PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

A Design Project Presented to the Faculty of College of Engineering
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In Partial Fulfilment of the Requirements for the Degree of
Bachelor of Science in Computer Engineering

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APPROVAL SHEET

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DEDICATION

This research and device project is dedicated to researchers' families, who have supported them from the very beginning. Researchers are deeply grateful to have parents who continuously support them, especially financially and emotionally, to complete not only this research paper but also the development of the actual device.

The handicraft weavers in Luisiana, Laguna who contributed to this research are also recognized and appreciated. The researchers would like to thank them for their time, patience and willingness to share their knowledge, experiences and suggestions which help in improving the design and the purpose of the device.

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P.N.G.Z.

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ABSTRACT

Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna

Arias, J. A., Calayag, H.L., Larona, A. R. C., Lupig, J. D., Martinez, A. M., Sanchez, D. M. T., and Zara, P. N. G.

Pandaiku, integrating Arduino-based drying and pressing, captivates researchers, entrepreneurs, producers/owners, consumers. It offers easiest and fastest way to produce a ready to weave panda leaves. These system improve the natural process by using new materials such as infrared heater, fan and a round metal roller to provide a good quality of pandan leaves. This approach increase the product and minimize the working and drying time particularly in Luisiana Laguna where the weather pattern and condition is unstable.

The general aim of this project is to help Handicraft Workers in Barangay Zone VI Luisiana, Laguna by speeding up the drying and pressing process of pandan leaves to increase their production.

The specific objectives are as follows, (1) Design and develop an Arduino-based device that performs the following functions: (a) Maintaining the set temperature inside the device by calibrating it using the PID controller; (b) Drying a batch of pandan leaves based on the maintained temperature and time set by the operator; (c) Displaying data on the LCD screen regarding the on-going process, either drying or pressing, as well as the elapsed time during each operation or processes; (d)Stopping the drying process automatically when the set time is completed; (e) Pressing the dried pandan leaves in a single layer, back and forth; (f)Notifying the operator through a sound alert when all the processes is completed. (2) Evaluate using ISO 25010 to make sure that the design project meets the functional requirements while performing well the functional suitability, efficiency /performance, compatibility, usability, reliability, security, maintainability, and portability which ensures the quality of the device.(3) Deploy the device to Luisiana Weavers Organization.

The Agile Model was used in the developing the pandaiku device, it has seven phase planning, designing, developing, testing, deploying, reviewing and

launching. After implementing the prescribed testing procedures for the following components: PID Controller, Infrared Tube Heater, Solid State Relay, Channel Rwlay, 2-Channel Relay, Step-down Voltage, Pin Header, Buzzer, Exhaust Fan, LCD, Power Supply, Keypad, Wiper Motor, Power Button the effectiveness of device have succeeded. The device was also a 'highly acceptable' by the Computer Engineering (CpE) Practitioners and Agriculturist with the mean score of 4.66, while device was rate as 'very acceptable' by the Luisiana Weavers with the mean score of 4.04. All specified criterias were considered as satisfactory by both parties indicating the effectiveness of pandaiku in meeting the exact dryness and pressing the pandan leaves.

Based on the findings and results of the evaluations and experimentation conducted with the device, the following statements are the recommendations of the project:

1. To encourage the adoption of new way of drying and pressing of pandan leaves, aiming to maximize and increase the production of ready to weave pandan leaves.
2. To implement and integrate an arduino based drying and pressing device to weavers' organization, aiming to increase a better quality of pandan leaves while minimizing manual labor and time consume of the process. This approach aims to decrease potential issues encountered by the weavers during the process.
3. For future developers:
    a.) Detect the color of leaves using a sensor to ensure they reach the dryness preferred by the user;
    b.) Explore to dry different leaves, enhancing the capability of drying part;
    c.) Provide additional back up power for the device to operate even without the electricity supply from the outlet.

Keywords: Pandan leaves, Infrared heater, Automation, Luisiana, Laguna, Handicraft workers, Drying and pressing

CHAPTER I

THE PROJECT AND ITS BACKGROUND

Introduction

Pandan leaves have significant purposes which can be used in cooking, crafts, décor, medicine and so on. In rural places where it is abundant they turn into an art which is called “handicraft”. It became their culture and tradition which can be passed down from generation to another generation. The pandan leaves undergo a process before they are turned into planters or baskets which include the cutting, drying, pressing and weaving processes. Each of these processes consume a lot of time and are physically exhausting which can lead to weavers to limit the product they would produce. Pandaiku is an innovative, Arduino-based tool designed to help the weavers of Luisina, Laguna to make these tasks easier, faster and more efficient.

The town of Luisina, Laguna is known as the home of pandan products. Luisianians were blessed because in their community the pandan trees are abundant which can lead to them to use as its main sources of livelihood. According to a survey led by Mr. Ramil Orgasan (Luisiana’s municipal administrator) about 1,300 households in Luisiana are engaged in the industry as planters, weavers or traders. The pandan plant is also indigenous and perennial in 15 out of 23 barangays. The town became one of the primary producers of bayong in the Philippines in response to the Department of Trade and Industry’s Balik Bayong Program.

Nowadays, the weavers still rely on manual methods, particularly for drying and pressing the pandan leaves. Each of the processes consume a lot of time and effort which can slow their production. In their drying process they typically rely on the sun drying which contains a lot of work for the weavers. According to research of Sanchez et al. (2024) entitled “Challenges in Manual Drying of Pandan Leaves Encountered by Handicraft Workers of Barangay Zone VI, Luisina, Laguna: Development of Sustainable Solution”, the result of their study emphasized that one of the challenges of wavers were the manual drying because it prolonged the drying process that sometime can cause an effect to the quality of the leaves. Additionally, upon conducting interviews with some members of Luisiana Weavers Organization, the developers found out that weavers also used traditional practices in different processes such as in pressing processes. The weavers need an innovative solution that can help them to keep up the demand to grow and ease their production without the use of their traditional methods.

This project aimed to develop an innovative tool that could help the weavers of Luisina, Laguna with regards to the process of drying and pressing the pandan leaves which made it easier for them to produce ready-to-weave pandan leaves. By introducing the Pandaiku, the weavers were able to improve their productivity, preserve their heritage, and help them to succeed in today’s world.

Background of the Project

Pandanus Simplex Merr., simply known as native pandan, is a tropical plant usually found in Southeast Asian countries. It is often used by weavers due to its unique characteristics, texture, flexibility and durability making it suitable for

weaving. In Luisiana, Laguna, there is an abundant supply of pandan leaves because it is naturally growing in the wild, forests and even in the resident's backyards.

The members of Lusiana Weavers Organization located at Barangay Zone VI became creative and resourceful, and have seen this as an opportunity to have an additional source of income. According to Ms. Agnes N. Natnat , one of the residents and weavers in Luisiana, weaving and selling pandan handicraft products is her primary source of income which supports her family as well as their children's education until they graduated and became all professionals today.

Different processes will be undergone by pandan leaves such as removing the thorns, cutting, drying, and pressing before it becomes fully ready for weaving. These processes are crucial for it may affect the quality of handicraft products. Weavers of Luisiana Weavers Organization heavily rely on manual methods and techniques to accomplish each process which makes it labor-intensive and prone to challenges. This will not only affect their products' overall quality but also profitability. One of the challenges experienced by handicraft workers is due to unpredictable weather patterns. This is because drying, as one of the process of preparing pandan leaves utilize methods such as sun and air drying, is a time-consuming process that takes 1-2 days in summer to produce ready-to-weave pandan leaves while it lasts for about 1 week during rainy days usually in the month of August to December (Sanchez et al., 2024). Longer drying period can disrupt the production of pandan handicraft products and can be a hindrance for the workers not to meet certain market demands. This highlights the need for an

innovative solution that can enhance the traditional leaf processing management while maintaining the quality of pandan leaves ready for weaving.

The integration of modern technology into the manual processing of pandan leaves will improve the overall production of handicraft products such as Arduino-based devices/ machines that is very convenient for the weavers due to its affordability and multifunctionality. This project will focus on the design and implementation of Pandaiku which will automate the drying and pressing of pandan leaves through the use of Arduino. This device is a remote drying environment where there is controlled temperature and humidity levels, together with the integration of pressing mechanism to press and flattens the leaves, thus giving uniform results in a batch of processed pandan leaves ready and suitable for weaving. It will be beneficial for handicraft workers not only in terms of reduced drying time and minimized labor-intensity in preparing pandan leaves but can also increase their production as well as their income. As stated by Fan and Zhang(2024), integrating digital technology can enhance craftsmanship while the traditional methods are preserved and adapted in contemporary contexts. This device will serve as a bridge connecting the gaps between innovation and tradition.

The development of Pandaiku aligns with the Sustainable Development Goals (SDG) approved by the United Nations General Assembly in 2015. One of it is SDG 8 which is about having a decent work and economic growth. By means of using Pandaiku, weavers will be able to improve their production, thus increasing their income and productivity contributing to the growth of their economy in Luisiana, Laguna. Another is SDG 9 which focus on industry,

innovation, and infrastracture since the developers are introducing Arduino-based technology that could help them solve issues regarding the drying and pressing process of pandan leaves. Pandaiku also aligns with SDG 12 which pertains to the responsible consumption and production. This device will allow weavers to maximize the use of pandan leaves and minimizing wastes and errors.

The development of Pandaiku will help to boost the weaving industry in Luisiana, Laguna particularly of Lusiana Weavers Organization at Barangay Zone VI. This project further aims to enhance the quality of pandan products produced by weavers as well as to empower them and support their livelihood. According to Turner(2024), the handicraft industry has been growing steadily, driven by increasing consumers' interest in unique, handmade products. Countries like India, China, and Mexico are major exporters while countries such as the United States and Europe have largest consumers. With the integration and advancement brought by modern technology in the weaving industry, Luisiana Weavers Organization and their local handicraft products will be competitive enough in local and global markets promoting sustainability and economic growth while preserving their rich tradition.

Objectives of the Project

General Objectives:

The general aim of this project is to help Handicraft Workers in Barangay Zone VI Luisiana, Laguna by speeding up the drying and pressing process of pandan leaves to increase their production.

Specific Objectives:

Specifically, it aims to;

1. Design and develop an Arduino-based device that performs the following functions:

    a. Maintaining the set temperature inside the device by calibrating it using the PID controller;

    b. Drying a batch of pandan leaves based on the maintained temperature and time set by the operator.

    c. Displaying data on the LCD screen regarding the on-going process, either drying or pressing, as well as the elapsed time during each operation or processes.

    d. Stopping the drying process automatically when the set time is completed ;

    e. Pressing the dried pandan leaves in a single layer, back and forth.

    f. Notifying the operator through a sound alert when all the processes is completed.

2. Evaluate using ISO 25010 to make sure that the design project meets the functional requirements while performing well the functional suitability, efficiency /performance, compatibility, usability, reliability, security, maintainability, and portability which ensures the quality of the device.

3. Deploy the device to Luisiana Weavers Organization.

Scope and Delimitations

The primary goal for the development of Pandaiku and integrating it into weaving processes was to support the handicraft workers of Luisiana Weavers Organization found at Barangay Zone VI, Luisiana, Laguna. The development and implementation of this device were done for the first and second semester of the entire academic year 2024-2025 which involved stages for conceptualization, development, evaluation, testing, and implementation. This project integrated several hardware elements, such as an Arduino board, heating elements, fans, PID controller as well as the motor attached to the roller applied in the pressing mechanism. An LCD screen was also introduced to display real-time data such as the temperature maintained inside the device, the current process, and the time allotted for each process. Aside from the aforementioned hardware components, application of software programs was also included so that the device would function properly. This device was intended to dry, and press pandan leaves up to 5 feet long which is the standard size used in weaving baskets, hats, and other small handicraft products. Pandaiku was aimed at the improvement of traditional craftsmanship that the weavers employed, with further growth in the local handicraft industry and economic development of the place along with its culture being preserved.

After all these steps, Pandaiku will undergone testing and evaluation using an ISO standard, which is ISO25010, to be able to assess its functionality, reliability, maintainability, and efficiency. The evaluation process is a necessary step so that the specific requirements and standards were met, guaranteeing its

quality and optimum performance. The final device was implemented at Luisiana Weavers Organization as the target beneficiaries of this project. Pandaiku offers an optimized process for drying, and pressing pandan leaves to handicraft weavers and workers of the organization. Upon the development of Pandaiku, the developers provided training and demonstration regarding its operation for efficient usage as well as maintenance guaranteeing its overall success and long-term use within the community.

However this project faced certain limitations. Pandaiku was not primarily designed to dry, and press other types of leaves. It was not also be able to process pandan leaves exceeding to 5 ft. due to the dimensions specified and designed by the developers. Pandaiku did not also guarantee that the device was free from errors on the initial deployment since the drying process is controlled by a PID controller attached to the device thus several testing to minimize these errors are needed. Additionally, the pressing mechanism of Pandaiku has the potential limitations regarding the different thickness and texture of pandan leaves due to the uniform pressure applied by the rollers in all leaves. The alert system of the device include basic audible notifications through buzzer only and excluded the use of advanced functionalities such as mobile alerts and SMS notification for not all the weavers have access on smartphones. The developers did not also integrate backup power supply.

This device was limited only to the handicraft workers of Barangay Zone VI, Luisiana, Laguna. Any introduction, adaptation, or implementation to other communities requires changes in the device making it suitable in different

conditions found at other places. Training provided by the developers includes basic operations of the device as well as its maintenance and did not cover topics regarding advanced troubleshooting and customizations on hardware and software, allowing the weavers to seek help regarding this matter, thus limiting them to solve complex issues.

Significance of the Project

The project and findings will be significant and useful for the following:

Luisiana Weavers and Workers. This project will be beneficial for handicraft workers and weavers in a way that this device will help them to ease their work with regards to the process of pandan leaves which can also help to increase their production without compromising the quality of handicraft products.

Business Owners. The development of this Pandaiku device can enhance the efficiency of their operations, improve the quality of pandan handicraft products, increase profitability, as well as for them to become competitive enough in introducing their crafts in the market.

Customers. This project will improve the processing of pandan leaves which can lead to the production of handicraft products with high quality, durability, and aesthetic features thus increasing customers' satisfaction.

Weaving Industries. Designing and implementing Pandaiku can ensure sustainability and growth of the industry by modern technology and methodology.

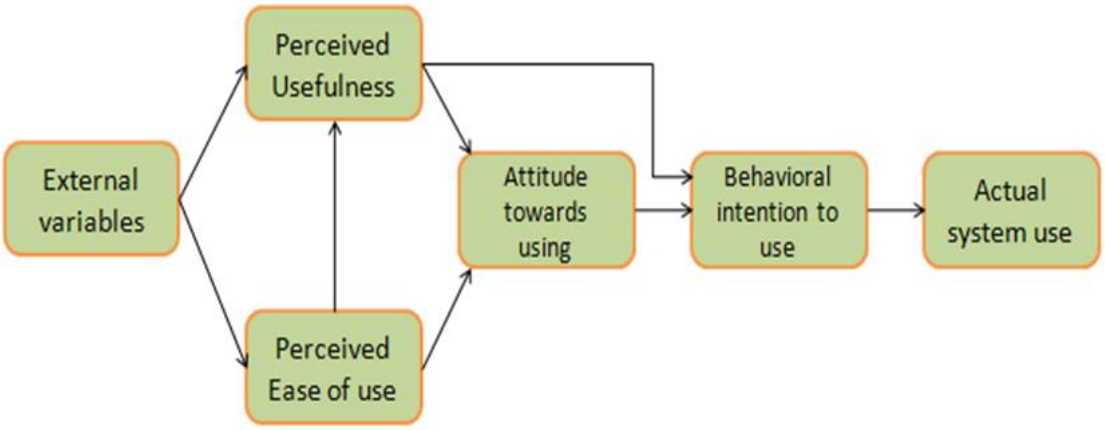
Developers. This project helps developers to apply their knowledge in engineering which can help the handicraft workers in having an optimized leaf

processing system and will also enable them to contribute to the promotion and empowerment of local handicrafts.

Future Developers. Future developers can serve as their foundation or reference for their investigations. The identified development and sustainable solutions provide a comprehensive starting point for further exploration and innovation in related areas.

Theoretical Framework

Technology Acceptance Model (TAM) was conceptualized by Fred Davis in 1989 which explains and provides a framework for understanding of factors related to user acceptance and the use of technology. The two essential variables of this model are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Perceived Usefulness refers to the belief that the use of technology has a positive influence which can enhance a job performance while Perceived Ease of Use pertains to how an individual views technology as easy to use. The Technology Acceptance Model (TAM) can be used in different contexts and can provide important insights regarding the interaction of users and new technologies, improving performance and efficiency.



(https://www.econposts.com/change-management/technology-acceptance-model/)

Figure 1.1. Davis' Technology Acceptance Model (1989)

In designing and implementing Pandaiku for an enhanced processing of pandan leaves, Technology Acceptance Model will help in identifying factors that can influence acceptance of handicraft workers in Barangay Zone VI to this kind of modern approach. Knowing how these handicraft workers perceive the use of an automated device in further improving the drying and pressing processes and the ease it can offer while operating can show barriers or constraints to its adoption. Assessing both Perceived Use (PU) and Perceived Ease of Use (PEOU) can determine specific aspects of design and functionality thus affecting the Behavioral Intention of workers. If the users recognize the use of Pandaiku as highly beneficial in optimizing the leaf processing efficiency, they will be willing to adopt it. On the other hand, if the device becomes challenging to use, its potential adoption will fail, and the development of a more user-friendly technology is needed.

Using the Technology Acceptance Model, the design and development of Pandaiku is centered on the users. Attention to Perceived Usefulness(PU) and Perceived Ease of Use (PEOU) will help in designing technology based on users' needs and expectations. Thus, this can make the integration easier with the current practices. This theoretical framework emphasizes the significance of user's perceptions in the proper implementation of technological innovations aiming to increase productivity and quality of produced handicraft products.

