings provided by the gardeners and utility personnel, who were the primary users of the plant hydration system at Asian College, indicated moderately reliable perceptions across various criteria. In terms of enabling quick task accomplishment and increasing productivity, the system received weighted mean scores of 3.6 and 3.5, respectively, falling within the "Moderately Reliable" range. The ease-of-use aspects, such as system navigation and customization, also received moderately reliable ratings with a weighted mean score of 3.7. While the system was perceived as moderately reliable and helpful, there was room for improvement in certain areas to enhance its effectiveness and user satisfaction.

Conclusion

In conclusion, the Autonomous Solar-Powered Plant Hydration System for Asian College landscaped grounds offers a scalable and efficient solution for maintaining green spaces while minimizing environmental impact. Based on the ratings collected, the plant hydration system at Asian College was generally perceived as moderately reliable and valuable by gardeners and utility personnel. However, improvements such as system navigation and customization could have enhanced user satisfaction and overall system performance.

Recommendations

To improve the plant hydration system and address the identified areas for enhancement, the following recommendations are suggested:

- Conduct user feedback sessions to gather insights on specific pain points and usability issues experienced by gardeners and utility personnel.
- Prioritize enhancements based on user feedback and the perceived importance of different system features.
- Implement iterative design and development cycles to improve the system's functionality and ease of use incrementally.
- Provide comprehensive training and support to users to maximize their system utilization and ensure effective operation.
- Continuously monitor system performance and user satisfaction metrics to identify areas for ongoing improvement and refinement.

By implementing these recommendations, Asian College can enhance the effectiveness and usability of the plant hydration system, ultimately improving the management of landscaped areas and contributing to the overall satisfaction of gardeners and utility personnel.

ACTIFIT (GYM MANAGEMENT SYSTEM)

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ABSTRACT

The ACTIFIT Gym Management System is a crucial response to the growing needs of the fitness industry, aiming to simplify gym operations and improve member experiences. Utilizing modern technologies, this system allows gym owners to monitor important metrics such as membership trends, finances, and equipment usage. Through a comprehensive survey conducted in Valencia Municipality, the system's effectiveness among gym stakeholders was assessed, receiving positive feedback for its user-friendly design and practical features. This innovative solution tackles current industry challenges and sets a new operational efficiency and member satisfaction standard. It emphasizes the power of technology in optimizing gym operations and fostering dynamic fitness communities aligned with the needs of today's enthusiasts.

Keywords: management system, innovative solution, gym operations

CHAPTER I

INTRODUCTION

Technology has become an integral part of our daily lives, impacting almost every aspect of society, including communication, education, healthcare, entertainment, and more (Hillary, 2023). Technology has drastically changed how we interact with the world and each other, from smartphones to social media platforms. With this in mind, the researchers looked for various industries that lack the use of any technological advancement and, in the end, settled for the gym or fitness industry because most gyms and fitness centers still use the pen-and-paper method of tracking their members, schedules to name a few.

With that in mind, the researchers created a gym management system. The gym management system is a powerful tool that offers a wide range of features to assist gym staff members in managing their day-to-day operations. It will streamline various aspects of gym management, including equipment maintenance schedules and repairs, helping staff members stay organized and efficient. The software's user-friendly interface is designed to be intuitive, ensuring that even non-technical staff members can easily navigate and operate it without extensive training. The software can save gym owners and managers valuable time and reduce operational costs by automating time-consuming processes like equipment tracking and scheduling. With the ability to focus more on providing a superior experience for their members, gym staff members can use the software to elevate the overall quality of their services.

Project Context

The fitness industry has experienced significant growth over the past decade (Spraul, T., 2023), with a surge in gym memberships and fitness center participation as more individuals seek to improve their health and well-being. As a result, gym owners and managers are continuously searching for innovative ways to enhance their operations and member experience. This project addresses these needs by developing a cutting-edge gym management system offering various features and functionalities to streamline operations, engage members, and elevate the overall gym experience. By leveraging advanced technologies, this software can help gym staff members manage equipment usage, maintenance, and repairs more efficiently while improving member satisfaction and retention rates. Ultimately, this software will help gym owners and managers stay ahead of the competition and deliver exceptional service to their members.

Project Description

The gym management system is a specialized tool to enhance the overall gym experience. It provides gym or fitness center staff with a wide range of features and functionalities that streamline operations, increase member engagement, and improve the overall gym or fitness center experience.

The gym management system will be designed with features that are easy to use, require little training, and have an intuitive interface. Membership management, training scheduling, equipment maintenance, and workout progress tracking will all be included in the software, which will be easily accessible to gym staff. With the software's equipment tracking feature, gym managers can effortlessly oversee equipment usage, maintenance schedules, and repairs, streamlining maintenance procedures and ensuring that gym equipment is adequately maintained and ready for member use.

Objectives

The gym management system is a specialized system designed to assist gym owners and managers in managing their day-to-day operations effectively. The researchers' primary objective is to develop a system that could improve the operations of a gym or fitness center. The objectives of this project are as follows:

a. Payment tracking
b. Track workout progress
c. Manage training schedules
d. Manage staff, trainers, and members
e. Streamline membership management.
f. Track equipment usage and maintenance
g. Member attendance is achieved by scanning the QR Code
h. Provide reporting and analytic features for data-driven decision-making

Scope and Limitations

Developing a gym management system with various functionalities has become essential for gyms and fitness centers to manage their daily operations and provide better services to their members. The scopes of the study are:

a. To develop a gym management system.
b. The focus of the project is to create an effective system.
c. The software will be designed for a single gym or fitness center.
d. The system should streamline operations, improve communication, and enhance member experience.
e. The system will include various features for managing memberships, organizing training, and equipment maintenance.

As with other development projects, there are some limitations found in the proposed project, such as:

- The system developed in this project will not be scalable across multiple locations or franchises. It will be created solely in a single gym or fitness center.
- No hardware or other tangible equipment will be developed for the project. The focus is purely on developing software for gym management.
- The project will not cover any marketing or advertising aspects for the gym or fitness center.
- The project does not include advanced features such as artificial intelligence or machine learning. The focus is on developing a user-friendly system with basic functionalities for gym management.

Significance

This project can positively impact the gym and fitness industry by providing owners and managers with a comprehensive software solution to streamline operations, enhance member engagement, and improve the gym experience. With improved equipment maintenance and availability, gym owners and managers can maintain a loyal member base and attract new members. This project also contributes to the field of gym management and operations by offering a new software solution that meets the industry's needs.

Managers—The system can help gym managers streamline operations, manage users and memberships, improve member engagement and staff management, and manage finances better.

Staff—The system's equipment maintenance feature is designed to simplify staff tasks, helping them keep track of maintenance tasks and ensure that gym equipment is well-maintained and available for members.