Conceptual Framework

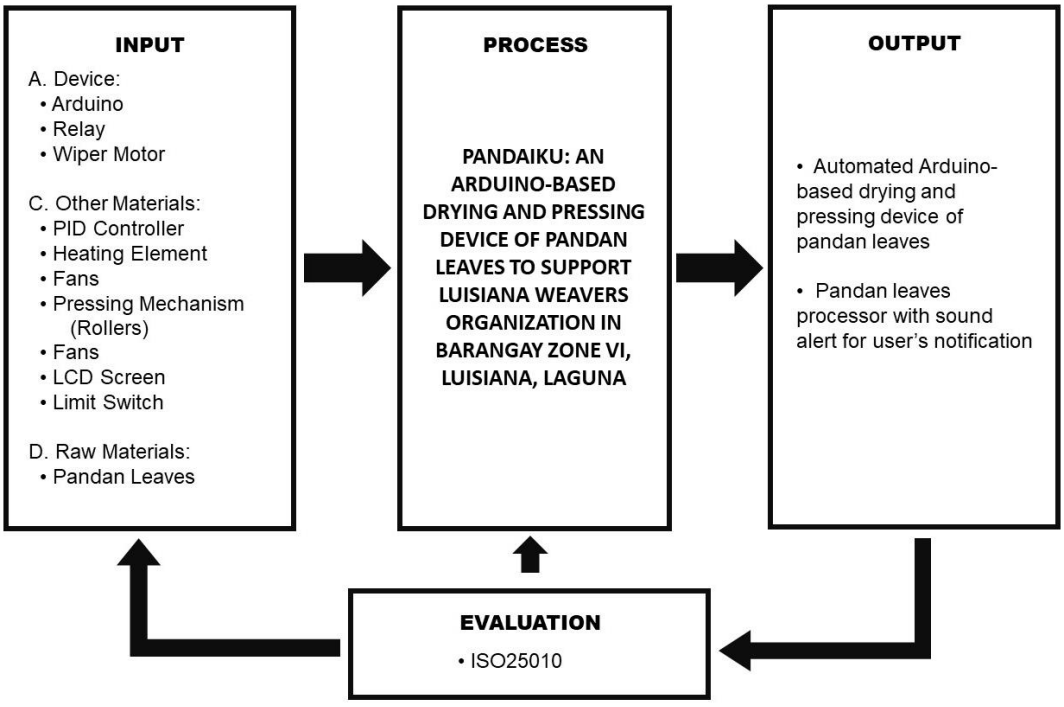


Figure 1.2. The Conceptual Framework of the Project

The 'input' consists of all the necessary components to develop Pandaiku such as the Arduino, motors, heating elements, and other components to ensure efficient drying and pressing of pandan leaves. Arduino is the main element of the

device which is a small board that allowed developers to create projects, fast prototyping, and makes programming easy. It was the one responsible for managing all the important steps and processes for the device to function properly. On the other hand, using a relay is important for effectively controlling high-power components like motors and heaters.

In this project, the developers used a PID controller to maintain the level of temperature and humidity inside the device set by the user. PID controller is the one responsible in regulating the heat inside the device and ensuring that the temperature did not exceed on what was set by the user. In this way, they can ensure that pandan leaves receives constant amount of heat essential to produce uniform results in the drying process.

Aside from PID controller and Arduino, the device is also composed of heating elements, pressing mechanism, fans, display screen, limit switch and a buzzer which works together for an optimized ready-to-weave pandan leaves. The heating element produces consistent heat while fans ensure that warm air regulates inside guaranteeing uniform results thus avoiding over drying or under drying in some of the leaves. Pandaiku was also integrated with a pressing mechanism to ensure that leaves are flattened and ready for weaving. The data regarding the ongoing process as well as the remaining time for each process, both for drying and pressing, were displayed with the help of an lcd screen and notify the operator when the process is completed using a buzzer which produces sound when all the processes is finished.

The ‘process’ in order for the developers to design and build Pandaiku, involved creating layout through CAD which will served as their guide throughout the development, putting and connecting all the necessary elements as well as programming it using C++ language for it to function properly. The developers ensures that the layout and functions of the device aligned to the users’ needs.

The ‘output’ was an automated Arduino-based device that effectively dries and presses a batch of pandan leaves, while also providing a sound alert and to notify the operator that the process was completed. This output represents the practical application and the successful implementation of the device developed by the developers.

Evaluation played an important role in this project. Evaluators used ISO 25010 system and software standard to assess the performance and functional requirements of the device which includes suitability, efficiency, usability, reliability, maintainability, portability, and security. Using this standard, it can ensure the quality of the device and the effectiveness of the selected components and materials to the overall performance.

This project aimed to enhance the overall process of preparing ready-to-weave pandan leaves to support the handicraft workers and increase their production.

Definition of Terms

This section consists of the technical terms, key concepts and terminologies used throughout this project:

Automation pertains to the use of technology to perform tasks with minimal human intervention, aimed at improving efficiency and reducing labor intensity in the processing of pandan leaves.

Arduino is an open-source electronics platform and consists of a microcontroller that can be programmed to perform tasks such as monitoring and controlling devices like the dehydrator (Banzi & Shiloh, 2014).

Drying refers to the process of removing moisture from pandan leaves to make them suitable for weaving.

Humidity refers to the quantity of water vapor in the air, typically expressed as a percentage.

Humidity sensor is one of the devices that measure temperature and supply data for regulating conditions in processes such as drying.

Pandaiku is a device that can automate the process of drying and pressing pandan leaves which is designed for an optimized efficiency and products' quality.

Moisture content refers to the amount of water present in a material, particularly pandan leaves, typically expressed in percentage and serves as an indication for their readiness in weaving.

Pandanus Simplex Merr., also known as native pandan, is a type of tropical plant endemic in the Philippines in which leaves are used in making handicraft products due to its durability and flexibility (Jimenez, 2023).

Temperature sensor is a device that detects and measures the temperature which is very important in regulating the heat inside the dehydrator device.

Paghihinik is the process of removing thorns from pandan leaves after harvesting.

Paglalala refers to the weaving process of pandan leaves to make it a handicraft product.

Paglilinas is the process of cutting pandan leaves into strips into the desired size used for weaving.

Pagyuyupi pertains to the process of flattening the leaves to achieve the desired thickness and pliability for weaving.

Pananagpas refers to the process of gathering leaves from the tree.

Prototype is an initial model or version of a product created to test and validate concepts to large - scale production.

User-friendly pertains to a product, device, system, or service that is easy to use, understand, and interact with, even without technical expertise on using it

CHAPTER II

REVIEW OF LITERATURE AND RESEARCH PROJECTS

Conceptual Literature

Characteristics and Uses of Pandan Leaves

According to an article of Maticph (2021), pandan is a common name shared by a number species of Pandanus, and is also known as Fragrant Screw Pine. It varies in size from small shrubs less than a meter to medium-sized trees of about 20 meters. It is characterized by its abundant leaves spirally crowded towards the ends of its branches. The leaves are green, long. Linear and slender growing up to 1.5 meters long, three to five centimeters wide. Its male inflorescence emits a fragrant smell and grows in length of up to 0.5 meters.

https://www.flickr.com/photos/eltrinidad/8381556832

Figure 2.1. Pandan Tree

Pandan leaves (Pandanus amaryllifolius) are widely used in Southeast Asia for culinary, medicinal, and crafting purposes. They are a crucial raw material for various handicrafts, especially woven products, due to their flexibility, fragrance,

and durability (Chin, 2017). The traditional weaving techniques utilized in regions like Luisiana, Laguna, thrive on locally available resources, where pandan leaves are harvested and processed by local artisans (Santiago, 2016).

Pandan Weaving Industry in Luisiana, Laguna

According to an article of Team Luxon (2020), pandan crafts are made from dried Pandan Leaves which are skillfully woven by the locals. They come in different products like bags, boxes, mats and hats and so on. They also mentioned that the main sources of livelihood of Luisianians was to rely on agriculture and hand-woven products since the pandan industry is indigenous and perennial in most of barangays. Furthermore, it is also mentioned that according to a survey led by Mr. Ramil Orgasan (Luisianians municipal administrator) that about 1,300 households in Luisiana are engaged in the industry as planters, weavers or traders. Additionally, they also emphasized that the town has become one of the primary producers of bayong in the Philippines.

(https://pandanusleaves.blogspot.com/)

Figure 2.2. Pandan Weaving Industry

According to an article of Berto (2022), he mentioned that in Luisiana, Laguna, Harden de Boro is working with pandan farmers and basket weavers to produce sustainable plant holders made from pandan and lessen the use of plastic pots.

Traditional Methods of Pandan Processing and Challenges

According to the weavers, pandan undergo a process prior to weaving and each step has a specific term to it. They refer to the gathering of the leaves as pananagpas, while the removal of the thorny edges is known as paghihininik, and the process of cutting leaves into desired sizes and shape is called paglilinas (Berto, 2022). To further soften the leaves and make them more suitable for weaving they press and flatten them in a process called pagyuyupi.

According to the research of Liwanag et. Al (2020), they explained that in most rural parts of the Philippines, where species of Pandan grow, people still make use of weaving as their primary source of income. That being said, the weaving of Pandan Leaves can be a long and intricate process that often starts with the removal of thorns, cutting them into strips, followed by air drying/sun drying the leaves, dyeing and lastly the actual weaving process.

Additionally, they also mentioned that the tools used by each farmer have different dimensions which are quite troublesome since the varying widths in the strips greatly affect the quality of the finished product. The flattening on the other hand requires less precision and more effort. This is because the tensile strength of a Pandan leaf when dried is very high which thereby requires great effort to press or flatten. Flattening the strips makes it easy for the weavers to weave since

the leaves are much easier to handle when they are soft and flat. Also, the flattening process not only flattens and softens the leaves, but it also gives the strips a shining look which seems to attract more buyers. It is therefore very timely for studies such as this to be conducted since the demand for handicrafts made from Pandan leaves is yet to reach its peak.

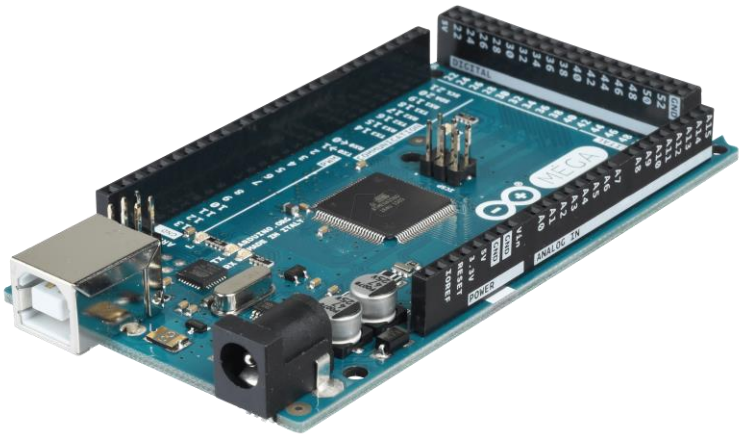
Innovations in Pandan Weaving

Traditional methods for drying and pressing pandan leaves involve manual labor and rudimentary tools, which can be inefficient and time-consuming. As mentioned by Tan (2019), he highlights the need for mechanization to enhance productivity, reduce labor costs, and improve the quality of woven products. Additionally, innovations in small-scale agricultural machinery can significantly benefit the weaving community, ensuring sustainability and economic viability (Gonzales & Reyes, 2020).

In the work of Mendoza (2020) he emphasized that the introduction of automated devices in rural communities can lead to enhanced skill development and empowerment of artisans through training on new technologies. The Luisiana Weavers Organization stands to benefit from such technological advancements, as they can increase output and diversify their product offerings while ensuring environmental sustainability (Villanueva et al., 2021).

The result of the study of Esguerra (2023), they suggested a strong potential for designing an Arduino-based drying and pressing device specifically for pandan leaves to enhance the effectiveness of the Luisiana Weavers Organization. This development will not only modernize the traditional practices of

the local weavers but also preserve and promote the cultural significance of pandan weaving, making it more competitive in both local and global markets.



https://arduinomaster.ru/platy-arduino/plata-arduino-mega-2560/

Figure 2.3. Arduino Mega 2560

With regard to agricultural automation, systems with Arduino technology, especially the Arduino Mega 2560, have increasingly been applied because of its flexibility and affordable cost. Arduino Mega 2560 has built a reputation of reliability. The study conducted by Yuliati, Gumilar, and Manova (2023) found out that devices developed with Arduino Mega 2560 showed substantial validity and reliability, reaching the maximum coefficient of variation at 1.86% and minimum reliability coefficient of 0.62%. The results show the suitability of using the Arduino Mega as a base for developing the automated systems of precise environmental controls, such as temperature and humidity, which applications like drying and preservation of agricultural products require.

https://agreekompheaters.com/tubular-heater-air-heating/

Figure 2.4. Heating Element

A study of Aduewa, Oyerinde, and Olalusi (2021) entitled "Development of an Automated Solar Powered Hot-air Supplemented Dryer", explores the development of a SPHSD, designed for crop dehydration, such as yam, by using a solar collector, a drying chamber, and an auxiliary hot-air system. The results revealed that the SPHSD was significantly more stable in temperature control than a traditional indirect solar dryer. Additionally, energy-saving systems in agricultural practices are also very important. Reliable and stable heating sources like solar power can be able to address the issues on energy cost and environmental effects; hence, the system is applicable for drying applications in agricultural practice, including the preservation of pandan leaves.

https://www.tradekorea.com/product/detail/P244628/30NM-FRONT-WIPER-MOTOR-FOR-BUS-&-TRUCK.html

Figure 2.5. Wiper Motor

Wiper motor is commonly used in mechanical devices and is responsible for the movement and control of a certain part or the whole device itself. According to Erizon et al. (2019), the use of a mechanized pressing system for gambir leaf processing significantly helped local farmers improve productivity by eliminating the need for costly manual rental services. Its integration into pressing system allows continuous and uniform pressing motions because of its reliable torque output, constant pressure, and compatibility with low-voltage power supplies. With regards to pandan leaf processing, the wiper motor enhances mechanical consistency, cuts down manual workload, and reduces the risk of damaging the leaves. Its low power consumption and straightforward integration with automated, IoT-enabled systems further make it an ideal fit for scalable agricultural solutions such as in pandan weaving industry.

https://5.imimg.com/data5/SELLER/Default/2022/12/GP/HJ/CY/949926/rkc-rex-c100-pid-temperature-controller-500x500.jpg

Figure 2.6. PID Controller

The PID (Proportional-Integral-Derivative) controller is an essential component in maintaining stable temperature conditions during the drying process. Accurate temperature control is critical in preventing product quality loss due to overheating or insufficient drying. According to Busu et al. (2023), the PID strategy outperformed P and PI controllers in reaching and maintaining the desired temperature set point in a centralized HVAC system, even in the presence of environmental disruptions. The results indicate that PID controller is best of all other versions, as it has more reliability and response speed in controlling the temperature inside the device. The integration of PID controller is used against real-time sensor feedback which allows for optimal and automated adjustments that guarantee the consistent heat conditions inside the device. By connecting it to a microcontroller such as Arduino, the users will have a very efficient and closed

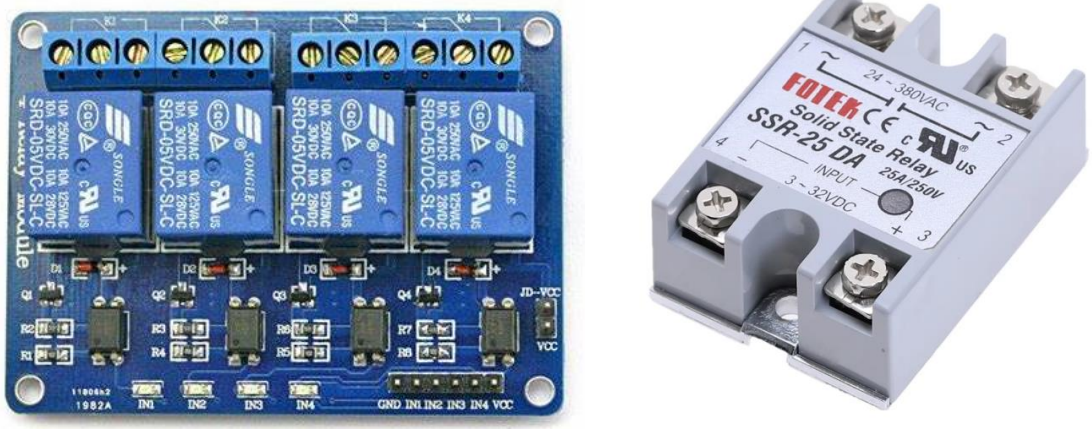
loop temperature control system without any intervention of man. This minimizes human effort and increases energy efficiency as well as consistency in the quality of dried agricultural products like pandan leaves.

https://electricalgang.com/working-principle-of-limit-switch/

Figure 2.7. Limit Switch

Limit switches are important in motion controlled systems as they provide accurate endpoint detection and critical safety feedback. This level of accuracy is required in automated drying chambers and pressing devices where mechanical movement needs to be precisely halted to avoid over-compression or stress. According to Geek's Pub (2021), limit switches are referred to as components commonly used by engineers to indicate the stopping positions of parts which is controlled by a microcontroller such as Arduino, thus allowing the motors to proceed with other actions as dictated by the automation sequence. Similarly, Karthik and John (2021) described the application of limit switches in cut-off safety systems such as vehicle ignition turn-off switches during failure of braking highlights the relevance of these components in applications requiring timely and

reliable responsive actions. For disengaging or pressing mechanisms, the addition of limit switches guarantees that the parts in motion will no longer continue moving to avoid the damage of the machine and the materials inside it. Its compatibility with Arduino and real-time responsiveness enhance response speed and interaction with the system, making it a good option in safety feature implementation, achieving operational reliability and system control accuracy.



https://www.arduinolearning.com/code/5-volt-4-channel-arduino-relay-module-example.php

Figure 2.8. Relay

The relay provides a safe measure of integrating high power or high current electrical equipment into automation systems with low power/signal controls. In drying or pressing systems, relays assist in controlling high-current switching elements like heating fans or motors without any mechanical contact. According to Abduraimov (2023), the use of semiconductor-based relay circuits enhances the reliability and safety of automated electrical systems, especially for motor startup and undervoltage protection. This study emphasized the effectiveness of solid-state switching in developing non-contact control systems, which reduce wear and

improve response time. Connecting microcontrollers such as Ardunio with relays enables switching of high voltage devices while still protecting the entire system from surges and other harmful electrical changes. With regards of drying systems and devices, controlling airflow and temperature becomes simpler with the use of relays due to flexibility, robustness, and reliability demanded from such powered devices during the operation. Their maintenance-free features and lack of mechanical parts make them suitable for continuous operation systems where minimal intervention is required.

Sustainability in Handicraft Production

Yang & Shafi (2020) explained that process innovation refers to the introduction of changes in the production processes which include techniques, equipment and tools that were involved in the production of crafts. It is often focused on reducing costs. Still, cost-saving ideas are part of process innovation, like using new or cheaper materials when traditional ones become too expensive. Technology also helps by improving or replacing tools and equipment to save money, as shown by Mendoza-Ramírez and Toledo-López (2014). Yang and Shafi (2020) explain that process innovation in handicrafts includes using better methods, new materials, and advanced tools or machines to make things more efficient and of higher quality.

Research Literature

Pandan leaves are widely recognized for their versatility in handicraft production and their potential for technological integration in processing methods. Pandan leaves were considered to produce handicrafts in the form of handbags,

mats, basketware, and decorative material in the form of designs of various artifacts (Matichub, 2021).

In regions such as Aceh, Indonesia, craft production in the form of pandan is not just a source of livelihood but a way of expressing cultural identity. Knowledge transfer among the craftswomen has been shown to improve skills and result in better quality products hence better integration into local and international markets (Aisteel, 2023).

According to J.I.M. Kendall (2020), the traditional method is one of the oldest known methods for drying, and pressing pandan leaves every time they make craft. Prepare them for the initial steaming/heating process and then dry them out. Place the leaves in the sun to dry. Take a handful of leaves, tie the ends together, hang the leaves, and let them get the maximum sunlight possible for about a week. The Pandaiku device using temperature sensors such as DHT22 can maintain an optimum drying temperature. For example, higher temperatures can expedite the drying process; however, temperatures that are too high must be avoided to prevent damaging the leaves. Humidity sensors also help in maintaining the appropriate humidity levels. Lower humidity levels are generally preferred for drying as they allow faster moisture removal from the leaves. To know when the leaves are properly dried, one must monitor their moisture content. For example, it would be required that the moisture content reach at least 20% in order not to mold the leaves, and for further storage and use, this system can manage and monitor these parameters at a more efficient level than others (Jimenez Jr. J.P, 2023). Additionally according to (Ramos et al. 2022), incorporating

temperature and humidity sensors enables precision drying that minimizes leaf damage while reducing drying time. These devices align with sustainable development goals by reducing waste and improving energy efficiency.

When dry, you might still want to press the leaves further to flatten them and make them easier to work with. Use a heavy rock to press to flatten the dried leaves. (J.I.M. Kendall, 2020). Pressing of pandan leaves is necessary for forming into desired shapes for weaving. Recent innovations include a combined automatic splitter and presser that streamlines this process. This device integrates both functions to reduce manual labor and improve output consistency. The automation will give better control over the pressing process, thus allowing uniformity in thickness and texture (Adhamatika et al., 2021).

The process is intended to end when an alarm sounds the alarm through a sound alert along with a blinking light bulb. It can be made with a buzzer or speaker producing a sound alert. This can be regulated using a microcontroller, like Arduino or Raspberry Pi. In the same manner, you can use an LED or a light bulb that can be controlled with the same microcontroller (Weinger, M. B. et al., 2021).

There is great potential for automation in the processing of pandan leaves by integrating Arduino technology. Arduino can be used to control various parameters like drying temperature, and humidity levels in the processing. The technology will allow real-time monitoring and adjustment, hence better efficiency and quality. Programming and sensors are the determining factors in the outcome of performance in these systems (Kondaveeti et al., 2021).

Research Project

According to the study of Ariffin et al. (2023), they provide foundational insights into the relationship between traditional craft practices and the natural environment. They emphasize the significance of considering the local context when designing sustainable solutions. Their work underscores the importance of aligning design strategies with the cultural and environmental attributes of the region in Malaysia. They highlight the need for a holistic approach incorporating indigenous knowledge and local materials concerning innovations such as design, materials, techniques and uses. Innovation in creating actual traditional crafts needs to be balanced to maintain the authenticity of traditional crafts.

In the work of Maida et al. (2022) they explored the potential of pandanus as a sustainable resource for rural craft preneur. They emphasize the economic and ecological advantages of utilizing pandanus fibers in various artisanal products. Maida and Magalhaes demonstrate how optimizing pandanus resources can increase income for rural communities while promoting environmental conservation.

Due to the versatility and accessibility of an Arduino technology it has been used increasingly in the applications of agriculture. In the study of Nascimento and Barros (2017) they emphasized the effectiveness of it in agriculture because of its improvements in monitoring and automation processes. Their study proved that Arduino-based systems allow the development of systems that can automate agricultural tasks, improving efficiency and reducing labor.

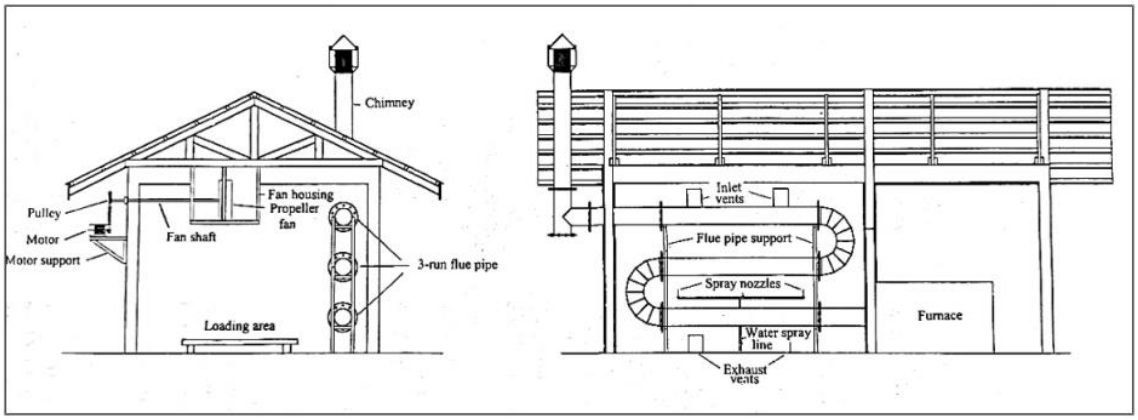
https://www.scribd.com/document/512137312/Pandanus-Leaves-s-Litter-Presser

Figure 2.9 . Pandanus Leaves Slitter-Presser

The Pandanus Leaves Slitter-Presser developed by DOST-Aklan and MIRDC is a simple tool that allows a smooth output and press pandan leaves. It has metal rollers that push the leaves in tandem, with adjustable parts. Though effective, it is manual in nature and limits the number of leaves that could be processed at the same time. Testing found that the leaves' moisture content was critical in achieving the best results, since air-dried leaves were optimal. Pandaiku adds to these findings an automated system for pressing and slitting. Using Arduino technology, Pandaiku hopes to make things more efficient and cut down on the physical work needed, making it better for small weaving communities that need a lot of production.

Preserving the quality and extending shelf life in drying of agricultural products has been studied extensively due to its importance. According to the study of Chowdhury et al. (2018), they examined different drying techniques and explained that controlled temperature and humidity greatly improves the efficiency

in drying of botanicals like pandan. In drying the Arduino-based system could incorporate temperature and humidity sensors to optimize the drying process.



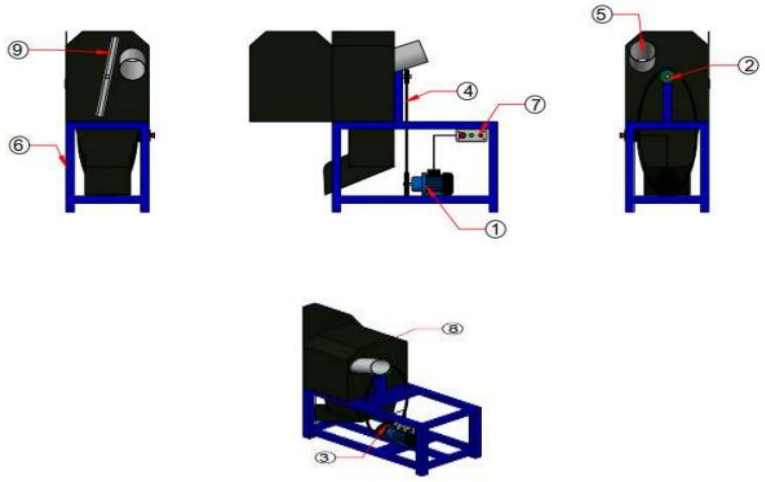
https://philjournalsci.dost.gov.ph/images/pdf/pjs_pdf/vol152no6A_Dec2023/drying_characteristics_of_pandan_leaves_using_the_FPRDI_furnace_type_driver_.pdf

Figure 2.10. DOST-FPRDI furnace-type dryer

Useful information on moisture management and efficiency in drying pandan leaves is derived through studies on the DOST-FPRDI furnace-type dryer. The study of Jimenez (2023) proved that narrow leaf strips attained the required moisture content faster than broader strips, and uniformity is thus observed in drying. Meanwhile, increased temperature settings already significantly lessened the drying time while maintaining a high quality of the leaves. Pandaiku uses this knowledge to automate the drying process in its system, ensuring the moisture levels of the pandan leaves are uniform. Combining drying with pressing makes the whole preparation process easier, saving time and work while improving the quality of the final product.

A single device that can process drying and pressing provides efficiency on the process. As evidenced by Wang et al. (2020), they develop a multi-functional

device that carries different processes with regards to the agricultural products and its results show that there is a significant improvement in workflow and to the quality of the product. Additionally, he mentioned that through the use of Arduino-based systems for pandan leaves it can reduce the time and effort needed for every procedure which make it more feasible for small-scale farmers.



https://scholar.google.com/citations?view_op=view_citation&hl=en&user=JNJN6D8AAAAJ&sortby=pubdate&citation_for_view=JNJN6D8AAAAJ:Q_E8KsG3g9MC

Figure 2.11. Pandan Decking Machine

The design of the pandan decking machine made by Zulkarnain and Mulyadi (2024) is light and efficient to increase productivity. Using SolidWorks for detailed planning, it employs a single-phase electric motor that cuts pandan leaves. This study reveals why the best materials and characteristics of an engine must be chosen to last long and be affordable. Pandaiku uses Arduino to make operations automatic and add more features like drying and pressing. By making things work better while keeping them small, Pandaiku helps small weaver groups improve efficiency in a cost-effective way.

Integrating technology, such as Arduino-based systems into traditional crafting has emerged to grow a trend to blend the heritage with modern efficiency. In the study of Fernandez et al. (2021), he highlighted that the Arduino microcontroller is known for its adaptability and affordability which can be used to develop an automated system customized for specific crafting needs. Additionally, Bautista (2022), also noted that through this technology it does not only speed up the production but also improve precision in processes like in the cutting and drying.

According to the study of Thompson (2018), there are several projects around Southeast Asia that successfully implement technology to process the natural fibers and leaves. Furthermore, he explained that in Thailand, weavers used automated pressing machines to improve the quality of textile and can reduce the production time. Through this study it offers insights to understand the benefits and challenges of adopting similar practices.

The designs and studies reviewed provided the fundamental understanding and inspiration to combine drying, and pressing into a single Arduino-based system of Pandaiku. In order to address such weaknesses as the time-consuming and multiple single-function devices, Pandaiku enhances the efficiency and access to weaver organizations in Barangay Zone VI, Luisiana, Laguna. Such an integrated approach aligns well with the target of enabling small-scale industries with innovative cost-effective solutions specially tailored for them.

Design Synthesis

The review of related literature and projects presents different methods applied to the processing of pandan leaves, starting from traditional and manual approaches into a more recent innovations using advanced technologies. This synthesis describes the similarities and differences found among the existing techniques and research, which set apart the unique features of the Pandaiku device designed for Luisiana Weavers Organization of Barangay Zone VI, Luisiana, Laguna to help them have an efficient drying and pressing processes of pandan leaves.

The literature often shows that pandan leaves is the main materials used in making products like mats and bags. Traditional ways to process these leaves, which include drying and pressing, require a lot of work. This similarity is true in rural areas where weaving pandan is an important job (Chin, 2017; Liwanag et al., 2020). Many studies point out that using machines is needed to make work easier and reduce the amount of manual labor in these steps (Tan, 2019; Mendoza, 2020). New automation ideas, especially those related to Arduino-based systems, significantly improve the processing of pandan leaves in terms of efficiency, consistency, and quality, thereby reducing the level of physical efforts required from the artisans (Kondaveeti et al., 2021; Weinger et al., 2021).

All the research studies strive to make the pandan leaf processing to be better and efficient, but they do this in different approaches. Some focus on the integration of multiple processes like drying and pressing, while others will try to

focus on one process. In the drying process, one of the differences mentioned in different projects and literature is that the utilizes Arduino-based devices or systems to monitor and control the temperature and humidity while traditional technique includes natural drying wherein the pandan leaves batch gets dried either with the help of the sun or through air as shown in literatures and projects by Chowdhury et al.(2018), Jimenez Jr.(2023), and Kondaveeti et al.(2021).

Pressing process is one of the most labor-intensive activities when preparing pandan leaves for weaving. Previous studies show new and advanced devices and machinery which makes it easier and more reliable (Adhamatika et al., 2021). The Pandaiku device puts together drying and pressing into one automated system, giving more advantages and benefits compared to old methodologies. These devices were researched recently (Jha et al., 2019; Singh & Agraval, 2021).

The development of Pandaiku integrates the drying and pressing functionalities into one device which allows it to stand out and really differ from recent innovations. Although other research or projects focused on enhancing a single process, the objective of the Pandaiku is to optimize the entire workflow, thereby minimizing the time and labor demanded from weavers.

CHAPTER III

DESIGN AND METHODOLOGY

Project Design

From the previous study of Sanchez et al.(2024), it was revealed that there are some of the challenges that weavers, who are engaged in handicraft production in Luisiana, Laguna, commonly encountered during their manual drying process of pandan leaves, particularly sun drying and air drying techniques. Among them is the unpredictable weather conditions in the area, which interferes with the drying process and leads to defects such as discoloration and mold formation. This prolongs the drying period and affects the quality of the leaves negatively. The drying process is physically demanding including other processes such as pressing, as most workers perceive it as moderately labor intensive activity and requires too much effort from the weavers to generate good results. All these challenges make the drying process even harder, especially during the rainy season, which prevents maintaining a smooth and continuous production of pandan handicraft products.

Sun Drying
(Drying Process)

Ilohan
(Pressing Process)

Figure 3.1.Manual Methodologies Used in Processing Pandan Leaves in Luisiana, Laguna

A modern and innovative solution is proposed by Sanchez et al. (2024) to resolve the challenges related to the production of handicraft products. The developers will design and develop an automated device that has drying and pressing functionalities which will enhance the processing of pandan leaves. The device will dry a batch of pandan leaves, and then press them to produce high quality pandan leaves perfect for weaving. It is therefore the combination of these features that reduces labor intensity, normally associated with manual processing, and thereby makes it easier on the body of workers. This controlled environment will help ensure that drying and pressing is efficiently and uniformly done despite any outdoor weather conditions.

The integration of this device is not just for the enhancement of the quality and number of yield of pandan handicraft products but also to significantly reduce

the labor and time requirement from weavers, thus resulting for an even more sustainable and effective operation and production. The development of Pandaiku significantly helped the workers of Luisiana Weavers Organization to increase their production of pandan handicraft products. This device enabled them to produce good quality of ready-to-weave pandan leaves over a short period of time and without requiring lots of human intervention since one of their main issues is labor intensiveness even in the presence of rain or any environmental factors that hinders them to meet high market demands and orders.

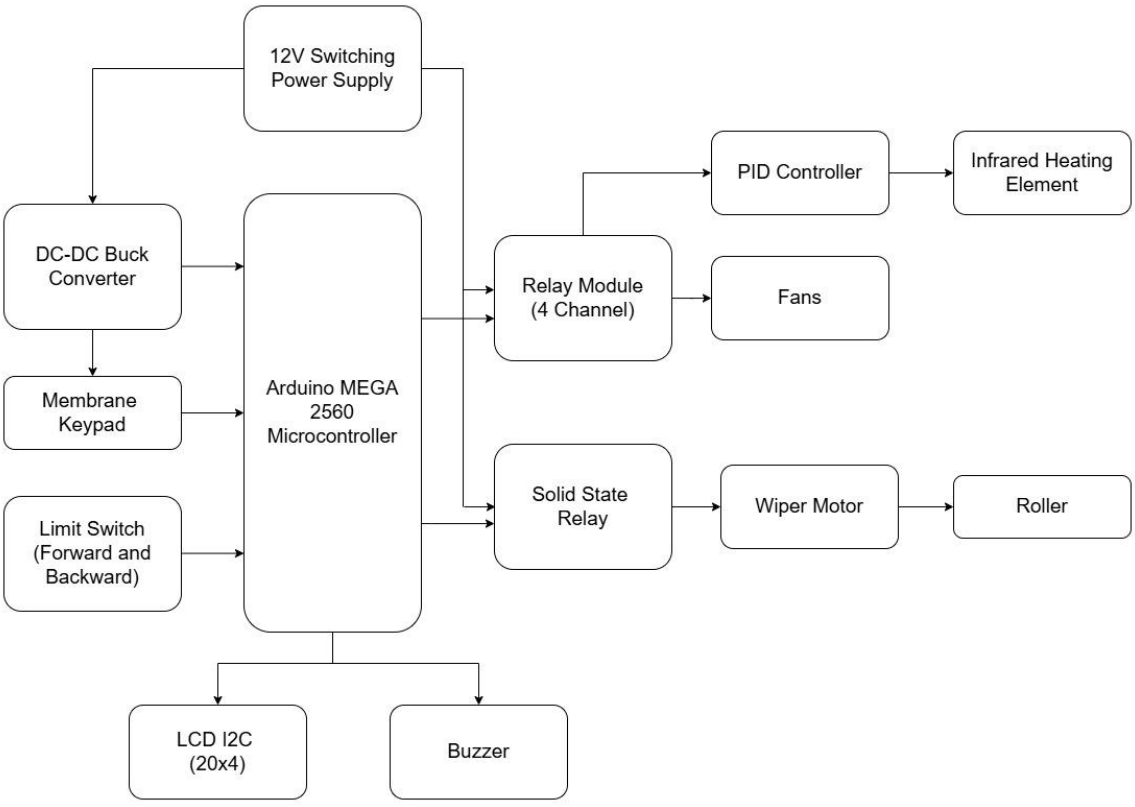


Figure 3.2. Block Diagram of Pandaiku

The figure above shows the block diagram of Pandaiku which shows the interconnection and flow of interaction between components in the system that

automates the drying and pressing process of pandan leaves. Central relays interface with the motor and sensors to control its operation and receive user input. The central control unit is an Arduino Mega 2560 microcontroller which gets signal from user interfaces, a keypad, and limit switches, processes, and manages the control signal for the actuators. This system is developed in order to simplify the processing of pandan leaves for the Luisiana Weavers Organization.