Trainers—The system's workout progress tracking feature can help personal trainers monitor clients' progress and create customized workout plans.

Members—The system can provide members with access to training schedules, workout plans, and progress tracking, helping them stay engaged and motivated in their fitness journey.

Developers - Developers benefit from the gym management system project by improving their skills, gaining knowledge, solving problems, collaborating with teams, building portfolios, and gaining industry recognition.

CHAPTER II

REVIEW OF RELATED LITERATURE

The topics listed below are pertinent to the ACTIFIT Gym Management System. Each topic is relevant to the ongoing research, encompassing local and foreign literature and studies.

Foreign Literature

The study (Nakamura et al., 2019) aimed to improve gym information management for customers and staff, recognizing the vital role of exercise in overall well-being. It employed a literature review and questionnaire-based interviews with gym managers to understand current practices. Findings revealed manual and computer-based platforms for customer information storage, with social media platforms utilized for communication. The proposed system, developed using data and process models, was implemented with WAMP software, facilitating testing methodologies to ensure functionality. Ultimately, the Gym Information Management System aimed to optimize daily gym operations by providing exercise lists, maintaining member records, and facilitating employee attendance, inventory management, and customer billing, enhancing overall efficiency and service quality.

The (Macon, R. 2020) study explored strategies health and fitness club managers use to improve customer retention. The study found that critical factors are service quality, customer satisfaction, and loyalty. It emphasized innovative thinking and integrating social media and technology into sustainability strategies. Customer engagement and personal relationships also contribute to higher retention rates. The findings are relevant for developing gym management systems and effective customer retention strategies.

A Gym Management System was developed for Taurama Fitness Centre to improve its current system **(**Waigaemo et al., 2017). The new system streamlines member registration, membership renewal, payment records, attendance, and financial reporting. Online member registration and faster membership renewal were introduced, along with more efficient search processes. Payment records were expedited, and attendance was recorded automatically. Financial reports are now generated periodically, helping to check income from various transactions. The new system has made gym management more efficient and effective.

Annan, S. R., & Kulkarni, P. A. (2011) detailed that the gym management system developed for Sanjay Health Club is a fast, reliable, and user-friendly solution. This new computerized system eliminates human error and facilitates quick retrieval of vital information. Reducing manual work and minimizing costs significantly enhances the efficiency of gym operations. The paper concludes that this system successfully manages gyms, providing valuable

insights for developing similar technological solutions in other organizations. This success story underlines the practical application of the research and keeps the readers engaged.

The "Survey Paper on Gym Management System" (Mahima, K. et al., 2022) highlights the need for automation to improve transparency, accuracy, and security in the current manual gym management system. The proposed system aims to computerize all records and store information about staff and customers. However, the paper needs more detail on specific features and functionalities, software and hardware requirements, and potential challenges and limitations. While the paper provides a good foundation, it could benefit from more comprehensive research and analysis.

The fitness management system developed (Moktan et al.,2015) is a reliable and efficient solution for managing fitness centers. It was designed to fulfill all requirements through a comprehensive requirement analysis phase, eliminating human error and calculation and making it faster and more reliable than previous systems. The user-friendly software maintains members, employees, and inventory details. It successfully achieves its development objective of managing and maintaining these details. It has proven an effective solution for fitness centers looking to streamline their operations and improve their management.

The 'Smart Gym Management System' (Ahmed et al., 2016) was developed to address the challenges gym owners face comprehensively. The system, built on extensive research, offers an efficient and secure registration process with diverse functions tailored to user privileges. It stores comprehensive data about members, employees, products, payroll, and transactions, providing a robust management solution that handles all necessary details of gym operations. The system's design ensures robust database security, meeting user requirements.

A study on gym-goers highlights the importance of understanding their motivations and goals when designing gym management systems (Doğan, C., 2015). The study shows that gym-goers strive to become fitter, stronger, and more resilient, but the research sample is limited. Designers of gym management systems must create a personalized experience for each member and consider the societal implications of promoting health services.

The computerized system developed for managing business functionalities in a gymnasium streamlines operations and enhances efficiency. It caters to the increasing number of members at Fitness Factory Gymnasium in Sri Lanka's Galle district, leveraging I.T. solutions to replace manual processes. Through iterative development, the system ensures continuous improvement and easy accessibility for members while facilitating management tasks. Key features include membership management, workout planning, nutrition management, leave management, and report generation, all aimed at improving user service delivery.

The thesis (Halme, M., 2013), assigned by Viveca, the University of Jvaskyla, aims to investigate the reasons for using multiple information systems in fitness centers and how these systems are utilized to manage customers effectively. With the proliferation of fitness centers and the increasing demand for health and wellness services, the need for effective and efficient management systems is becoming more pressing. The thesis seeks to identify the reasons for using multiple information systems in fitness centers and how these systems can be integrated and utilized to streamline customer management processes.

Local Literature

The study (Ong et al. et al., 2021)) aimed to investigate the factors influencing gym-goers' intentions to visit fitness centers during the COVID-19 pandemic in the Philippines. This study has important implications for the development of gym management systems that cater to the needs of gym-goers during the COVID-19 pandemic and beyond. By providing insights into the factors that influence gym-goers' behavioral intentions, gym management systems could incorporate features that address these factors, such as providing information about COVID-19 and self-motivation to encourage physical activity maintenance. Additionally, gym management systems could include stress-reducing activities or programs to help gym-goers reduce life stress. Overall, this study is relevant to developing gym operations software and gym management systems, and it could help fitness centers improve their services and retain their customers.

This review discusses a study conducted in the Philippines (Ong et al. et al., 2021), which analyzed the preferences of gym-goers during the pandemic using the conjoint analysis approach. The study found that gym-goers consider attributes such as price, ventilation, service, trainer, payment method, operating hours, and log-in important when selecting a fitness center. Gym management systems can use this information to improve their services and retain customers, such as incorporating features like payment options, one-on-one training sessions, and 24-hour operating services. Features like monitoring ventilation and gym size could also be included in the gym management system to meet the needs of gym-goers.

The study compared the effectiveness of mobile fitness applications and gym exercises in improving the fitness performance level of first-year college students (Cabauatan et al., G. A. D., 2022). The results showed that both exercise programs were equally effective in enhancing the student's fitness performance, indicating that combining mobile fitness applications and gym exercises is best for physical activity. The study recommends integrating these programs in physical education classes and encourages P.E. teachers to undergo training on utilizing technology for instructional purposes.

In their research, the researcher (Cabalza, C., 2014) sought to comprehend the ongoing expansion of the gym industry through a strategic analysis of data categorized by specificity. Beginning broadly, they progressively honed their focus through tailored methods. Initially, archival research provided insights into overarching trends and patterns in the fitness industry. Subsequently, interviews with industry experts and gym owners enriched their understanding. Finally, field studies directly observed gym and customer behavior, gathering empirical data to augment their analysis.