The following are the detailed explanation of the block diagram:

A. The system's central processing unit is the Arduino Mega 2560 which receives input signals from the membrane keypad and limit switches. On the basis of information received, it controls other components and their outputs such as relays, LCD display, solid state relay, and buzzer with functions for controlling the drying and pressing operations.

B. The keypad allows the operator to set particular parameters such as drying time, pressing time, etc. It serves as the primary means of interaction with the microcontroller. With the keypad signals, the Arduino can start or change the operation of the device.

C. LCD screen indicates important data like temperature, time and also process status. It helps in allowing the user to view his/her input through the screen during setup and informs the user what the system is doing.

D. With the use of relay module, it is possible for the Arduino to control high voltage components like fans and heating without any danger. It serves as the link of the microcontroller to these electrical loads. The environment of the dryer is well controlled by the Arduino with the signals from the relays.

E. The PID controller guarantees accurate and stable temperature is maintained during the heating process of drying. It works independently from the Arduino, but it is activated through the relay. The controller modifies the power supplied to the heating elements in accordance with the temperature sensors' feedback, striving to keep within the set limits.

F. The infrared heating elements are the ones to provide heat up to the necessary temperature to dry the pandan leaves. They cooperate with the PID controller in maintaining a certain temperature level throughout the drying process. Their ability to emit infrared radiation helps them to heat up quickly and provide results uniformly.

G. Blower fans increase the speed of drying by regulating hot air inside the device. Their control is through the relay system, which is connected to the Arduino. The blower ensures that there is enough air to remove moisture from the pandan material.

H. Solid State Relay allows the motor to be switched on and off at high speed with no mechanical contacts. It takes pulses from the Arduino for the pressing motor's actions.

I. The wiper motor drives the roller through the chains connected to it to control the pressing of pandan leaves. The motor will continue to operate unless the time allotted for pressing is complete. This time, the motor will activate once again for the roller to go back to its default position.

J. The two limit switches activate at the defined maximum and minimum limits of movement of the roller. They receive signals from the Arduino to cease or change

the rotation of the motor. With these changes, the tendency of the roller is to move back and forth causing the pandan leaves to be pressed evenly.

K. Buzzer was the one responsible for the notification of the user once the entire process has been finished aside from the message displayed in the LCD screen. The buzzer, controlled by the Arduino, signals at the end of the pressing sequence, making the operator aware that all processes are completed.

L. DC-DC Buck Converter is essential for voltage regulation within the system as it transforms the 12 volts supplied by the primary power source into lower volts intended for the Arduino and keypad. It protects sensitive components from overvoltage damage while guaranteeing reliable operation, providing essential guard failure absent when low voltage components are integrated.

M. 12V Switching Power Supply converts the AC power available to 12V DC to supply all of its parts which include relays, fans, heating elements, and Arduino with electricity to operate. The unit also drives high and low power devices. Additionally, it also supplies additional power for components that require lower voltage through a buck converter.

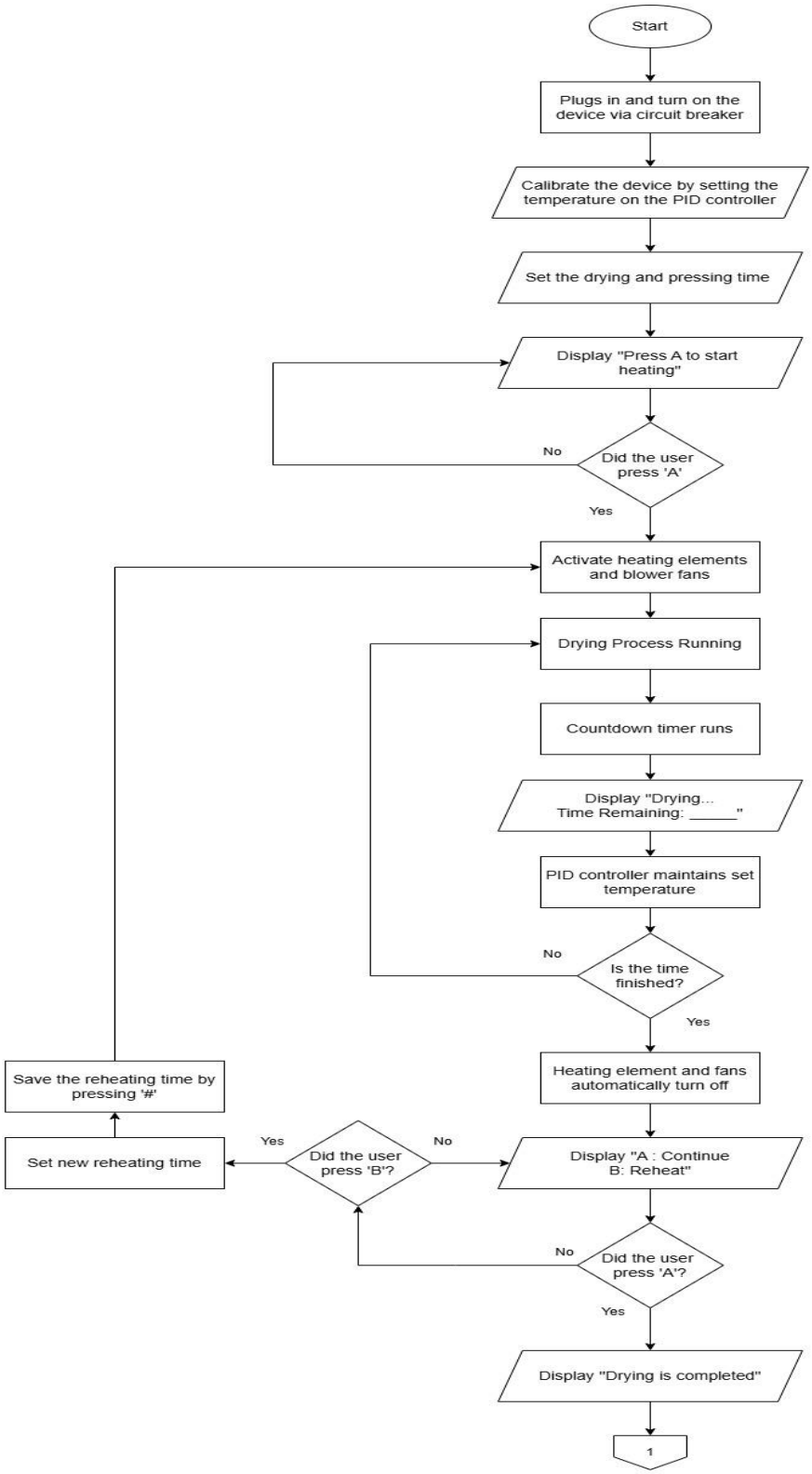


Figure 3.3. Drying Process Flowchart of Pandaiku

To begin the pandan leaf processing, the operator must plugs in and turn it on using the circuit breaker attached to the device supplying power to all its components. The LCD screen will be activated but first, the user must calibrate the device by setting the level of temperature he/she needs while drying using a PID controller. This PID controller will ensure that the amount of heat inside the device will be maintained throughout the drying process. After setting the degrees of temperature, the device will ask the user to input the time required for drying and pressing processes of pandan leaves. After saving the time, the LCD screen will display a message to the user asking him to press the 'A' button which will activate the heating elements and fans and immediately start drying the pandan leaves inside the device. The LCD screen will display the message “Heating…” as well as the remaining time for drying.

While the drying mechanism of the device is running, the thermocouple attached inside the device will be the one responsible for measuring the amount/level of temperature in real-time and displaying the collected data on the PID controller. The drying mechanism of the device will operate not until the time allotted on the drying process in finished. During this time, the moisture content of pandan leaves perfect for weaving is also achieved. According to the study of Jimenez (2023), the equilibrium moisture content (EMC) of pandan leaves used in weaving is approximately 15-18% which will be achieved through the relative humidity of around 60-80%. The temperature inside the device will also be monitored whether it is over the temperature set by the user. If it exceeds, the heating elements will turn off, allowing the fans to regulate the heat inside the

device until it returns to the desired temperature of the operator. Once the time required for drying is done, the heating elements and fans will stop, then display “Drying is completed”. Before proceeding to the next process which is pressing, the device will ask the user whether to reheat or to continue. If the operator is still not satisfied with the dryness of pandan leaves inside, he has the option to reheat and another time again. While on the other hand, if the user wants to proceed with pressing of pandan leaves, he will just press the 'A' on the keypad.

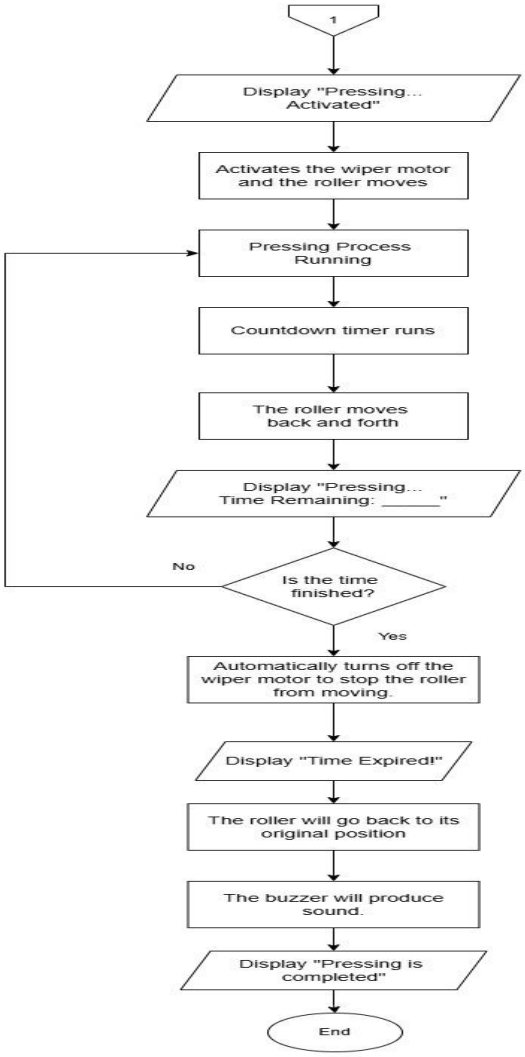


Figure 3.4. Pressing Process Flow Chart of Pandaiku

Once the drying process is complete, the LCD will display a message showing "Pressing activated". By this time, the motor attached to the roller will be activated causing the roller to move. During the pressing process, the LCD screen will display "Pressing..." as well as elapsed time. The device is also equipped with forward and backward limit switch attached to both ends. When the roller triggers each switch, it will automatically move in reverse direction causing the roller to move back and forth throughout the pressing process. Once the timer runs down, the motor will be turned off causing the roller to stop moving and the LCD screen will display "Time Expired!". After a few seconds, the roller will return to its default position. Once the limit swtich in its original position has been triggered, the buzzer will produce sounds notifying the user that the entire process has been completed.

Figure 3.5. Three-dimensional (3D) View of Pandaiku

Figure 3.5 shows the illustration of Pandaiku in its three-dimensional form, which has a strong base frame made of tubular stainless steel bars, a cover made from plain sheet linso. Stainless steel are used in construction because of the

numerous advantages it offers, such as flexibility, structural support, and load-bearing capabilities, which provide the needed rigidity and stability for different applications, including framing, bridge building, and industrial structures (TKL Steel, 2024). The plain sheet linso is lightweight and has the resistive property against corrosion, is a commonly used material in making protective case of the device.

The selection of materials used in Pandaiku enhanced its performance and overall efficiency. The tubular stainless steel bars ensure that there is a firm and reliable structure and foundation. Plain sheet linso guards the components inside the device from environmental conditions as well as other factors outside that may affect its function. All the materials used by the developers ensure that Pandaiku is a feasible, resilient, and an effective solution for addressing challenges related to pandan weaving.

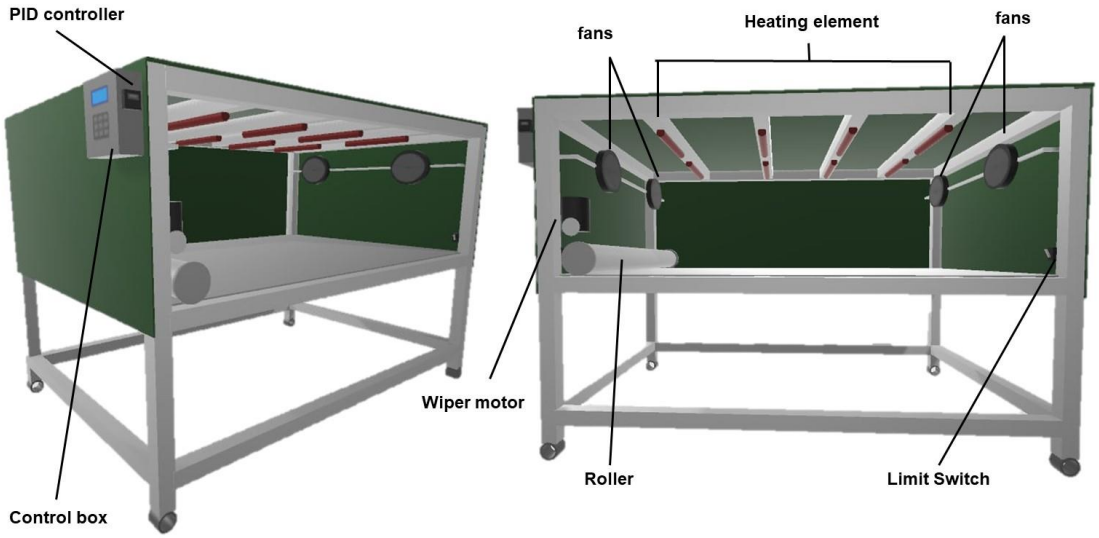


Figure 3.6. Components Setup of Pandaiku

As shown in the figure above (Figure 3.6), Pandaiku were composed of various components inside, attached to their respective places. Pandan leaves will be placed at the bottom, below the heating elements. The rollers attached to the motors are found at the other end of the device which will be automatically activated and press the pandan leaves once the drying process is complete. The rollers will move back and forth so that the leaves will be pressed evenly. Lastly, the control box located at one of the side near the motor and the back door which is the one responsible for the control of the different elements in Pandaiku.

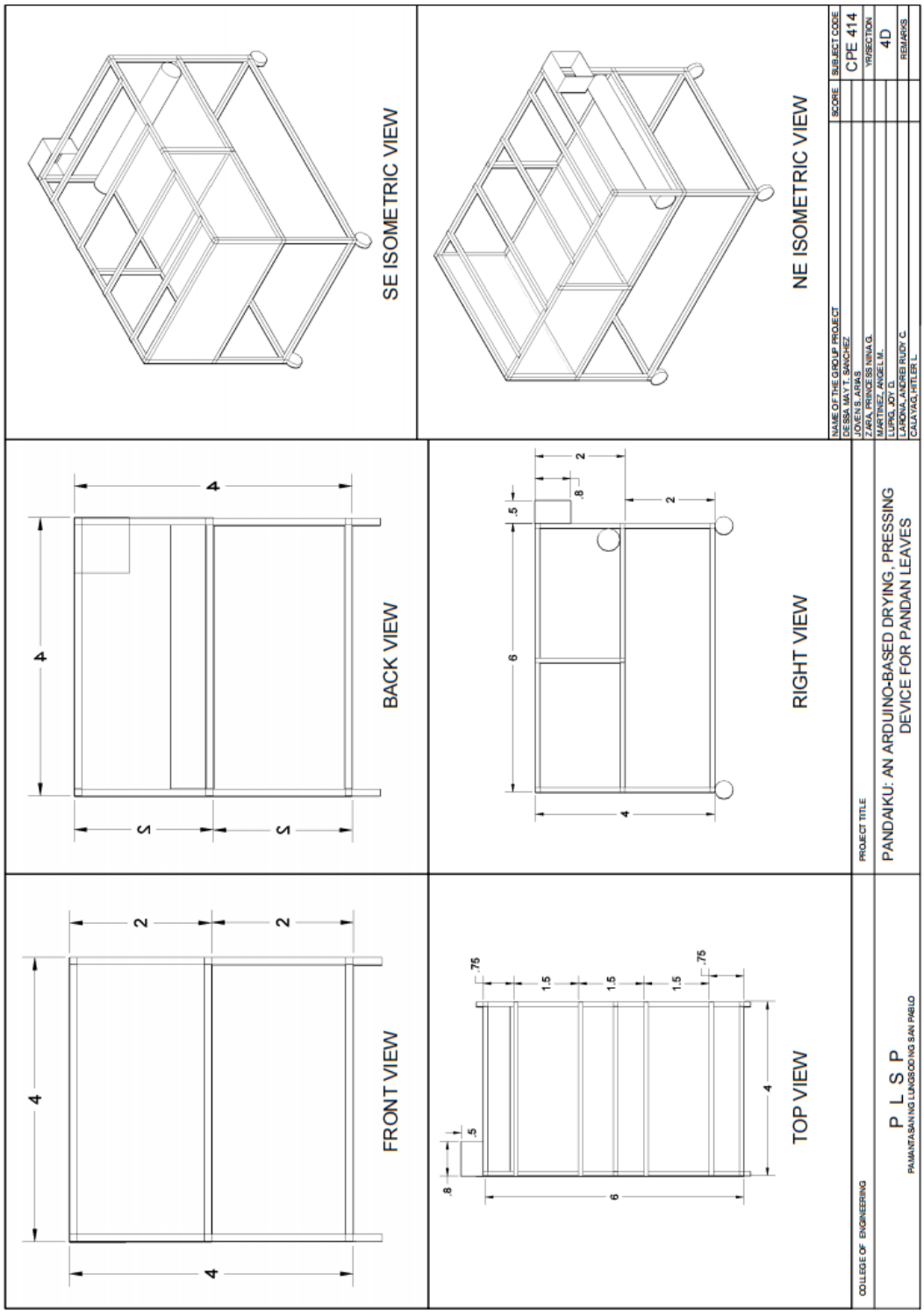
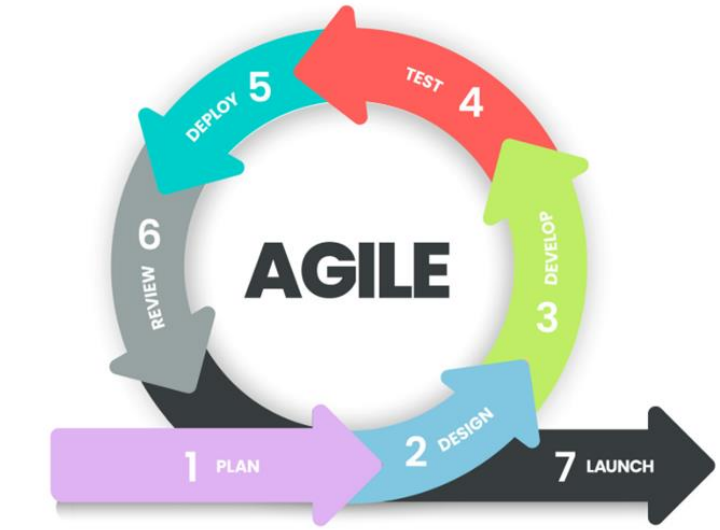


Figure 3.7. Top, Bottom, Front, Side, and Isometric View of the Project

Project Development and Testing Procedure

This project used agile project management methodologies to ensure a dynamic, flexible, and iterative framework for its creation. Its testing procedures adhered to the ISO/IEC 25010 standard to uphold quality standards, focusing on the comprehensive evaluation of functionality, usability, reliability, and performance. By aligning the project closely with its designated design, the developers addressed the specific needs of the Luisiana Weavers Organization in improving the efficiency of pandan leaf processing.