The researcher (Calado, K., 2017) has proposed a Gym Management System that substantially upgrades the manual process of registering new members, managing payments, and keeping track of inventory. By maintaining all transactions related to clients and gym equipment, the system provides convenience and aids in business monitoring. The use of an automated system by gym staff minimizes effort and reduces the hassle of record-keeping. Clients benefit from the system's privacy features that protect their information and ensure clear guidance on their workout routines. Overall, the Gym Management System offers an efficient and effective way to manage gym operations while providing a seamless experience for gym staff and clients.

The thesis (Garcia et al., 2019) aimed to improve the quality of services and products by investigating the factors that affect customer satisfaction. To provide total customer care, internal and external customer needs must be considered. Factors such as competitive pricing, employee behavior and courtesy, good value, and service quality influence customer service to meet customer expectations. By identifying and addressing these factors, businesses can enhance customer satisfaction and ultimately improve their bottom line.

The researcher proposed (Novelle et al., 2015) an automated system to replace the current manual operations of Adrenaline Fitness Gym, specifically for membership management and member profiles. The system aims to decrease the time consumed in these tasks by automating them while still keeping cash flow management a manual process.

The researchers (Diaz et al.; N., 2020) conducted a study to evaluate the business operations of fitness gyms in Cabanatuan City. The study described various aspects of gym operations, such as management, marketing, technical equipment and facilities, and finances. The researchers analyzed factors such as business ownership, workforce, marketing strategies, equipment and facilities offered, and financial aspects such as initial investment, revenues, and expenditures. The study can provide insights for gym owners to improve their business operations and gain a competitive edge in the market.

Cliffer V. Olofernes et al. (2022) explored enhancing Groovy Fitness's online gym management system, focusing on member administration, equipment tracking, attendance monitoring, progress tracking, and announcement dissemination. They emphasized managing member status and providing detailed reports for customer satisfaction.

The Groovy Gym website served as a central resource, offering information on promotions, instructors, memberships, supplements, and tailored daily instructions and programs for beginners. Another study investigated exercise motives among Filipinos, with participants aged 15 to 69 listing potential motives, resulting in 2,095 responses coded by two independent judges. The study included 592 participants, each contributing an average of four responses.

The capstone project titled "Mobile Virtual Fitness Application for Gym Businesses" (Cuna et al., 2021) aimed to enhance and modernize the member experience by developing a fitness application. The system's processes and functionalities were refined and implemented using data acquired during the project. The project featured two distinct user roles: Managers, who accessed the system via a web application, and Members, who utilized a mobile application. Employing an iterative, incremental model, the development process focused on continuous improvement and refinement. The web application facilitated the retrieval and display of account data, while the mobile application provided Members and Trainers with access to workout schedules, progress tracking, and other relevant information. A key innovation of the project was the automated creation of fitness programs, which aimed to streamline and enhance the member's gym experience.

Figure 1 Conceptual Framework

A conceptual framework provides a structured approach to system development, ensuring clarity, alignment, and effectiveness throughout the project life cycle. It promotes a shared understanding among stakeholders and is a valuable tool for guiding decision-making and achieving project success.

Inputs are the necessary information, data, and resources to start and proceed with the development process. The process encompasses the activities and steps undertaken to develop the system, following the agile software development life cycle (SDLC) stages: requirements, design, development, testing, deployment, and review. Outputs are the tangible outcomes and deliverables from the development process, including the developed system. In this case, the output is ACTIFIT: Gym Management System.

CHAPTER III

METHODOLOGY

The methodology chapter is pivotal in this research, providing a detailed insight into the planning and execution of the study. It explores the research design and methodological framework used to achieve the research objectives effectively. By outlining the research methodology and procedures, this chapter offers readers a clear understanding of the systematic data gathering and analysis approach. From explaining the rationale behind the research design to detailing sampling techniques and data collection procedures, it acts as a roadmap, guiding readers through the methodological nuances of the research process. This exposition equips readers with insights to critically evaluate the rigor and validity of the research findings in subsequent chapters.

Research Methodology

Design

This study uses a descriptive survey method to assess the feasibility and effectiveness of the proposed "Gym Management System" in the municipality of Valencia. The study will focus on a sample of gym owners, staff, trainers, and members. The aim is to understand their challenges when managing gym operations and determine if the proposed system can address them.

The descriptive research design employed in this study is frequently used to gain insight into a particular phenomenon, such as a social or cultural phenomenon, or to provide a snapshot of a population or group at a given time. This research design describes the characteristics, behaviors, attitudes, and perceptions of a specific population or phenomenon. Using this research design, the study can provide a comprehensive understanding of the gym management system's potential and limitations in the particular contexts of the Municipality of Valencia.

Locale

The Gym Management System Capstone Project will focus on improving gym facilities and services in the Municipality of Valencia. Most gyms in this area still use manual booking, payment, and other administrative tasks, which results in challenges in meeting customer needs. The Gym Management System will automate these tasks and streamline gym operations, providing easy online booking and payment, a real-time dashboard for gym owners to monitor operations, and customer feedback mechanisms. This will improve gym services, attract more customers, and increase business revenue, ultimately promoting healthy living among residents of the Municipality of Valencia.

Respondents/Population of Evaluators

Various respondents involved in gym operations and services, including the gym owner, staff, and gym-goers in the Municipality of Valencia, will evaluate the proposed gym management system. The gym owner is a key stakeholder who will evaluate the system's effectiveness in managing gym operations and improving business revenue. The gym staff will also play an essential role in assessing the system's ease of use and impact on their workload. Finally, gym-goers are the end-users who will determine the system's effectiveness in providing an improved gym experience.

The survey will be conducted using a questionnaire distributed to the identified respondents. The questionnaire will be designed to collect feedback on the usability, functionality, and effectiveness of the Gym Management System. The results will be used to identify areas for improvement and ensure that the system meets the needs of all stakeholders.

Sampling Technique

Due to the difficulty in finding gym owners willing to participate in research, convenience sampling will be used to select a smaller sample of 20 respondents, including one gym owner, two trainers, two gym staff, ten gym-goers, and 5 I.T. experts. The questionnaire will be open-ended and designed to collect feedback on the usability, functionality, and effectiveness of the Gym Management System.

Procedure

While convenience sampling may not represent the entire population of gym-goers in the Municipality of Valencia, it will provide valuable insights into the experiences and perceptions of the gym owners, staff, and gym-goers who use the system. The survey results will be analyzed to identify areas for improvement and ensure that the system meets the needs of all stakeholders.

Survey Instrument

Ensuring validity and reliability when selecting a survey instrument is crucial to obtaining accurate and consistent results. In evaluating the proposed Gym Management System, the ISO 25010:2011 standard belongs to the ISO/IEC 25000 series, which focuses on software engineering and systems quality. Specifically, ISO 25010:2011 is titled "Systems and Software Engineering -- Systems and Software Quality Requirements and Evaluation (SQuaRE) -- System and Software Quality Models. " It provides a framework for defining and evaluating the quality of software products.

The quality model is the cornerstone of a product quality evaluation system. It determines which quality characteristics will be considered when evaluating a software product's properties. A system's quality is the degree to which it satisfies the stated and implied needs of its various stakeholders and thus provides value. The quality model represents those stakeholders' needs (functionality, performance, security, maintainability, etc.) and categorizes product quality into characteristics and sub-characteristics. The product quality model defined in ISO/IEC 25010 comprises the eight quality characteristics in the Appendix.

Data Gathering/Survey procedure.

The data-gathering procedure for this study involves administering a series of questions to the gym owner, staff, and gym-goers. Before the survey, the researchers sought permission from the establishment's gym owner to conduct the study. Once permission was granted, the researchers explained the purpose of the study to the respondents and ensured that the survey was conducted with respect and professionalism.

The survey questions were designed to gather information on the problems faced by the fitness center and the current system and processes in place for managing gym operations. The questions were carefully crafted to ensure they were clear, concise, and relevant to the study's objectives. The respondents were given ample time to complete the survey and were encouraged to answer truthfully and to the best of their knowledge. The researchers also ensured that the participants' responses were kept confidential and their identities protected. Overall, the data-gathering procedure was conducted systematically and ethically to ensure the validity and reliability of the data collected.

Statistical Treatment of Data

The responses from the questionnaire administered to the gym owner were analyzed based on the data requirements of the study. The questions were designed to gather information about the gym's management system, current processes and systems in place, and the problems and challenges they face in managing the gym.

Descriptive statistics such as frequency count, mean, and percent were used to summarize the data obtained from the questionnaire. The gym owner's responses were also categorized according to the different aspects of gym management, such as membership management, equipment management, and financial management. This allowed for a more comprehensive understanding of the gym's management system and helped identify areas that need improvement.

The data gathered was analyzed using qualitative methods, such as content analysis. The gym owner's responses were carefully reviewed and categorized according to the emerging themes. This approach helped provide a more in-depth analysis of the gym's management system and allowed for a better understanding of the challenges and issues they face in managing the gym.

Where:

W.M. = weighted mean
Xi = each value in the dataset
Wi = weight assigned to each value
N = total number of respondents
∑ = summation of all individual values

DEVELOPMENT METHODOLOGY
Software Development Life Cycle Diagram

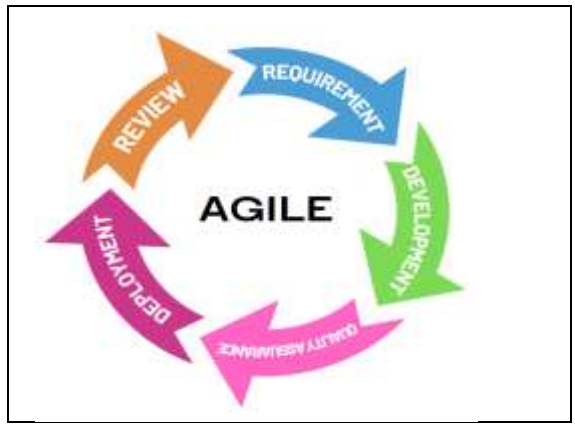

Figure 2 Agile Model Cycle Diagram

Software Development Life Cycle (SDLC) is a process software development teams use to plan, design, develop, test, and deploy software applications. SDLC aims to produce a high-quality software product that meets the needs of the users and the organization.

Agile methodology is well-suited for the gym management system because it emphasizes flexibility and adaptability, which are crucial in the dynamic and ever-changing fitness industry. With the incremental and iterative development approach, the system can be created step by step, with added functionality and refinement, allowing the team to work on the project efficiently and see the bigger picture.

Furthermore, the agile approach allows frequent communication and collaboration between the development team and stakeholders, including gym owners and managers. This enables them to provide feedback and quickly change the system, ensuring that the final product meets the users' needs and requirements. In the fast-paced and competitive fitness industry, it is essential to have a system that can adapt to changing needs and market trends, and agile methodology provides the flexibility to do so.

Phase 1: Requirements

The team conducted extensive research and interviews to identify challenges in traditional gym management systems, including operational inefficiencies, error-prone processes, and scheduling difficulties. To address these issues, they developed a sophisticated web-based application focusing on a user-friendly interface, advanced scheduling tools, and robust data analytic features for informed decision-making and resource allocation.

Phase 2: Development

The design team used Figma to prototype a gym management system's user interface, ensuring alignment with the gym's branding and user needs. The system will be web-based, using the Laravel framework for scalability. To ensure efficiency in task allocation, the team will be divided into two groups, one focusing on design and the other on coding. Tools like Trello and Google Drive will be used for collaboration and project management.

Phase 3: Quality Assurance

The system will undergo rigorous testing to ensure its robustness and readiness for deployment. This includes unit testing, integration testing, performance testing, stress testing, load testing, compatibility testing, system testing, and acceptance testing. The team's meticulous testing and validation processes will ensure the system is fully prepared for deployment and presentation, ensuring its functionality and alignment with user requirements.

Phase 4: Deployment

After the development and testing phases, the team will deploy a gym management system to the operational gym environment. A final check will verify functionality and accessibility for gym personnel. The team aims to facilitate a smooth transition through user-friendly design and meticulous deployment procedures, empowering them to fully utilize the system's capabilities.

Phase 5: Review

The gym management system will be thoroughly reviewed and evaluated, incorporating feedback from owners and users. The team will analyze feedback to identify areas for improvement, implement adjustments, and ensure alignment with user needs. Continuous iteration will maintain the system's effectiveness and user-friendliness over time.

Requirements Specification

Requirements Specification lays the foundation for developing the gym management system, providing a detailed outline of the essential features and functionalities of stakeholders' demands. This chapter serves as a road map, delineating the requirements and objectives to guide the system's design and development process. This chapter aims to comprehensively understand the system's scope and purpose through meticulous analysis and documentation of user needs, business goals, and technical constraints. By articulating these requirements in detail, the chapter sets the stage for subsequent phases of development, ensuring that the final product aligns closely with stakeholder expectations and delivers maximum value to end-users.