After careful consideration of a client's specific needs in the design, development, and testing procedures and deployment, an agile methodology was chosen. This has been illustrated in Figure 3.8, in which strategic alignment in the requirements of the phases of a project was drawn. An agile approach was picked because this dynamic and adaptable framework fit iterative development, ensuring the strategy in place was highly responsive to the changing nature of the demands of the project



https://www.geeksforgeeks.org/agile-sdlc-software-development-life-cycle/

Figure 3.8. Agile Model

The Agile Software Development Life Cycle (SDLC) is a very powerful approach to project management and software development, focusing on flexibility, collaboration, and continuous improvement. It allows developers to deliver high-quality products in a timely and efficient manner, with the flexibility to adapt to changing requirements and customer needs by embracing agile principles and frameworks.

The first phase of agile development was the *Planning Phase*. In this case, developers considers whether it was possible to implement Pandaiku for Luisiana Weavers Organization. Inspired by Indunil Karunarathna et al. (2023), the developer created the basis for these needs by conducting primary data directly from sources such as surveys and observations to understand the difficulties that the Luisiana Weavers Organization encountered. The developers brainstormed

ideas on how they could solve the issue of the long process of pandan leaves using technology and developed a plan.

After the identification of the plan, the developers drafted the solid blueprint of the device in the *Design Phase*. In order to create a solid design foundation, the developers did research on relevant data and existing devices and sought advice from their advisors. Visual aids, including the block diagram in Figure 3.2 and the flow chart in Figure 3.3 and Figure 3.4, were employed to visualize the device's structure and necessary components.It is not just pictorial description of the device, but these illustrations also helped the developers understand all the potential and defects that might arise in the development process.

The third phase is the *Development Phase*, where the design from the flowchart and block diagram was implemented using codes for the device. The programmer of the team translate this conceptual design into actual functioning code, while simultaneously, the physical body of the device was created, meeting all the specifications that it must and will do as a working model. This stage is the implementation of the designed concept into practice, combining the development of software with the building of the device's physical parts to set up for the extensive testing phase that follows.

The *Testing Phase* is a thorough evaluation of the prototype by examining the working of each of its parts. This is a combined effort of three key important roles, the Project Manager, Programmer, and Tester. The Project Manager is supposed to support a plan for testing that corresponds with the goals and needs as stated in the project. On the other hand, the Programmer ensures that the proof

of the usefulness of the code is done. The Tester checks whether the device functions appropriately by using it under specified criteria. This process filters through potential problems, and those are identified and addressed early in the development cycle thus avoiding costly rework and ensuring a good-quality prototype.

The *Deployment Phase* represents the stage in which the device has undergone thorough testing and is now prepared for use by its intended users. In this phase, the pandaiku was ready for use by the intended users. The complete deployment phase of the device can be seen in the project deployment plan part of this paper.

Upon its successful deployment, the developer then proceeded with *Review Phase*. This was an important step to ensure that Pandaiku really worked and the end-users do utilize it properly. Detailed reviews assisted in finding potential problems or areas where the prototype was incomplete and can be improved on further. Close monitoring of user interaction and device performance on the part of developers helped them get precious feedback, which was vital for guiding further improvement and better accomplishment of all desired specifications and needs as perceived by users.

Once the review process was concluded, the *Launch Phase* was carried out, which is the point of time when the device was ready for its intended end-user. During this phase, the parties involved signed a Memorandum of Understanding (MOU) including the developers and their client which is the Luisiana Weavers Organization. It was done to formalize the understanding and ensure the device

will be used to the client's advantage. This agreement confirmed the commitment of both parties towards the effective and useful application of the device.

Testing Procedures

Software Testing

This software testing was made to ensure that the system functions properly and met its set specified requirements. Software testing involved identifying and fixing the errors and bugs to make sure that the software operates properly and performs efficiently, it helped to minimize the potential issues during the usage hours.

The programmers did a software testing to ensure that all the code will functioned correctly according to its purpose and make sure that it meets the intended requirements. The programmer's team tested the code and made an adjustment depending on the output that needs to be met using sensors and other materials relevant to this project. This kind of process helped to identify and address the future problems that could cause some trouble to the users. Through this testing, it was ensured that the software's functionality is aligned with goals of this project.

Hardware Testing

Developers tested the hardware parts and components of the pandaiku device to make sure that every parts were properly connected, working, and all functional. It includes the checking and testing the physical components of the pandaiku device such as heating elements, fans, motors, and other materials if it works properly and meet the expected output of the device. This testing helps to

avoid any problems in the near future, ensuring that the device will be useful and error free.

Specific Objectives Testing

This test aimed to ensure that all the functionalities integrated into this device operates as intended. The following details are the comprehensive testing procedures designed to meet the objectives of the device.

Temperature Monitoring and Regulation Testing

This device uses heating elements and fans. PID controller is also used to have a consistent heat and warm air inside the device, which ensures high-quality results and avoid over-drying of the pandan leaves.

The thermocouple attached to the PID controller was used for temperature monitoring inside the device, and the following outlined procedures used by the developers to verify the device capacity to monitor and regulate the temperature:

1. Set the time allotted for drying process then press the ‘A’ button on the keypad to start.
2. Check if the relay is connected to heating elements and fans are functioning throughout the drying period.
3. Check if the temperature is displayed on the PID controller and show the accurate temperature inside.
4. Verify if the relay connected to the heating element is deactivated when the temperature shown in PID controller reaches the above celsius inside the device set by the operator.
5. Record the gathered data in a table to analyze.

Drying 50-70 pcs of Cut Pandan Leaves Testing

To validate the device capability to dry 50-70 pieces of pandan leaves, several testing were conducted to ensure the accurate result. This test ensures that the device can perform well as its function.

The following test procedures was conducted:

1. Make sure that there is 50-70 pcs pandan leaves inside the drying area.
2. Record every minutes until the set time is completed.
3. Repeat the process until the desired output is achieved.
4. Put the collected data in a table.

Pressing Testing

In this testing process, it ensures that the pressing materials performed well to press the pandan leaves properly without causing damage to it. The following outlined the procedures used by the developers to verify the device functionality :

1. Activate the pressing process when drying is completed.
2. Check if the pressing materials applies the right and enough pressure to totally press a pandan leaves.
3. Look if the pandan leaves has no damage and meet the desired output.
4. Record the time period during the process.
5. Repeat the process to ensure the consistent performance and output of the device.

Notification Testing

This pandiku device features an audible notification sound place at the control box of device to inform the operator when the process is already completed.

To test its functionality, developers wait the enough time to complete all the process , ensuring that the speaker module functions well as its assigned role.

Project Evaluation

To ensure that Pandaiku was efficient in drying and pressing pandan leaves, five (5) CpE practitioners together with five (5) members of Luisiana Weavers Organization, and one (1) Agriculturist from the municipality of Luisiana, Laguna, for a total of thirty-five (11) individuals, were selected as evaluators. The evaluators used ISO 25010 which served as a comprehensive framework for assessing software quality, ensuring that both product functionality and user experience were prioritized throughout the development lifecycle and provided a flexible framework that aligns with modern software development needs while facilitating effective communication and thorough assessment of quality across various dimensions with the following software standards: performance, compatibility, usability, reliability, security, maintainability and portability.

Validation Criteria

In order to identify the acceptability of Pandaiku, a validation criteria designed using a systematic five-point Likert scale was employed as shown below in Table 3.1. For every scale value, there was a corresponding interval range with an associated adjectival rating reflecting the perception made by the evaluator.

Table 3.1. Pandaiku's Validation Criteria Using Likert Scale

LIKERT SCALE	INTERVAL	ADJECTIVAL RATING
5	4.51 – 5.00	Highly Acceptable
4	3.51 – 4.50	Very Acceptable
3	2.51 – 3.50	Acceptable
2	1.51 – 2.50	Moderately Acceptable
1	1.50 and below	Not Acceptable

The evaluators were able to express their perceptions through the scale value where they consider the best that represents their attitude or opinion regarding a given statement or question related to the device. After the evaluation process, the data was analyzed and processed using the arithmetic mean, which was one of the commonly used measure of central tendency. The arithmetic mean requires that all the responses in the group be added up and then divided by the number of total responses.

Formula:

$$A = \frac{\sum fx}{N}$$

Where,

A = Arithmetic Mean

$\sum fx$ = Sum of all responses in a group

N = Total number of responses

Findings were analyzed and classified according to the scale intervals as Highly Acceptable, Very Acceptable, Acceptable, Moderately Acceptable, or Not Acceptable. This systematic method of gathering data from the respondents and evaluators ensures transparency, uniformity, and dependability.

Design Instruments and Techniques

This design project used ISO 25010 evaluation model as a design instrument and technique to ensure the comprehensive software quality of the pandaiku device. This evaluation framework helped to make sure the device performance met the specific materials needs of handicraft weavers to their products.

The evaluation was composed of two different questions, the close-ended and open-ended questions. In close-ended, evaluators choose their response based on the given evaluation questions that base on ISO standard while open-ended questions the developers seek the evaluators to share their own thoughts regarding the device and its function. The provided questions are based on the updated ISO 25010 evaluation model and align with the goals of this project.

The evaluation process is composed of two parts;

Part 1 : Evaluating the device on its functional suitability, efficiency / performance, compatibility, usability, reliability, security, maintainability, and portability.

Part 2 : Asking the evaluators to test the device performance and provide honest feedback about the device functionality.

Project Deployment Plan

Following final approval as part of the deployment strategy, the developers sent the device to Ms. Mayline Lorico, President of Luisiana Weavers Organization in Luisiana Laguna, as the project beneficiary. The device is responsible for pressing and drying pandan leaves. After the handover, the developers gave the chosen device operator a user manual to refer to when maintaining the device modules and resolving system problems.

Table 3.2. Project Deployment Plan

Strategy	Activities	Persons Involved	Duration
Approval from beneficiaries	Letters for the PLSP	Client and Developers	10 Minutes
setting up the Device	Assembly and reviewing for potential problem	Developers	30 Minutes
Handover the device	Manual Discussion	Developers	15 Minutes
Training	Hands-on Basic Fundamental of Handling the device	Client and Developers	1 Hour

The procedures for deploying and utilizing the device in Brgy. Zone VI, Luisiana, Laguna are outlined in table 3.2. After being configured, the device was examined for any possible problems.The device was handed over to the client. The last stage is to instruct them on how to use the device.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter presents the technical feasibility, operational feasibility, testing, evaluation results, analysis, deployment results, project economic feasibility, and schedule feasibility. The findings of the evaluation suggest that the device should be improved further.

Project Technical Feasibility

Project Design Technical Discussion

The project's developers created a device capable of efficiently drying and pressing pandan leaves to help the Handicraft Workers of Barangay Zone VI, Luisiana, Laguna, to improve productivity using the help of technology. The device is designed with a control box that includes several components to ensure optimal performance of the device. The temperature is controlled by a PID controller that maintains the desired output by adjusting the power supplied at 12V to the heating elements based on real-time sensor feedback. Also, the drying process of the pandan leaves is displayed through an LCD screen that can show the current status of the drying and pressing, the elapsed time, and the device's current temperature. The device has eight (8) infrared heating elements inside that provide heat distribution to effectively reduce pandan leaves' moisture to avoid leaf damage. Four (4) fans operate within the chamber to circulate hot air to make sure to ensure consistent temperature of the device and uniform drying.

After the drying process, the device enters pressing mode, where the leaves are pressed between the roller system that is driven by a wiper motor with

220V, which automates the whole movement of pandan leaves through the chamber. A limit switch is positioned to detect the rolling motion endpoint to provide an automatic stop signal to prevent mechanical overrun or damage. On the other end of the device, the operator is informed by a buzzer once the whole cycle of pressing and drying has been achieved.

Additionally, a circuit breaker ensures the management of the electrical functions and system protection during a power surge or fault. The developers utilized the Arduino IDE and the C++ programming language for writing, compiling, and uploading code to the Arduino Mega (2560) and modules, thus ensuring the system's high efficiency in the drying and pressing pandan leaves processes.

Software Specification

The Pandaiku: Drying and Pressing System software is compatible with Arduino IDE, allowing for simulation. In the project, programmers used C++ as the programming language. It facilitates writing, compiling, and uploading code onto the Arduino module. When the device is released at a specific time and temperature, the software running on Arduino Mega executes command functions to control the devices. It controls the activation of the infrared heaters, the timing sequences for the roller motor, and the real-time temperature monitoring. Upon reaching a pre-set temperature, the PID controller, pre-configured through the IDE, regulates it via on-off control. Limit switch signals are detected through digital input detection to activate auto-stop functions for the roller motor.

Also, the software allows them to present real-time information collected from such sensors on an LCD, giving operators valuable information about the performance of the machine and surrounding conditions.

Programming Environment

The developers employed the Arduino IDE as the programming environment to design and implement the control system of drying and pressing device for pandan leaves. The Arduino MEGA is programmed to handle various hardware components, including the PID controller, solid-state relay, channel relay, and step-down voltage regulator. The device also used ceramic heating element, thermocouple to monitor the temperature inside the chamber, exhaust fan to regulate the air inside, and wiper motor for the pressing mechanism of the device. Device also used a 20x4 LCD display, and keypad, allowing the user to input specific time and real-time monitoring. The buzzer can give awareness to the operator when the operation is done, on the other hand the pin headers make stable connections to all components used in the device. The program ensures the coordinated operation to achieve enough drying and pressing of pandan leaves.

Hardware Specification

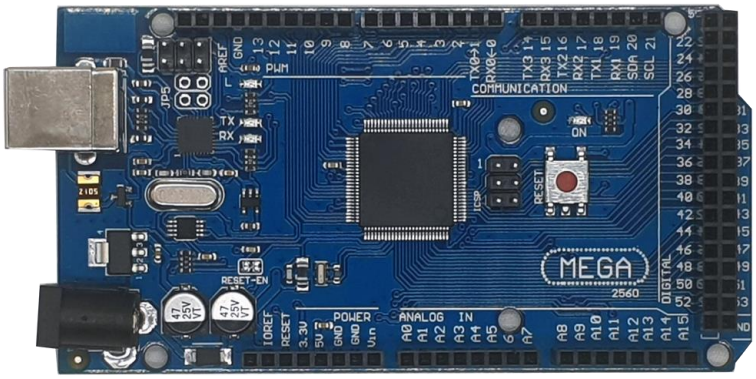
The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a

computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

The Mega 2560 is an update to the Arduino Mega, which it replaces.

Materials

The Arduino Mega board serves as the device's brain system that controls all operations and its functions, powered by an ATmega2560 microcontroller that has 54 digital input/output pins. It helps the device function to operate efficiently and accurately, to provide a better output.



https://i.ebayimg.com/images/g/fs4AAOSwNiJi7B2k/s-l1600.jpg

Figure 4.1 Arduino Mega

A power supply is an electrical device that supplies electricity to those components that use electric power. A power supply is different from a power source. The main function of a power supply is to receive the current from a source and convert it to accurate voltage, frequency, or format to that component that is called power load. The Power Supply is an electronic device that can convert

current input (AC) from a wall outlet into direct current (DC) with a voltage output of 12 volts.

https://www.majju.pk/assets/uploads/2019/10/POWER-SUPPLY.jpg

Figure 4.2 Power Supply

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly.This device use a monochromatic 20x4 alphanumeric LCD. 20x4 means that 20 characters can be displayed in each of the 4 rows of the 20x4 LCD, thus a total of 80 characters can be displayed at any instance of time.

https://th.bing.com/th/id/OIP.HZqbQH8bUQNajLieY7iEAgHaHa?rs=1&pid=ImgDetMain

Figure 4.3 LCD 20x4 Display 5v

LCD 20×4 can be used to display information from the Arduino or any sensor connected to it.The values shown on the display can be either a simple text or numerical values read by the sensors, such as temperature or pressure, or even the number of cycles that the Arduino is performing.

https://static1.s123-cdn-static-a.com/uploads/8274358/800_650355178a4af.jpg

Figure 4.4. 4×4 Matrix Keypad

The 4x4 matrix keypad is a simple mechanism that resembles the numeric input on your computer keyboard, except that it has an additional '*,' '#' and 4 other auxiliary buttons that can be used for various functions in the application.

https://www.ponpe.com/images/stories/virtuemart/product/REX-C100.jpg

Figure 4.5 PID Controller

A PID (Proportional – Integral – Derivative) controller is an instrument used by control engineers to regulate temperature, flow, pressure, speed, and other process variables in industrial control systems. PID controllers use a control loop feedback mechanism to control process variables and are the most accurate and stable controller.