Operational Feasibility

The operational feasibility of a gym management system refers to the ability of the system to be utilized, supported, and perform the necessary tasks by all system users. The system will cater to four roles - admin, staff, trainers, and members. The admin role will be able to manage trainers, members, staff, maintenance tasks, schedules, inventory, payments, and reports. Staff can manage their personal information, manage inventory, maintenance tasks, and create reports. Trainers will have access to manage personal information, training sessions, and workout plans and track/update member progress. Lastly, members can manage personal information, view, book, and cancel training, track individual progress, and renew or cancel membership. The system will ensure that each role has appropriate access and functionalities specific to their needs, thus ensuring the operational feasibility of the gym management system.

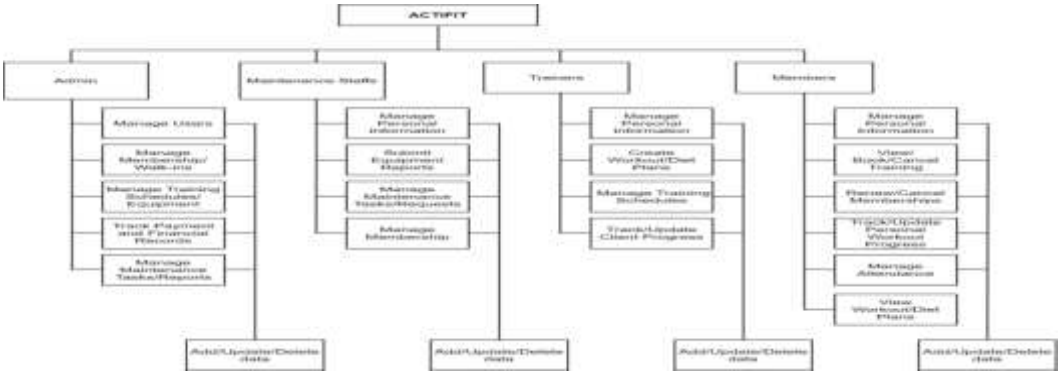

Figure 3 Functional Decomposition Diagram

1. Requirements Modeling

a. Input

The gym owner/admin, staff, trainers, and members must have login credentials to access the system. The gym admin will input and manage staff, trainers, member information, personal training sessions, and schedules. The trainers will input and manage their schedules, availability, and client progress. The members will input and update their personal information, view their schedules, and book personal training sessions and check-ins.

b. Process

The system will process the creation, alteration, and deletion of schedules, staff, member, trainer information, and personal training sessions. It will also track member attendance and progress and book and confirm personal training sessions.

c. Output

The system must provide staff reports, reports on member attendance, trainer availability, and revenue generated from personal training sessions and training schedules. Staff must be able to create maintenance reports through the system. The trainers and staff members must be able to access their schedules and duties. Members must be able to view their schedules and attendance records and receive confirmation of their personal training session bookings.

d. Control

Only authorized users can access the system and create, update, and delete schedules and member information. Trainers can only access and manage their schedules, availability, client information, and progress. Members can only view their own schedules and attendance records and book personal training sessions.

Data and Processing Modeling

Context Flow Diagram

The system context diagram illustrates the external entities that may engage with the system and shows the entire software system as a single entity. The diagram positions the system at the center and encloses it with its external components, related entities, and environment. It deliberately excludes any detailed information about the internal structure of the system. The following were the symbols used in the context flow diagram:

Program Flowchart

A program flowchart is a graphical representation of the data flow when creating a program or algorithm. It enables the user to explain the process to others and collaborate effectively and efficiently. Additionally, these flowcharts analyze the logic behind the program to streamline the programming code. There are various uses for programming flowcharts, such as analyzing and visualizing code, as well as helping to determine the structure of an application and how users navigate through it. The following were the symbols used in the system flowchart:

Object Modeling

Use Case Diagram

A use case diagram in UML illustrates the relationships between actors and use cases, representing system functionality. Use cases outline actions necessary for achieving specific goals, while actors represent individuals or entities fulfilling roles within the system. The following were the symbols used in the use case diagram:

The Administrator user is crucial in managing the gym's administrative operations and manages various tasks such as walk-ins, subscriptions, users, schedules, equipment, and training sessions. They can add new users or cancel memberships, read sales reports, and maintain system integrity. They also regulate login access and perform maintenance tasks like adding, updating, and removing tasks as needed. The Administrator is the key to keeping the gym's amenities and administrative operations running smoothly.

Staff play a vital role in managing user memberships, including adding, updating, and removing memberships. The diagram illustrates the connections between different use cases, emphasizing the need for seamless integration and efficient workflow management. Arrows in the diagram depict interdependencies between operations, such as the "Log in" use case required for the "Update Personal Information Update Task Progress." This highlights the importance of cohesive integration and streamlined workflow for staff in maintaining system functionality.

It illustrates the Trainer's pivotal role within the system, delineating their core responsibilities, such as lesson scheduling, resource organization, student supervision, progress tracking, and report generation. Authentication, represented by the "Log in" use case, underscores the necessity for secure access to the system. Additionally, the diagram showcases the interconnections of various use cases, demonstrating the seamless integration of the Trainer's workflow. This emphasizes the significance of authentication in facilitating efficient training and development processes.

The use case diagram, focusing on the Member, offers a comprehensive view of a gym membership system. It covers essential functionalities like managing personal data, reservations, memberships, training progress, attendance, and access to exercise and diet programs. Members can perform tasks such as updating data, canceling training requests, scheduling sessions, managing memberships, and tracking workout progress. The diagram emphasizes login authentication's crucial role in facilitating access and supporting members' fitness journey.

Class Diagram

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, attributes, operations (or methods), and the relationships among objects. The following were the symbols used in the class diagram:

Sequence Diagram

Sequence diagrams, called event diagrams, describe class interactions regarding exchanging messages over time. They are an excellent way to visualize and validate various runtime scenarios. They can help predict a system's behavior and discover responsibilities a class may need to have in modeling a new system.

Data Design

Entity Relationship Diagram

An Entity Relationship (ER) Diagram is a visual representation that depicts the relationships between various "entities" within a system, such as individuals, objects, or concepts. These diagrams are commonly used in software engineering, business information systems, education, and research to design and troubleshoot relational databases. ER Diagrams provide a clear overview of how entities interact with each other, aiding in the understanding and organization of complex systems. The following were the symbols used in the entity relationship diagram:

EntityRelationshipDiagram

The Entity-Relationship Diagram (ERD) of the ACTIFIT gym management system is a holistic representation of its database architecture, seamlessly integrating intricate facets of member administration and gym operations. At its core, users, categorized as admin, trainer, staff, and member, are endowed with essential attributes like duties and contact details, epitomizing the system's user-eccentric approach. Membership records meticulously monitor members' statuses and subscription duration, complemented by Membership plans offering a diverse array of subscription options to cater to varying needs. The meticulous logging of Attendance ensures optimal workforce efficiency and resource allocation by accurately documenting the presence of both members and employees. Concurrently, Workout plans, meticulously tailored to individual fitness aspirations, are reinforced by Training Schedules that delineate session timings for optimal organization.

Delving into nutritional aspects, food catalog dietary products, while Trainer diet plans, meticulously curated by trainers, dispense invaluable nutritional guidance. Equipment records meticulously manage equipment inventory, with maintenance protocols seamlessly integrated for timely upkeep when required. The ACTIFIT gym management system harmoniously orchestrates multifaceted operations through this comprehensive database architecture, ensuring streamlined administration, personalized member experiences, and optimal resource utilization.

Data Dictionary

A data dictionary is a cornerstone document in any data management initiative. It provides a comprehensive overview of the structure and semantics of a database or information system. It serves as a reference guide, meticulously documenting the various data elements, including tables, fields, relationships, attributes, and corresponding descriptions and definitions. By offering a structured representation of the data schema, the data dictionary enables stakeholders to gain insights into the organization and meaning of the data, fostering a common understanding across teams and departments.

Furthermore, the data dictionary is crucial in promoting data consistency, integrity, and usability within an organization. Detailing key attributes such as field names, data types, and allowable values ensures that data is accurately interpreted and utilized across different applications and user groups. Additionally, the data dictionary serves as a central metadata repository, supporting effective data governance practices and decision-making processes. Through its comprehensive documentation and standardization efforts, the data dictionary enhances data quality and accessibility, empowering organizations to derive actionable insights and make informed decisions based on reliable data.

Technical Feasibility

Technical feasibility assessment is a critical component in the development process of any software project, including the gym management system under consideration. This evaluation examines the practicality and viability of implementing the proposed system from a technical standpoint. By scrutinizing factors such as the availability of required technology, compatibility with existing infrastructure, and the feasibility of development tools and methodologies, this assessment aims to ascertain the system's potential to be successfully designed, developed, and implemented. Through a thorough analysis of technical constraints and opportunities, this evaluation provides valuable insights that inform decision-making and mitigate risks throughout the system development life cycle.

1. Compatibility

The leading technologies that will be used in this study, ACTIFIT, are:

Operating Systems: Windows 8 above, Mac, Linux

Browsers: Google Chrome, Mozilla Firefox, Microsoft Edge

Keyboard and compatible pointer device

Diagrams and Tools

Draw.io

It is a license-free downloadable for Windows 10 version 14316.0 or higher. You can also create it using browsers by typing draw.io or diagrams.net.

Draw.io is software for creating custom diagrams and charts with various shapes and visual elements. The drag-and-drop feature makes creating professional-looking flowcharts, org charts, UML, ER, and network diagrams easy.

Canva

Canva is a design platform that enables users to create social media graphics, presentations, posters, documents, and other visual content. Users can enhance their designs with additional features, such as free access to templates and subscription options, such as Canva Pro and Canva for Enterprise. Canva also offers a print-on-demand service for physical products.

Canva is accessible on mobile devices through the Google Play store and on browsers by typing canva.com. With Canva, creating branding images is effortless. You need only a few clicks to add your logo, social media handles, or hashtags, making what used to be a time-consuming task a matter of minutes now.

Laravel

Laravel is a web framework that provides an elegant and expressive syntax. It aims to make development an enjoyable and creative experience by simplifying everyday web project tasks like authentication, routing, sessions, and caching.

Laravel is a PHP web framework designed to create web applications following the model-view-controller (MVC) architectural pattern. It includes a modular packaging system, relational database access methods, and application deployment and maintenance tools. Laravel emphasizes using "syntactic sugar" to make code easier to read and write. It is an open-source framework created by Taylor Otwell and built on top of Symfony.

2. Relevance of the Technologies

The gym management system will benefit from freely accessible and manageable platforms and technologies, streamlining the project's flow and development for increased efficiency and effectiveness, ensuring its technical feasibility and manageable completion.

3. Technical Specification

Software Specifications

Operating Systems: Windows 8 above, Mac, Linux
Browsers: Google Chrome, Mozilla Firefox, Microsoft Edge

Hardware Specifications

For Desktop Computers/Laptops:
RAM – 4GB or more
Processor – Intel Core i3 or AMD Ryzen 3 – Onwards
Storage – 4GB or more

Programming Environment

Front End	Back End
HTML	PHP
Tailwind CSS	Laravel
Alpine JS	Livewire
JavaScript	

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Schedule Feasibility

The schedule feasibility assessment is a pivotal phase in the development process of any project, including the gym management system. This evaluation scrutinizes the project timeline and milestones to determine the practicality and achievability of completing the project within the specified time frame. By analyzing factors such as resource availability, project complexity, and potential risks, this assessment aims to ensure that the project can be executed efficiently

and effectively within the time constraints. Through meticulous planning and scheduling, the schedule feasibility assessment helps mitigate risks, optimize resource allocation, and facilitate timely project delivery. Ultimately, this evaluation is a cornerstone in project planning, enabling stakeholders to make informed decisions and maintain project momentum throughout its life cycle.

The work breakdown for schedule feasibility assessment serves as a foundational framework for evaluating the practicality and achievability of project timelines and milestones. This structured approach entails breaking the project's scope into manageable tasks and subtasks, each with defined deliverables and timelines. By systematically organizing and sequencing these tasks, the work breakdown facilitates a granular examination of project requirements, resource allocation, and dependencies. Through this detailed decomposition, project managers can effectively identify critical path activities, allocate resources optimally, and mitigate risks associated with schedule constraints. Ultimately, the work breakdown provides a roadmap for assessing schedule feasibility, enabling stakeholders to make informed decisions and ensure timely project completion.

D. Economic Feasibility

Assessing the economic feasibility of the gym management system is essential to determining whether the project is financially viable. This involves conducting a cost-benefit analysis and evaluating the potential benefits and costs of implementing it.

Cost and Benefit Analysis

The gym management system offers numerous benefits to gym owners, staff, and members. It provides an efficient platform for managing memberships, schedules, and payments, benefiting owners and staff by streamlining administrative tasks. Additionally, members can access an online portal to manage their memberships, track progress, and book training sessions, enhancing their overall experience. By minimizing manual paperwork and improving operational efficiency, the system saves time and reduces costs for the gym. Moreover, it opens up new avenues for revenue generation through opportunities for upselling memberships and services, further contributing to the system's value proposition.

Cost Recovery Scheme/ROI

The cost recovery scheme for the gym management system is feasible and offers a promising return on investment for gym owners. The system's implementation promises increased operational efficiency and cost reduction, translating into long-term savings. Moreover, its potential to introduce new avenues for upselling memberships and services holds promise for revenue growth., The system assures enduring benefits for the gym one-time investment.