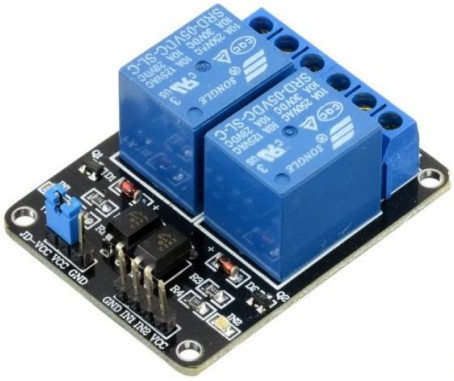
PID control is a well-established way of driving a system towards a target position or control parameters. It's practically ubiquitous as a means of controlling temperature and finds application in a myriad of chemical and scientific processes as well as automation. PID control keeps the actual output from a process as close to the target or setpoint output as possible.

https://vishaworld.com/cdn/shop/products/DCToACSSR-25DASolidStateRelayModule3-32VDC24-380VAC25A1_1024x.jpg?v=1676369985

Figure 4.6. Solid State Relay

A solid state relay (SSR) is an electronic switching device that controls a load without moving parts, unlike traditional mechanical relays. It uses an LED to send an optical signal across an isolation barrier to a semiconductor switch (like a transistor or triac) that turns the load on or off. This design provides electrical isolation between the control and load circuits, ensuring safety and protecting

sensitive components. SSRs offer faster switching, higher reliability, no contact wear or sparking, and better resistance to vibration and interference. They are commonly used in industrial automation, motor control, and process systems where durability and quick response are important.



https://ifuturetech.org/wp-content/uploads/2020/04/2-CHANNEL-RELAY-MODULE-ISO-600x600.jpg

Figure 4.7. 2 Channel Relay

A 2-channel relay module is a device that allows you to control two independent circuits using a single module. Each channel contains a relay that can switch a high-power circuit on or off.

https://www.fabtolab.com/image/cache/data/Power/Controls/KY-019-500x500.jpg

Figure 4.8. 1 Channel Relay

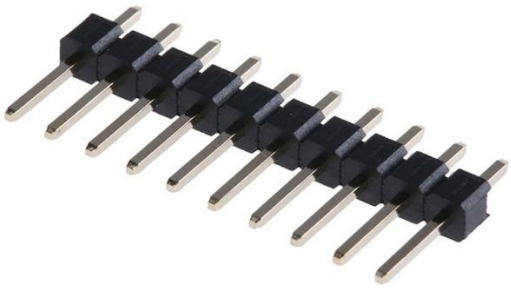
The Single Channel Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, NodeMCU, etc. The relay's terminal (COM, NO and NC) is being brought out with screw terminal. It also comes with a LED to indicate the status of relay.

The relay is the device that opens or closes the contacts to switch ON/OFF other appliances operating at high voltages. It is also used in safety circuits where it detects the undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area through ON or OFF.

https://alexnld.com/wp-content/uploads/2019/02/35a26480-1abf-4176-ad36-ed794ffacb66.jpg

Figure 4.9. Step-Down Voltage Regulator

Step-Down Voltage Regulator, also known as a Buck Converter, is an essential component in modern electrical and electronic systems. Its primary function is to take an input voltage and reduce it to a desired lower output voltage, hence the term “step-down”. This process is accomplished while maintaining a high level of efficiency and minimizing energy loss.



https://res.cloudinary.com/rsc/image/upload/w_1024/F7636757-01

Figure 4.10. Pin Header

The pin header serves as a bridge between blocked or isolated circuits, transmitting current or signals. It is typically used with a header to create a board-to-board connection or with an electronic wiring harness terminal to create a board-to-wire connection. A Pin header is also suitable for board-to-board connections independently.

https://down-ph.img.susercontent.com/file/sg-11134201-7qvel-lhtz5ptw3hwt93

Figure 4.11 Buzzer

A buzzer is an audio signaling device that produces sound to alert or notify users. It can be mechanical, electromechanical, or piezoelectric. Electromechanical buzzers work like electric bells without the metal gong, creating

a buzzing noise, while piezoelectric buzzers use electronic circuits to generate sound. Buzzers are commonly used in alarms, timers, and confirmation signals.

https://img.lazcdn.com/g/ff/kf/Sbed1ae69a8d64a8f968f629081d6cb4bh.png_720x720q80.png

Figure 4.12. Exhaust Fan

Exhaust fans play a crucial role in regulating air inside drying chambers by maintaining a controlled environment through continuous removal of stale, moist, or contaminated air. In drying systems, exhaust fans are typically installed above filter chambers to create a constant low-pressure state within the drying chamber. This negative pressure ensures that air flows through the filters, which trap dust and particles, thereby maintaining clean air quality inside the chamber. The fans help in expelling hot exhaust gases or moist air, which is essential for efficient drying and temperature regulation.

https://i5.walmartimages.com/seo/Lierteer-Adjustable-Temperature-Electric-Ceramic-Soldering-Iron-Core-220V-60-80-100W_bfb4729b-81c8-4337-8bf7-95ca29e0957c.ea7a78fd1c7cc8b3b0701ba7dde7bf41.jpeg

Figure 4.13 Infrared Heating Tube

A tube heater typically uses thermostatic controls to regulate the temperature of the air or liquid passing through the heater. The controls consist of a temperature sensor, a control system, and a power control mechanism. Temperature sensors are usually a thermocouple or a thermistor that measures the temperature of the air or liquid passing through the heater.

The control system uses the information from the temperature sensor to determine when to turn the power on and off. This allows it to maintain the desired temperature. The power control mechanism is usually an electric valve or a switch that regulates the flow of electricity to the heater. Some tube heaters may also have additional features such as timers, temperature displays, and remote control capabilities.

https://www.boschmotor.com/data/watermark/20190520/5ce264a5ae79a.jpg

Figure 4.14 Wiper Motor

Windshield wipers are powered by a small electric motor, usually mounted on the firewall or under the cowl (the area under the windshield's base). The motor activates linkage that moves the wiper arms back and forth.

Figure 4.15. Thermocouple

A thermocouple is a sensor for measuring temperature. This sensor consists of two dissimilar metal wires, joined at one end, and connected to a thermocouple thermometer or other thermocouple-capable device at the other end.

When properly configured, thermocouples can provide temperature measurements over wide range of temperatures.

https://probots.co.in/jumper-wire-female-to-female.html

Figure 4.16. Jumper Wire

Jumper wires are small metal connectors used to close or open circuit components. They have two or more connection points that control an electrical circuit board.

Schematic Diagram of the Device

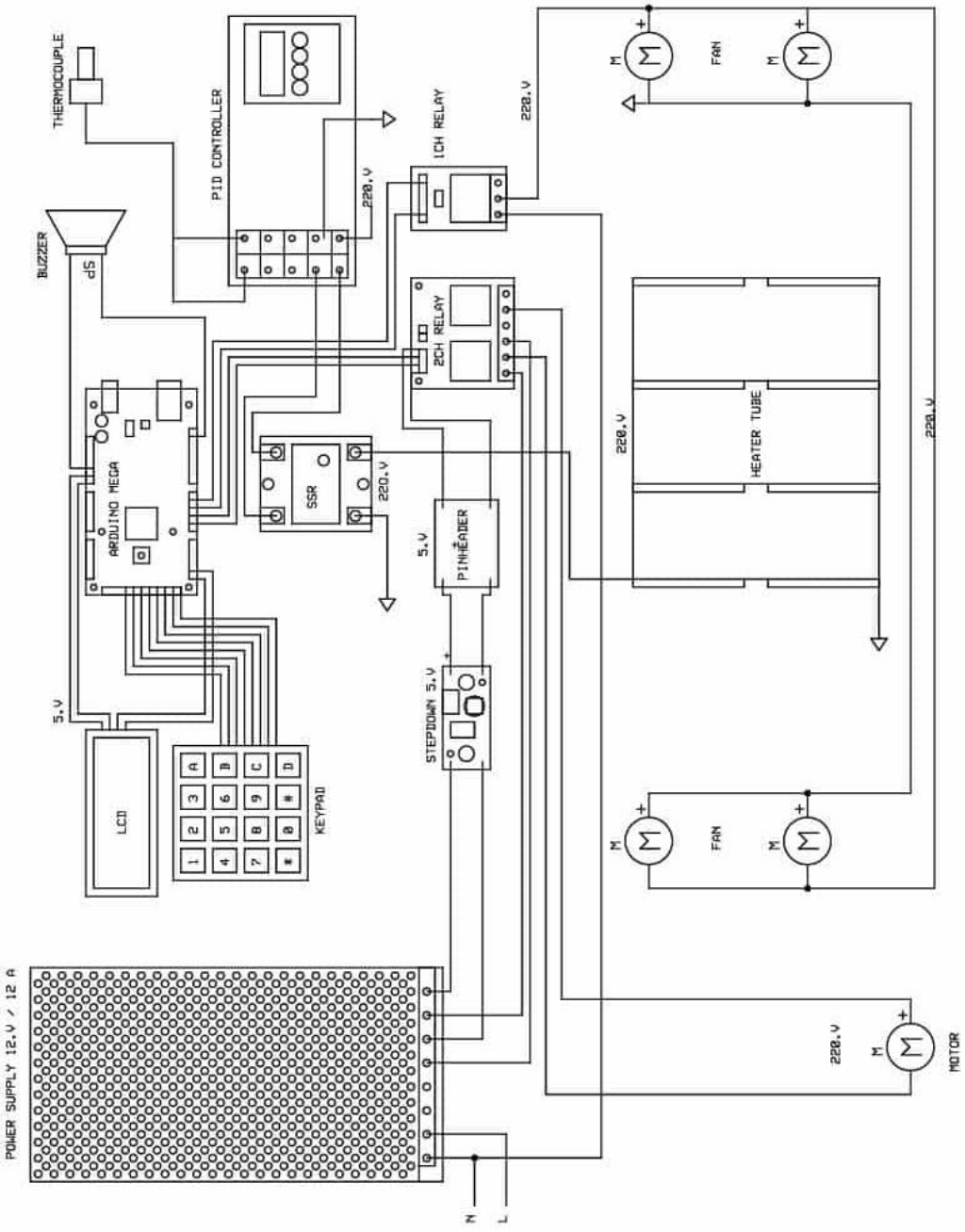


Figure 4.17. Schematic Diagram of the Device

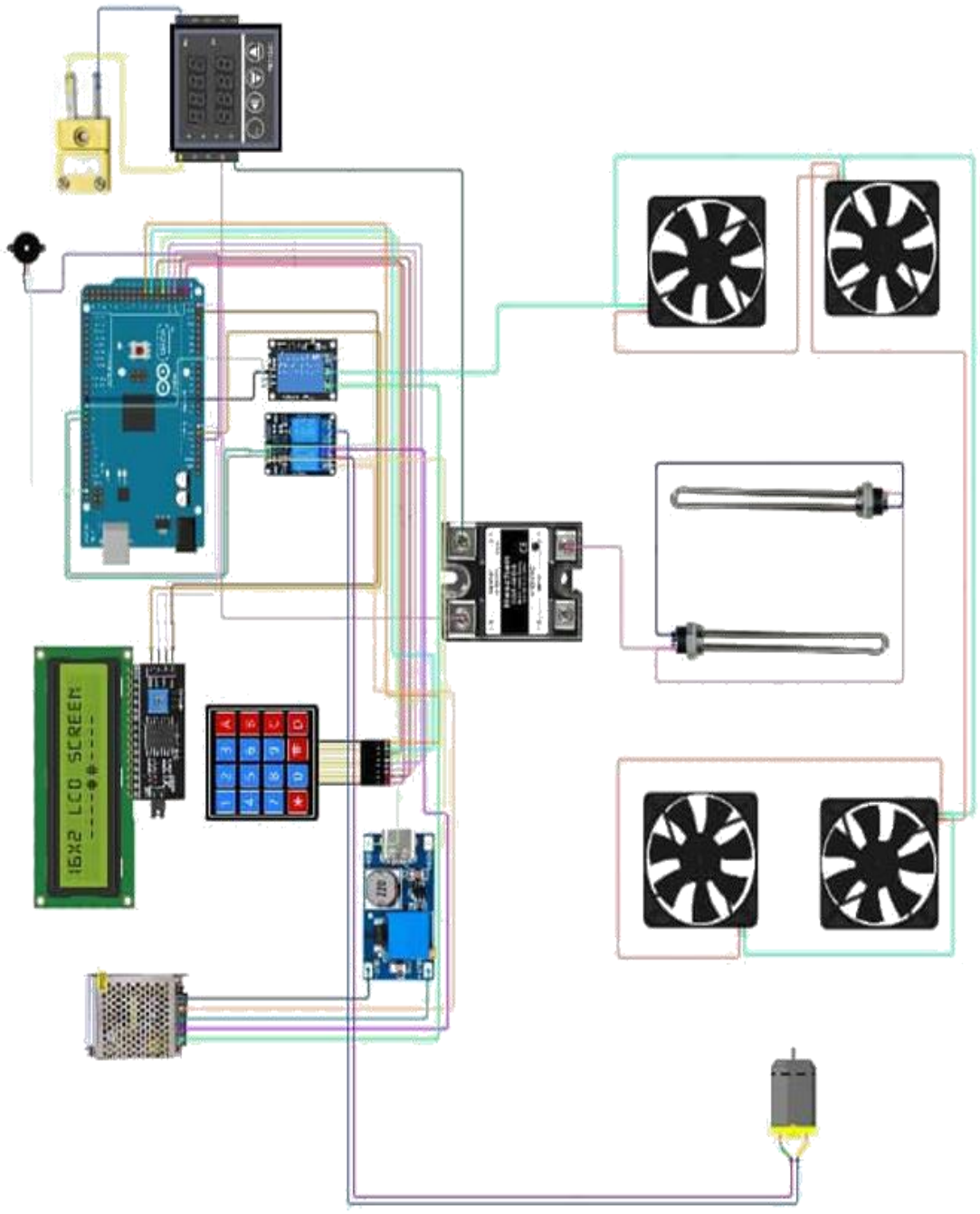


Figure 4.18. Digital Schematic Diagram of the Device

Project Operational Feasibility

Design of Project

Based on the figure 4.11 it shows the actual image of the Pandaiku, an Arduino based device that can be used for drying and pressing the pandan leaves that usually tend to made a handicraft product. It is constructed from stainless steel because of the its advantages such as flexibility and load-bearing capabilities which ensure that the components are protected and secured. This thoughtful design enhances the device's overall performance and durability, making it a practical solution for long-term use.

Figure 4.18. Pandaiku Drying and Pressing

As shown in the figure 4.19 it shows the LCD which enables to monitor the status of the process specifically to drying and pressing.

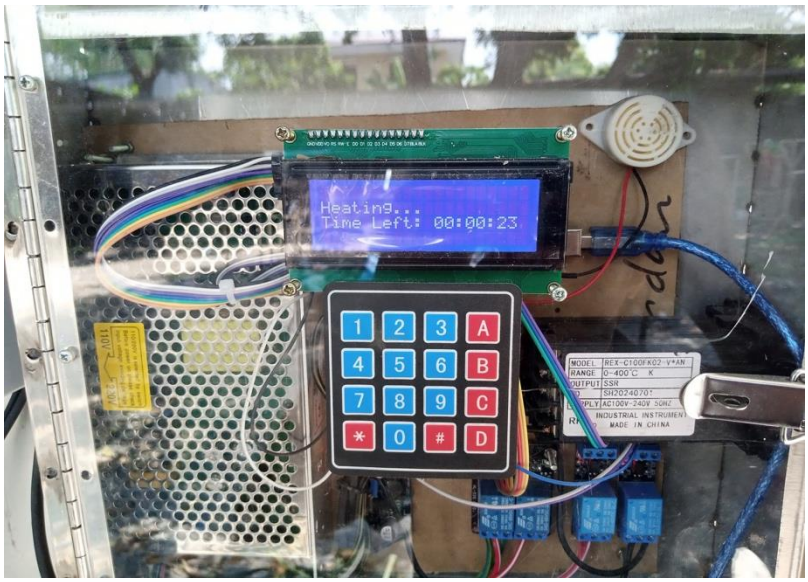


Figure 4.19. Liquid Crystal Display

The device described has a significant capacity for processing pandan leaves, during its operation. Figure 4.19 show the details of its design; it includes the equipment such as heater, fan and roller. The heater provides consistent heat to dry out the moisture of the pandan leaves. Then the fan helps to blow and circulate the air to ensure that is facilitating the natural drying. The roller is responsible to press the pandan leaves to make it more flexible and bendable.

Figure 4.20 Heating and Pressing inside the Device

Testing, Evaluation Results, and Analysis

Program Testing Results

Below is the figure of the actual testing results on software functionalities of Pandaiku made by the developers to ensure that the device executes its functions smoothly and was implemented in the Arduino successfully. This series of testing done by the developers is also important to avoid errors and fix bugs immediately to resolve issues regarding the device.