CHAPTER IV

PRESENTATION OF RESULTS AND FINDINGS

Survey questionnaires were carefully distributed at the designated gym using a Purposive-Random Sampling Technique, a method known for its selective and judgmental approach. This non-probability sampling strategy allows researchers to handpick participants based on their relevance to the study, ensuring a tailored and targeted sample. Given the prevailing community pandemic conditions, the research team deliberately decided to keep the sample size conservative, with 20 respondents. The team now includes one gym owner offering managerial insights, ten gym goers providing user feedback, two staff members, two trainers, a total of 15 end users, and five IT experts contributing specialized insights on system performance. This diverse composition ensured a comprehensive examination of ACTIFIT: A Gym Management System while prioritizing safety and practicality in data collection efforts.

Table 17 Rating Scale of the Survey

Rating Scale			
Rating	**Low**	**High**	**Descriptive Equivalent**
4	3.26	4	Exceptional(E)
3	2.51	3.25	Considerable(C)
2	1.76	2.5	Limited(L)
1	1	1.75	Extremely Limited(EI)

Table 17 shows the survey's rating scale. The researchers use this to calculate the survey results' weighted means and determine the descriptive counterparts of the outcomes.

Table 18 Weighted Mean of Perceived Usefulness

Perceived Usefulness	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
System use speeds up tasks at work.	15 (60)	0 (0)	0 (0)	0 (0)	4	Exceptional
System use boosts productivity.	11 (44)	4 (12)	0 (0)	0 (0)	3.73	Exceptional
System use enhances job performance.	15 (60)	0 (0)	0 (0)	0 (0)	4	Exceptional
System use improves job effectiveness.	15 (60)	0 (0)	0 (0)	0 (0)	4	Exceptional
System use simplifies job tasks.	15 (60)	0 (0)	0 (0)	0 (0)	4	Exceptional
I find the system useful at work.	15 (60)	0 (0)	0 (0)	0 (0)	4	Exceptional
Overall Weighted Mean	**3.96**					

The table reflects a highly positive perception of the system's impact on work-related tasks, with an overall weighted mean score of 3.96. Across all functions, the majority of respondents strongly agreed on its ability to increase effectiveness (100%) and simplify work (100%), with a substantial majority expressing confidence in its productivity-boosting potential (100%). Despite some reservations, the prevailing sentiment suggests a high confidence level in the system's ability to enhance work efficiency and effectiveness.

Table 19 Weighted Mean of Perceived Ease of Use

Perceived Ease of Use	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Learning the system is easy for me.	4 (16)	11 (33)	0 (0)	0 (0)	3.27	Exceptional
Getting the system to do what I want is easy	14 (56)	1 (3)	0 (0)	0 (0)	3.93	Exceptional
Interacting with the system is clear.	6 (24)	8 (24)	1 (2)	0 (0)	3.33	Exceptional
The system is flexible to use.	10 (40)	3 (9)	2 (4)	0 (0)	3.53	Exceptional
Becoming skilled at using the system is easy.	13 (52)	2 (6)	0 (0)	0 (0)	3.87	Exceptional
The system is user-friendly.	15 (60)	0 (0)	0 (0)	0 (0)	4	Exceptional
Overall Weighted Mean	**3.64**					

Table 19 underscores respondents' prevailing sentiment of ease and simplicity in utilizing the system. A significant majority of respondents, between 53% and 73%, expressed that engaging with the system, accomplishing desired tasks, and mastering its operation were straightforward. Additionally, 66% and 73% of participants reported the system as user-friendly, reflecting a consistent perception of its ease of use. These findings suggest a strong consensus among respondents regarding the system's accessibility and user-friendliness, contributing to a positive user experience.

Table 20 Weighted Mean of Functional Suitability

Functional Suitability						
Software Evaluation Criteria	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Functional Usefulness	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Functional Correctness	2 (8)	2 (8)	1 (2)	0 (0)	3.2	Considerable
Functional Appropriateness	3 (12)	1 (3)	1 (2)	0 (0)	3.4	Exceptional
Overall Weighted Mean	**3.46**					

Table 20 summarizes ratings from 5 respondents on various functional aspects. Most respondents rated "Functional Usefulness" as 4, with a few giving it a 3. "Functional Correctness" saw varied ratings, with 40% assigning a score of 4, another 40% rating it as 3, and 20% rating as 2. Similarly, for "Functional Appropriateness," 60% rated it as 4, 20% rated it as 3, and 20% rated it as 2. The overall weighted mean was 3.46.

Table 21 Weighted Mean of Performance Efficiency

Performance Efficiency						
Software Evaluation Criteria	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Learning the system is easy for me.	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Getting the system to do what I want is easy	4 (16)	0 (0)	1 (2)	0 (0)	3.6	Exceptional
Interacting with the system is clear.	4 (16)	0 (0)	1 (2)	0 (0)	3.6	Exceptional
Overall Weighted Mean	**3.66**					

Table 21 presents evaluations from 5 respondents on various functional aspects. Most respondents scored "Time Behavior" 4, with one assigning a score of 3, indicating exceptional performance. Similarly, "Resource Utilization" and "Capacity" were rated 4 by the majority, with one respondent rating them 2. The overall weighted mean across all aspects was calculated to be 3.66.

Table 22 Weighted Mean of Compatibility

Compatibility						
Software Evaluation Criteria	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Co-existence	4 (16)	0 (0)	1 (2)	0 (0)	3.6	Exceptional
Interoperability	2 (8)	3 (9)	0 (0)	0 (0)	3.4	Exceptional
Capacity	3 (12)	2 (6)	0 (0)	0 (0)	3.6	Exceptional
Overall Weighted Mean	**3.53**					

Table 22 summarizes assessments from 5 respondents on different compatibility aspects. For "Co-existence," most respondents rated it as 4, with one respondent assigning a score of 2, indicating exceptional performance. Regarding "Interoperability," two respondents rated it as 4, while two others rated it as 3. Similarly, for "Capacity," three respondents rated it as 4, while two others rated it as 3. The overall weighted mean for all aspects was calculated to be 3.53.

Table 23 Weighted Mean of Usability

Usability						
Software Evaluation Criteria	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Appropriateness recognizability	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Learnability	3 (12)	2 (6)	0 (0)	0 (0)	3.6	Exceptional
Operability	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Use error protection	3 (12)	1 (3)	1 (2)	0 (0)	3.4	Exceptional
User interface aesthetics	3 (12)	1 (3)	1 (2)	0 (0)	3.4	Exceptional
Accessibility	4 (16)	0 (0)	1 (2)	0 (0)	3.6	Exceptional
Overall Weighted Mean	**3.6**					

Table 23 Usability provides assessments from 5 respondents on different usability aspects. "Appropriateness recognizability" received a score of 4 from most respondents, with one assigning a score of 3, indicating exceptional performance. Similarly, "Learnability" and "Operability" were rated as four by most respondents, with two assigning a score of 3. Regarding "Use error protection" and "User interface aesthetics," three respondents rated them as 4, while one respondent rated them as 3, and one assigned a score of 2. "Accessibility" received a score of 4 from most respondents, with one assigning a score of 2. The overall weighted mean for all aspects was calculated to be 3.6.

Table 24 Weighted Mean of Reliability

Reliability						
Software Evaluation Criteria	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Maturity	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Availability	2 (8)	3 (9)	0 (0)	0 (0)	3.4	Exceptional
Fault tolerance	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Recoverability	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Overall Weighted Mean	**3.7**					

Table 24 Reliability displays evaluations from 5 respondents on various reliability aspects. Most respondents scored "Maturity" 4, with one assigning a score of 3, indicating exceptional performance. Similarly, "Availability" was rated four by the majority, with three respondents assigning a score of 3. Regarding "Fault tolerance" and "Recoverability," most respondents rated them as 4, with one assigning a score of 3. The overall weighted mean across all aspects was calculated to be 3.7.

Table 25 Weighted Mean of Security

Security						
Software Evaluation Criteria	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Confidentiality	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Integrity	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Non-repudiation	2 (8)	3 (9)	0 (0)	0 (0)	3.4	Exceptional
Accountability	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Authenticity	4 (16)	0 (0)	1 (2)	0 (0)	3.6	Exceptional
Overall Weighted Mean	**3.68**					

Table 25 Security presents evaluations from 5 respondents on various security aspects. Most respondents scored "Confidentiality" and "Integrity" 4, with one assigning a score of 3, indicating exceptional performance. Regarding "Non-repudiation," most respondents rated it 3, with two assigning a score of 4. Most respondents rated "Accountability" and "Authenticity" 4, indicating exceptional performance. The overall weighted mean across all aspects was calculated to be 3.68.

Table 26 Weighted Mean of Maintainability

Maintainability						
Software Evaluation Criteria	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Modularity	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Reusability	3 (12)	1 (3)	1 (2)	0 (0)	3.4	Exceptional
Analyzability	3 (12)	1 (3)	1 (2)	0 (0)	3.4	Exceptional
Modifiability	4 (16)	0 (0)	1 (2)	0 (0)	3.6	Exceptional
Testability	4 (16)	0 (0)	1 (2)	0 (0)	3.6	Exceptional
Overall Weighted Mean	**3.56**					

Table 26 Maintainability summarizes evaluations from 5 respondents on different aspects of maintainability. Most respondents scored "Modularity" 4, with one assigning a score of 3, indicating exceptional performance. Similarly, "Reusability" and "Analyzing" were rated four by the majority, with one respondent assigning a score of 2 for each. Most respondents rated "Modifiability" and "Testability" as 4, indicating exceptional performance. The overall weighted mean across all aspects was calculated to be 3.56.

Table 27 Weighted Mean of Portability

Portability						
Software Evaluation Criteria	Rating Scale				Overall	
	4	3	2	1	Weighted Mean	Descriptive Equivalence
Adaptability	4 (16)	1 (3)	0 (0)	0 (0)	3.8	Exceptional
Install ability	3 (12)	1 (3)	1 (2)	0 (0)	3.4	Exceptional
Replaceability	3 (12)	1 (3)	1 (2)	0 (0)	3.4	Exceptional
Overall Weighted Mean	**3.53**					

Table 41 Portability presents evaluations from 5 respondents on various portability aspects. Most respondents scored "Adaptability" 4, with one assigning a score of 3, indicating exceptional performance. Similarly, "Installability" and "Replaceability" were rated four by the majority, with one respondent assigning a score of 2 for each. The overall weighted mean across all aspects was calculated to be 3.53.

All the tables evaluate the system across various dimensions. Specifically, Functional Suitability averaged 3.47, Performance Efficiency 3.67, Compatibility 3.53, Usability 3.65, Reliability 3.60, Security 3.68, Maintainability 3.56, and Portability 3.60. This collective evaluation underscores the system's effectiveness and reliability, reflecting a highly positive perception among respondents regarding its functionality and efficiency.

CHAPTER V
SUMMARY, CONCLUSION, RECOMMENDATION

SUMMARY

The fitness industry has seen significant growth, leading to the development of the ACTIFIT Gym Management System. This software streamlines gym operations, enhances member experience, and boosts business performance. Through advanced technologies, gym owners can monitor trends, financials, member engagement, and more. This study assessed the system's effectiveness in Municipality Valencia by surveying gym owners, managers, trainers, and members. Feedback highlighted the system's usability, functionality, and effectiveness. Overall, the system's development marks a milestone in the fitness industry, offering solutions to management challenges and setting new standards for effectiveness and satisfaction.

CONCLUSION

The ACTIFIT Gym Management System represents a significant leap forward for the fitness industry, revolutionizing gym operations. Its implementation streamlines day-to-day activities and elevates the overall member experience, enhancing satisfaction and retention rates. The positive feedback from users within Municipality Valencia underscores the system's effectiveness and ability to meet the diverse needs of gym owners and members. Moreover, by leveraging advanced technologies such as real-time monitoring and analytics, ACTIFIT sets a new benchmark for efficient and proactive gym management. This innovative approach addresses existing challenges and paves the way for future advancements in the fitness industry, ensuring that gyms remain at the forefront of delivering unparalleled experiences to their clientele.

RECOMMENDATION

Other gyms within the fitness industry are encouraged to explore adopting gym management systems akin to ACTIFIT. Regular updates driven by user feedback are pivotal in ensuring such systems' ongoing relevance and effectiveness. The following recommendations are proposed further to enhance the functionality and user experience of the project:

Implement Notification SMS for Membership Renewals: Introduce a feature within the system to automatically send SMS notifications to gym members as their membership expiration dates approach. This proactive approach is a gentle reminder for members and facilitates timely renewal, reducing the likelihood of membership lapses.

Enable Online Payment Processing: Enhance the system's capabilities to seamlessly process online payments for membership fees and additional gym services. By integrating secure online payment gateways, such as credit/debit card processing or digital wallets, members can conveniently settle their payments and avail themselves of various amenities without needing physical transactions.

Collaborating with IT experts can further optimize the system's functionality and performance. Their expertise can offer valuable insights into implementing cutting-edge technologies and best practices, ensuring the system remains at the forefront of innovation within the fitness industry. Embracing technology enhances operational efficiency and fosters a more member-friendly environment, creating vibrant and engaging fitness communities. By leveraging technology, gyms can elevate their offerings, strengthen member satisfaction, and cultivate thriving fitness ecosystems that inspire individuals to pursue their health and wellness goals enthusiastically.

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