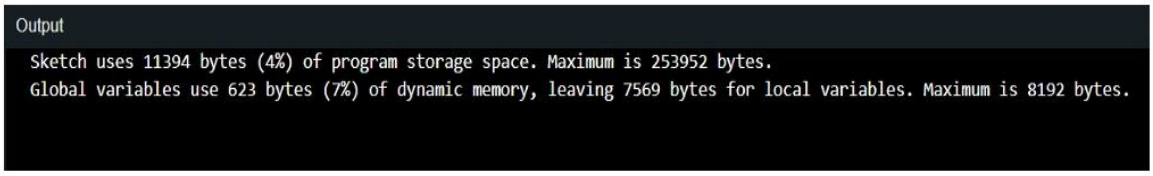


Figure 4.21. Program Testing Results

Hardware Testing

Table 4.1. Hardware Testing Results of LCD Screen

Day	Functionality	Reliability	Accuracy
1	/	X	/
2	/	X	/
3	/	/	/
4	/	/	/
5	/	/	/

Runs Smoothly (/) Error (X)

Table 4.1 shows the testing made by the developers on the LCD screen to test its functionalities, reliability, and accuracy. Upon the series of testing made by the developers on 5 consecutive days, the LCD screen executes its functions

properly and can display precise reading to the user. However, during its initial testing stages, such as the first two days, there are some instances that the developers had encountered errors such as bugs which can make the entire screen lag and forced the user to restart the device by pulling the circuit breaker off. Although later on, during the remaining days of testing Pandaiku, the LCD screen becomes fully reliable and can display data or operate without failures.

Below is the table of the actual testing of LCD screen during the on-going process of drying and pressing.

Table 4.2. Hardware Testing Results of LCD Screen

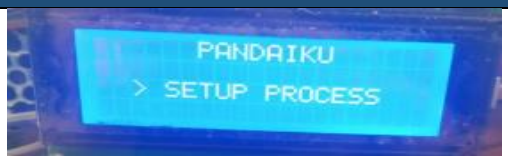
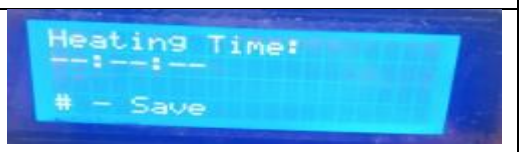
Actual Photo of LCD during Testing	Analysis
    	The LCD screen functioned accordingly to what it is expected to do or its purpose without any delays or errors.

Table 4.3. Hardware Testing Results of Solid State Relay

Actual Picture of the Relay	Actual Picture of the PID Controller	Expected Result		Actual Result		Analysis
		Fans	Heating Element	Fans	Heating Element	
		ON	OFF	ON	OFF	The relay functioned properly.
		ON	ON	ON	ON	The relay functioned properly.

The table above (Table 4.3), shows the testing made by the developers to the solid state relay whether it performs well during the drying process. This solid state relay is connected to the heating element and fans inside the device. It is also the one responsible to the toggling state (ON/OFFF) of these heating element based on the data received by the PID Controller through the thermocouple attached to it.

After they have conducted the testing, the developers found out that when the solid state relay is ON, the heating element will be turned OFF. While if the solid state relay is OFF, the heating element will be turned ON. In conclusion to that, both condition means that relay functioned properly during the operation.

Table 4.4. Hardware Testing Results of Limit Switch

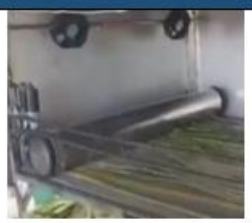
Actual Picture of the Limit Switch Being Triggered	Limit Switch	Actual Picture of the Roller	Direction of the Motor	Movement of Roller	Analysis
	Forward Limit Switch		Clockwise Direction	Move forward	The limit switch and motor functioned properly.
	Backward Limit Switch		Counter-clockwise Direction	Move Backward	The limit switch and motor functioned properly.

Table 4.4 presents the hardware evaluation results conducted regarding the limit switch of Pandaiku to ensure that it functions and performed well during the pressing process of pandan leaves. In this evaluation, the limit switch was tested whether the roller will change its movement direction once one of those switch is triggered. It shows that when the forward limit switch has been triggered by the roller, the wiper motor will change its direction to clockwise causing the roller moves forward. On the other hand, once the roller reach the other end of the device and triggered the backward limit switch, the wiper motor will then change

is movement direction into counter-clockwise thus causing the roller to move backward.

Upon the evaluation, the limit switch is the one responsible for the roller to move back and forth making sure that pandan leaves is flattened and pressed evenly. The limit switch and the motor functioned well during every pressing process.

Temperature Regulation and Monitoring Testing

The table below (Table 4.5) shows the results of the testing regarding temperature monitoring and regulation of pandan leaves. In this part, the developers conducted an observation using a PID controller which can maintain, monitor the temperature and provide real time data through a type of sensor attached to it called the thermocouple.

Table 4.5. Temperature Monitoring Results

Time (minutes)	Actual Photo	Temperature (°C)	Temperature Increase	Remarks
0		41	Initial Temperature	Initial Reading
1		41	0	Stable
2		42	+1.0	Normal Rise
3		44	+2.0	Normal Rise
4		45	+1.0	Normal Rise
5		46	+1.0	Normal Rise

6		47	+1.0	Normal Rise
7		49	+2.0	Normal Rise
8		50	+1.0	Normal Rise
9		51	+1.0	Normal Rise
10		51	0.0	Stable
11		52	+1.0	Normal Rise
12		53	+1.0	Normal Rise
13		54	+1.0	Normal Rise
14		56	+2.0	Normal Rise
15		57	+1.0	Normal Rise

The data has been recorded and put into a table for easy visualization. As shown above, the temperature starts at 41 degrees celcius and falls on 57 degrees after 15 minutes, close to what was set by the operator which is 60 degrees. It gradually increases every minutes and provides 16 degrees difference in temperature over time.

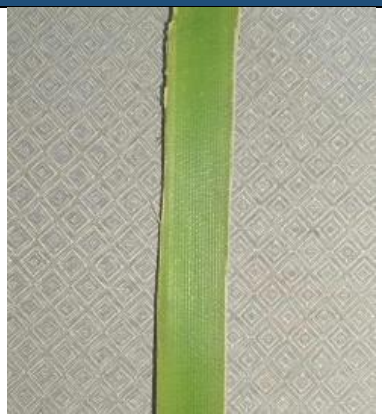
Drying 50-70 pieces of Pandan Leaves Testing

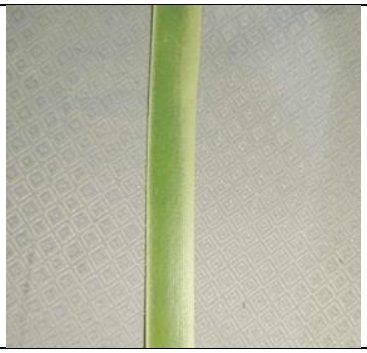
For the Pandaiku to be considered as a productive and effective device in drying and pressing pandan leaves, several testings has been made by the developers to ensure that it meets not just the quantity but also the desired quality

of leaves that weavers used in making their handicraft products. They based the temperature in their testing to the previous study of Jimenez (2023), where he explains that in order to achieve that specific amount of dryness of pandan leaves used for weaving purposes, the leaves must be subjected to a temperature ranging from 60-80 degrees celcius.

Below is the table (Table 4.6) that shows the result of the first testing of the developers to find the exact time in achieving the appropriate dryness of pandan leaves ready for weaving. In this testing, the device was set to sixty (60) degrees Celsius and after thirty minutes of drying with a gradually increasing temperature inside the device, the developers obtained the right amount of dryness that the weavers used in pandan weaving.

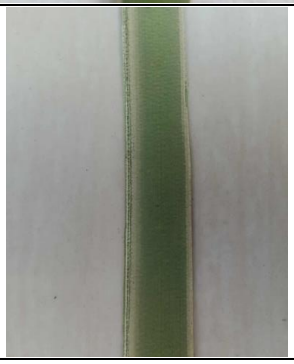
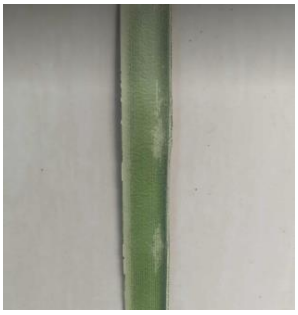
Table 4.6. Drying 50-70 Pieces of Pandan Leaves at 60°C

Actual Photo of Pandan Leaves	Time (minutes)	Temperature (°C)	Analysis
	0	45	Pandan leaves is fresh and is color green.

	10	49	Pandan leaves starts to dry at the edges.
	20	55	Pandan leaves turned its color into light green.
	30	60	Pandan leaves is already dried.

The second testing has been made by the developers but instead of 60 degrees celcius, they set the temperature of the device to 70 degrees. Below is the recorded result of the second testing for drying wherein it only takes twenty (20) minutes to achieve the right amount of dryness of pandan leaves used in weaving.

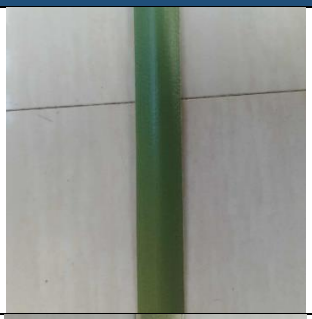
Table 4.7. Drying 50-70 Pieces of Pandan Leaves at 70°C

Actual Photo of Pandan Leaves	Time (minutes)	Temperature (°C)	Analysis
	0	50	Pandan leaves is fresh and is color green.
	5	55	Pandan leaves starts to dry at the edges.
	10	60	Pandan leaves is slightly dried at the edges and its middle part
	15	65	Pandan leaves continuously change its color into light green.

	20	70	Pandan leaves is already dried.

The last testing has been conducted with the temperature set at 80 degrees celcius and the results is presented at the table below (Table 4.8). Using 80 degrees celcius as the parameter of the drying process, the time required for drying must be lower than previous one to avoid overdrying of pandan leaves inside the device. The testing shows that it only takes fifteen (15) minutes to produce a good quality of already processed pandan leaves perfect for weaving handicraft products.

Table 4.8. Drying 50-70 Pieces of Pandan Leaves at 80°C

Actual Photo of Pandan Leaves	Time (minutes)	Temperature (°C)	Analysis
	0	65	Pandan leaves is fresh and is color green
	5	70	Pandan leaves starts to dry at the edges.

	10	75	Pandan leaves is slightly dried at the edges and its middle part
	15	80	Pandan leaves is already dried because of its pale color.

Table 4. 9. Drying Results of 70 pieces Pandan Leaves at Different Temperatures within 30 minutes

Actual Photo of Pandan Leaves	Temp (°C)	Good Leaves	Underdry/ Overdry	Analysis
	60	64 (91.43%)	6 (8.57%)	Highest percentage of good leaves ready for pressing. The leaves retained moisture well, preventing its brittleness.
	70	61 (87.14%)	9 (12.86%)	Slightly lower number of good leaves compared to those dried at 60 degrees. Leaves are slightly overdried at the edges.

	80	55 (78.57%)	15 (21.43%)	Highest damage rate due to increased in temperature which makes the leaves brittle and prone to cracking during the pressing process.

From the results, drying pandan leaves at 60°C produced the highest percentage of good-quality leaves, with 91.43% suitable for pressing and 8.57% showing some damage. This temperature was optimal for moisture removal while retaining the leaves' flexibility without making them brittle, thus making them ideal for pressing. At 70°C, the number of good leaves decreased slightly to 87.14%, with some signs of over drying at the edges which may negatively impact pliability during pressing. On the other hand, drying at 80°C produced the poorest quality result with only 78.57% of leaves in good condition and the highest damage of 21.43%. At this level, the increased temperature turned the leaves brittle and more likely to crack during pressing. These results suggest that the best drying temperature which balances moisture removal and leaf pliability is 60°C.

Table 4. 10. Drying Results of 70 pieces Pandan Leaves at Different Temperatures within 20 minutes

Actual Photo of Pandan Leaves	Temp (°C)	Good Leaves	Underdry/ Overdry	Analysis
	60	43 (61.43%)	27 (38.57%)	Low percentage of good leaves ue to insufficient drying time at this temperature, resulting in many underdried leaves.
	70	58 (82.86%)	12 (17.14%)	Generate good quality leaves given the 20 minute time alloted to dry each batch though there are still some leaves that was underdried.
	80	53 (75.71%)	17 (24.29%)	Moderate performance, but brittleness was evident in some leaves making it prone to damage when pressed.

The table above shows that pandan leaves subjected to 70 °C temperature can generate good results. In this testing, it produces 58 pieces or 82.86% good quality pandan leaves while only 12 pieces (17.14%) in a batch was slightly under dried at 60 °C temperature. On the other hand, only 43 pieces (61.43%) pandan leaves were dried perfectly for weaving indicating that it requires longer time for all the leaves to be fully dried. Only 53 pieces (75.71%) of pandan leaves were

dried perfectly at the temperature of 80 °C while remaining leaves was overdried.

Table 4. 11. Drying Results of 70 pieces Pandan Leaves at Different Temperatures within 15 minutes

Actual Photo of Pandan Leaves	Temp (°C)	Good Leaves	Underdry/ Overdry	Analysis
	60	32 (45.71%)	38 (54.29%)	Poor drying performance where most leaves are underdried and unfit for pressing.
	70	44 (62.86%)	26 (37.14%)	Improved results but still few leaves were underdried. Time may be too short even at this temperature.
	80	51 (72.86%)	19 (27.15%)	Best outcome for 15-minute drying, though some leaves began showing brittleness due to rapid moisture loss.

The research indicates that at 80 °C and considering the time duration of 15 minutes, leaves with good quality remain around 72.86% despite some moderate brittleness from moisture loss. Quality decreases to 62.86% at 70°C and 60°C only produced 45.71% of the required dried leaves, meaning more than half

are classified as underdried, thus not meeting the required standards. The data indicates that while higher temperatures do result in faster drying rates, there is also a strong possibility of damaging the leaves if temperature control is not exercised. In conclusion, 80°C appears to be the best suited for very short drying times, better than other temperatures, but there must be tighter controls to avoid over-drying.

The findings indicate that both the drying temperature and time have an impact on the quality of pandan leaves. These were most optimal at 60°C for 30 mins which provided the greatest amount of treasured leaves (91.43%) with the least amount of damage and ideal flexibility for pressing. For shorter time periods, 70°C for 20 minutes offered a balance between the speed of drying to the quality of the leaves; conversely, 80°C for 15 minutes dried leaves at an accelerated rate without increasing leaf quality, making them more fragile. As a whole, lower temperatures and longer drying times are ideal for maintaining the integrity of the leaves and avoiding unnecessary damage.

Pressing Testing

Three different batch of pandan leaves dried at temperatures such as 60°C, 70°C, and 80°C undergone pressing testing to identify which temperature can be considered as an optimal temperature and was able to produce good quality pandan leaves. The results was shown on the tables below.

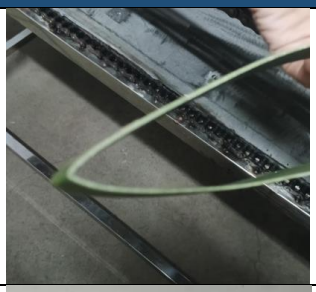
Table 4.12. Pressing 70 Pieces Pandan Leaves Dried at Different Temperatures within 15 minutes

Actual Photo of Pandan Leaves	Time (minutes)	Temperature (°C)	Analysis
	15	60	Pandan leaves were already bendable and pliable ready for weaving handicraft products.
	15	70	Though majority of the leaves were already pliable, there are few that was slightly brittle.
	15	80	There are still some good results upon pressing but many of the leaves was brittle and cracks easily.

The results of the testing during pressing process indicate that pandan leaves dried at 60°C and pressed for fifteen (15) minutes produces the most desirable result because the leaves were already bendable and pliable ideal for weaving handicraft products. At 70°C, most leaves were still pliable, although a few were starting to show signs of brittleness, indicating the loss of moisture that

could affect flexibility. On the other hand, leaves dried at 80°C and pressed for also fifteen (15) minutes were more brittle and many of the leaves cracked easily during pressing. These findings show that with a shorter drying time, lower temperatures like 60°C are better at preserving the moisture content of pandan leaves which can affect the leaves pliability during the pressing process.

Table 4.13. Pressing 70 Pieces Pandan Leaves Dried at 60°C

Actual Photo of Pandan Leaves	Time (minutes)	Analysis
	0	Pandan leaves is brittle.
	5	Pandan leaves breaks or cracks easily.
	10	Pandan leaves is slightly pliable.

	15	Pandan leaves is already pliable and is ready for weaving.

Based from the results of the testing that has been made for the pressing process of pandan leaves, the device achieved the flexibility or pliability of pandan leaves used in weaving. This is important to ensure that it will not cause cracks or breaks on the leaves upon using it to produce handicraft products. As evident in the table above (Table 4.13), after 15 minutes of pressing using the roller that moves back and forth, pandan leaves dried at 60°C temperature is already bendable and is pliable ready to be used in weaving purposes.

Notification Testing

Table 4.14. Notification Testing Results

Actual Photo of Serial Monitor during Pressing	Expected Result	Actual Result	Analysis
	Buzzer	Buzzer	
Serial Monitor Time remaining: 8 Time remaining: 7 Time remaining: 6	OFF	OFF	The buzzer functioned properly.
Time remaining: 2 Time remaining: 1 Pressing Complete. Buzzer activated!	ON	ON	The buzzer functioned properly.

The table above (Table 4.14) shows the result of the notification testing for Pandaiku. This is important to ensure that the user will be notified once the entire process, both drying and pressing, has been completed already. Upon testing, the

developers found out that the buzzer functioned properly and produce sounds audible to for the users once pressing is complete.

Summary of Testing

Below is the summary of all the testing that the developer conducted to ensure that the device meet the expected outcome and satisfaction of the user. The temperature monitoring and regulation functioned successfully through the use of PID controller with thermocouple sensor to read real-time data which is the temperature inside the device. Regarding to the drying and pressing testing of 50 to 70 pieces of pandan leaves per batch, the device was able to execute drying and pressing with just a relatively short amount of time. It was faster than the furnace-type method used in the study of Jimenez(2023) which takes one (1) to approximately four (4) hours of drying while on the study of Sanchez et. al(2024) which reveals that the traditional method used in drying which is sun drying and air drying as well as pressing using '*ilohan*' usually takes weeks before producing a ready-to-weave pandan leaves. On the other hand, notification testing shows that the buzzer functions properly.

Table 4.15. Summary of Specific Objective Testing

Testing	Expected Outcome	Actual Outcome
Temperature Monitoring and Regulation Testing	The device will be able to maintain and monitor the temperature	The device was able to maintain and monitor the temperature inside using the PID controller. In fifteen (15) minutes, the device reach the target temperature of 60

	inside using the PID controller.	degrees with stable and normal rise temperature each minute.
Drying 50-70 pieces of Pandan Leaves	The device will be able to dry 50-70 pieces of pandan leaves with the appropriate amount of dryness depending on the set temperature	The device was able to dry 70 pieces of pandan leaves with different levels of effectiveness depending on the set temperature and drying time. The highest quality output was achieved at 60°C for 30 minutes, producing 91.43% good leaves with optimal flexibility for pressing. At 70°C for 20 minutes, the device yielded 82.86% good quality leaves, showing a good balance between drying speed and leaf condition.
Pressing Testing	The device will be able to press pandan leaves with the right level of pliability.	The device was able to press pandan leaves effectively, achieving the appropriate level of pliability needed for weaving. Leaves dried at 60°C demonstrated the best pliability during pressing, even with just 15 minutes of drying, making them ideal for handicraft use. In contrast, leaves dried at 70°C showed slight brittleness in some pieces, while those dried at 80°C were more prone to cracking, indicating reduced flexibility.
Notification Testing	The buzzer will be able to produce sounds once the pressing process is complete.	The buzzer was able to produce sounds once the pressing process is complete.

Evaluation results

Pandaiku was evaluated by five (5) CpE practitioners, five (5) members of Luisiana Weavers Organization as well as one (1) Agriculturist from their municipality. This is to test and assess whether Pandaiku aligns and met the international standards and requirements regarding systems and devices. The evaluation is based on ISO/IEC 25010 which is composed of two parts. The first part of the evaluation is about the software standards which includes functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. On the other hand, part two is about hardware evaluation which asses the components, technicalities, as well as the structure of the device. The evaluation was conducted on a face-to-face modality where they can physically see and test the device, provide feedback and suggestions for further improvements.

CpE Practitioners' Evaluation Results

Table 4.16. CpE Practitioners' Evaluation Results Based on Functional Suitability

Criteria	Mean	Verbal Interpretation
Functional Completeness	4.8	Highly Acceptable
Functional Correctness	4.4	Very Acceptable
Functional Appropriateness	4.8	Highly Acceptable
Overall Mean	**4.67**	**Highly Acceptable**

Figure 4.16 shows the result of five (5) CpE practitoners under the category of functional suitability which checks if the product has all the necessary functions

to meet user needs and perform its tasks. It ensures the system delivers correct and complete results.

Upon the evaluation, the device scores 4.8 with verbal interpretation of “Highly Acceptable” for both functional completeness and functional appropriateness which indicates that it was able to cover all the specific functions and objectives the device needs to achieve. On the other hand, the functional correctness of the device has a mean of 4.67, still highly acceptable since Pandaiku can provide correct results with precisions.

Under functional suitability, Pandaiku has an overall mean of 4.67 with a verbal interpretation of "Highly Acceptable" in terms of functionalities which means that the device is complete, correct and appropriate for its intended use. The practitioners are strongly satisfied with how the device executes its main functions.

Table 4.17. CpE Practitioners’ Evaluation Results Based on Performance Efficiency

Criteria	Mean	Verbal Interpretation
Time Behavior	4.6	Highly Acceptable
Resource Utilization	4.8	Highly Acceptable
Capacity	4.6	Highly Acceptable
Overall Mean	**4.67**	**Highly Acceptable**

The table above (Figure 4.17) presents the summary of the results of the practitioners' evaluation based on the performance efficiency of the device. It shows that Pandaiku is highly acceptable in all citeria including time behavior, resource utilization, and capacity.

Time behavior has a mean of 4.6 which signifies that the device is responsive and quick to react whenever the user commands the system during the drying or pressing operations. This further indicates that the practitioners are highly satisfied regarding the time it takes to finish a task with little to no delays or lags during operation. Resource utilization has a mean of 4.8 which is higher than other criteria, indicating that Pandaiku makes use of its hardware and computing resources like system's capacity in processing information, components, and power efficiently, thus avoids wastage. On the other hand, Capacity has also a mean of 4.6 like time behavior which indicates that practitioners find Pandaiku able to operate efficiently without going on shut down nor errors.

Overall, the overall mean of 4.67 suggests that the system is very effective when in use, consistently performing its tasks efficiently and smoothly during normal conditions. With these results, the device will be able to meet the user demands thus increasing their satisfaction while using it.

Table 4.18. CpE Practitioners' Evaluation Results Based on Compatibility

Criteria	Mean	Verbal Interpretation
Co-existence	4.6	Highly Acceptable
Interoperability	4.6	Highly Acceptable
Overall Mean	**4.6**	**Highly Acceptable**

Table 4.18. summarizes the results regarding the evaluation of compatibility of the device. In the case of Co-existence, the score of 4.6 was attained, indicating "Highly Acceptable", which means that the device is capable of functioning

effectively in a shared environment without negative impact or dependency on the other systems. Interoperability also achieved a mean score of 4.6 which was interpreted as “Highly Acceptable” suggesting also that the device is able to proficiently exchange and utilize information with other systems or components as required.

In terms of compatibility, this gives the device an overall mean of 4.6 which can be translated as ‘Highly Acceptable’. This means that the practitioners find that the device is capable of performing along with other tools, systems or devices. In other terms, result demonstrates the system's operational functionality along with external elements for smooth data exchange without interruption. This findings is important since it shows how the device is suitable for use within the environment where it was designed.

Table 4.19. CpE Practitioners’ Evaluation Results Based on Usability

Criteria	Mean	Verbal Interpretation
Appropriateness Recognizability	5	Highly Acceptable
Learnability	4.6	Highly Acceptable
Operability	4.6	Highly Acceptable
User Error Protection	4.4	Very Acceptable
User Interface Aesthetic Accessibility	4.8	Highly Acceptable
Overall Mean	**4.68**	**Highly Acceptable**

Table 4.19 shows the findings of evaluation of the CpE practitioners regarding the usablity of the device. Appropriateness Recognizability has an mean

of 5 which is verbally interpreted as "Highly Acceptable". This only means that the practitioners recognize the device as really helpful to its user in terms of functionalities and was able to meet their certain needs.

On the other hand, both learnability and operability of Pandaiku achieved an average mean of 4.6 which is also interpreted as "Highly Acceptable". Higher scores in learnability means that practitioners thinks that users will be able to learn on how to fully utilize the device and use it efficiently, free from risk, effectively and with higher satisfaction while achieving their goals using the device. Additionaly, having such scores in operability only means that they find the device easy to operate and control because the interface of the device is user-friendly and does not require to do complicated steps in order for the device to be used.

For User Error Protection, Pandaiku has average mean of 4.4 which is verbally interpreted as "Very Acceptable". The practitioners are very satisfied with how the device protects its users in making errors although they have some concerns and provides suggestions as well regarding the safety of the operator who will use the device. Meanwhile, the User Interface Aesthetic Accessibility has an average mean of 4.8, which is classified as "Highly Acceptable" meaning that the interface of the device is visually pleasing while executing its functions, thus contributing to the overall experience of the user.

Overall, the evaluation results of the CpE practitioners regarding the usability of Pandaiku has an average mean of 4.68 which can be classified as “Highly Acceptable” which means that the device offers a user-friendly, safe, and

engaging experience and has the potential to support the pandan leaf processing of Luisiana Weavers Organization as its intended users.

Table 4.20. CpE Practitioners' Evaluation Results Based on Reliability

Criteria	Mean	Verbal Interpretation
Maturity	4.8	Highly Acceptable
Availability	5	Highly Acceptable
Fault Tolerance	4.4	Very Acceptable
Overall Mean	**4.73**	**Highly Acceptable**

Table 4.20 shows the results on the evaluation of the reliability of the device. The characteristic "Maturity" under the criteria "Reliability" received an average mean score of 4.8, which was verbally interpreted as highly acceptable, meaning that the components are dependable and perform consistently within the expectations set on them during normal usage. The highest score of 5.0 under availability also rated highly acceptable, which means that the system is fully operational and accessible for use whenever required so that tasks can be performed without unexpected delays or interruptions. In Fault Tolerance, the device received a mean score of 4.4, still termed as very acceptable, which shows how well the device is able to perform its primary functions even with some minor hardware or software problems.

For the criteria of reliability, Pandaiku has an overall average mean of 4.73 which is considered as "Highly Acceptable". This means that the five CpE practitioners finds that the device is strongly reliable and capable of delivering

consistent execution of functions as well as service. This rating given by the practitioners strengthens the idea Pandaiku can support Luisiana Weavers Organization in their pandan leaf processing without any interruptions caused by external factors at the locale.

Table 4.21. CpE Practitioners' Evaluation Results Based on Maintainability

Criteria	Mean	Verbal Interpretation
Analyzability	4.8	Highly Acceptable
Modifiability	4.6	Highly Acceptable
Testability	5	Highly Acceptable
Overall Mean	**4.8**	**Highly Acceptable**

The table 4.21 shows the results from CpE practitioners regarding the maintainability of Pandaiku. In analyzability, the average mean score was 4.8, which is considered as "Highly Acceptable". According to the practitioners, Pandaiku is capable of evaluating the impact of changing one or more of its part which can also be the cause of failures. Modifiability received 4.6 which is also rated as Highly Acceptable meaning the device may be altered or modified but is expected with little to no occurrence of defects or errors in the device itself and on its functionalities. CpE practitioners also rated testability by 5.0 which can be classified as "Highly Acceptable". This means that the device can be tested with lots of different standards to assure that Pandaiku really meet not just the expectation of its users but also the requirements and criteria of each standards.

With an overall average mean of 4.8 and is verbally interpreted as "Highly Acceptable", CpE practitioners finds Pandaiku effective and has strong maintainability though subjected to analysis, modifications, and testing activities while maintaining its reliability and smooth performance.

Table 4.22. CpE Practitioners' Evaluation Results Based on Portability

Criteria	Mean	Verbal Interpretation
Adaptability	4.8	Highly Acceptable
Installability	4.6	Highly Acceptable
Replaceability	4.6	Highly Acceptable
Overall Mean	**4.67**	**Highly Acceptable**

Table 4.22. shows the evaluation of CpE practitioners regarding the portability of the device. Adaptability was rated very high with a mean score of 4.8 which is regarded as "Highly Acceptable", meaning that they find the device as being capable of adjusting efficiently to changing hardware, software, and operational environments. Meanwhile, installability which received a score of 4.6 interpreted as "Highly Acceptable" demonstrates that the device can easily be installed and uninstalled in designated environments. On the other hand, replaceability also received the same rating of 4.6 considered as "Highly Acceptable" in verbal interpretation which means that the device can replace other devices designed for similar use and made for the same environment. The overall mean score is 4.67 with a verbal interpretation of also "Highly Acceptable" thus concluding that the practitioners rated the device as being portable and

adaptable or as some devices evaluate able to adapt, install, and replace in other environments without compromising the performance or usability of the device.

Table 4.23. CpE Practitioners' Hardware Evaluation Results

Criteria	Mean	Verbal Interpretation
Q1	4.6	Highly Acceptable
Q2	4.2	Very Acceptable
Q3	4.8	Highly Acceptable
Q4	4.8	Highly Acceptable
Q5	4.8	Highly Acceptable
Overall Mean	**4.64**	**Highly Acceptable**

Table 4.23. illustrates the results of the CpE practitioners' evaluation on the Pandaiku's hardware components, where the device was evaluated based on the achievement of design objectives, efficiency, and quality considerations. The findings show that the practitioners considered the device to be highly usable since it was easy to operate, to maintain, and to store. Moreover, they acknowledged its reliability and durability in addition to its aesthetic value which enhances the appeal of the device to its users. Considering the individual mean ratings between 4.0 ("Very Acceptable") to 5.0 ("Highly Acceptable") and an overall mean of 4.64 which is considered as "Highly Acceptable", it is clear that the practitioners regarded the hardware performance of the project as strongly acceptable suggesting that this was more than sufficient in terms of the design, usability, as well as quality.

Table 4.24. CpE Practitioners' Evaluation Results Summary on the Device Software

Criteria	Mean	Verbal Interpretation
Functional Suitability	4.67	Highly Acceptable
Performance Efficiency	4.67	Highly Acceptable
Compatibility	4.6	Highly Acceptable
Usability	4.68	Highly Acceptable
Reliability	4.73	Highly Acceptable
Maintainability	4.8	Highly Acceptable
Portability	4.67	Highly Acceptable
Overall Mean	**4.68**	**Highly Acceptable**

The table above shows the summary of the evaluation conducted by CpE practitioners regarding the device's software. All the criteria, including functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability, achieved a mean scores ranging from 4.69 to 4.80 which can be verbally interpreted as "Highly Acceptable". Overall, Pandaiku's software has a mean of 4.68 which can be considered as highly acceptable among all the practitioners.

Weavers' and Agriculturist's Evaluation Results

Table 4.25. Weavers' and Agriculturist's Evaluation Results Based on Functional Suitability

Criteria	Mean	Verbal Interpretation
Functional Completeness	4	Very Acceptable
Functional Correctness	4.17	Very Acceptable
Functional Appropriateness	3.83	Very Acceptable
Overall Mean	**4**	**Very Acceptable**

In Table 4.25, the Pandaiku's evaluation conducted by the weavers and Municipal Agriculturist of Luisiana, the primary beneficiaries of the device, is shown. The findings reveal that functional completeness tends to achieve a mean score of 4.0, which was verbally interpreted as "Very Acceptable." This means that the clients accepted that the device can adequately meet the relevant functions and objectives that they are supposed to perform as part of their work. Functional correctness scored slightly higher mean of 4.17 which was also interpreted as "Very Acceptable." This means that the weavers are already assured that the device makes accurate and dependable results needed in performing their functions. While functional appropriateness scored mean of 3.83 and still rated as "Very Acceptable", this means that the respondents consider the device useful in accomplishing their specific activities but find the device a bit lacking for making tasks easier or more effective.

With an overall mean of 4.0, the evaluation still suggests that the weavers and agriculturists perceived the device as functionally effective and reliable in

meeting their expectations in processing pandan leaves strengthening its importance and functionality in the everyday activities.

Table 4.26. Weavers' and Agriculturist's Evaluation Results Based on Performance Efficiency

Criteria	Mean	Verbal Interpretation
Time Behavior	4	Very Acceptable
Resource Utilization	3.83	Very Acceptable
Capacity	3.67	Very Acceptable
Overall Mean	**3.83**	**Very Acceptable**

Table 4.26. present the results regarding the efficiency for the device's performance from the perspective of weavers and agriculturists. Time behavior has a mean of 4.00, which can be considered as "Very Acceptable," meaning that the clients perceive the device as being relevant within an acceptable time frame. Resource Utilization was rated with a mean of 3.83, which was also interpreted as "Very Acceptable." This indicates that the device attains a level of effectiveness within its use of resources adequate to accomplish its functions without overuse of resources.

On the other hand, capacity obtained a mean of 3.67, still can be verbally interpreted as "Very Acceptable". This reflects that the weavers and agriculturist have the perception that the device can satisfactorily perform its functions, being easy and familiar for the users to use, though there are still areas that still need to improve to handle larger workloads.

The evaluation results regarding the performance efficiency has an overall mean of 3.83 which is consideered as "Very Acceptable" meaning that the device met the expectations of the weavers and agriculturist in terms of its speed, use of resources, as well as its capacity to support pandan leaf processing used in weaving most especially in the drying and pressing processes.

Table 4.27. Weavers' and Agriculturist's Evaluation Results Based on Compatibility

Criteria	Mean	Verbal Interpretation
Co-existence	3.67	Very Acceptable
Interoperability	3.83	Very Acceptable
Overall Mean	**3.75**	**Very Acceptable**

The table above (Table 4.27) presents the results of the evaluation conducted by the beneficiaies of the device. It shows that for co-existence, the device achieved a mean score of 3.67. This score is verbally interpreted as "Very Acceptable". Thus, the clients perceive the device as capable of functioning besides the existing tools that they have in place. This implies that the device works and can be efficient without much need for alterations to existing systems or tools.

On the other hand, interoperability received a slightly higher mean score of 3.83 which can be also interpreted as "Very Acceptable". This indicates that the weavers and agriculturist feel confident that the device can participate in the information exchange that is common in the systems and devices they utilize. With achieving this, the device's overall mean of 3.75 indicates its flexibility is adequate,

therefore ensuring that the device is really usable by its designated users and that they can integrate it with their existing processes to enhance workflow.

Table 4.28. Weavers' and Agriculturist's Evaluation Results Based on Usability

Criteria	Mean	Verbal Interpretation
Appropriateness Recognizability	3.83	Very Acceptable
Learnability	4	Very Acceptable
Operability	4.17	Very Acceptable
User Error Protection	4.17	Very Acceptable
User Interface Aesthetic Accessibility	4.17	Very Acceptable
Overall Mean	**4.07**	**Very Acceptable**

The weavers and agriculturist of Luisiana, Laguna conducted an evaluation regarding the usability of Pandaiku and the result was shown in Table 4.28. The usability of the device was assessed through various criteria, each reflecting how the users perceived its functionality and ease of use in their work. Appropriateness recognizability of the device received a mean score of 3.83, which is interpreted as "Very Acceptable," indication that the users recognized the device as helpful and capable of meeting their specific needs in their daily activities.

In terms of learnability, the device obtained a mean of 4.00, also interpreted as "Very Acceptable," suggesting that the weavers and agriculturist found it relatively easy to learn on how to use the device effectively and efficiently, with minimal risk and satisfactory outcomes. Likewise, the criteria for operability, user error protection, and user interface aesthetic accessibility all achieved similar

positive ratings, each with a mean score of 4.17 and a verbal interpretation of "Very Acceptable." These high scores imply that the users found the device simple to operate and control, designed with safeguards to prevent user errors, and equipped with an interface that was both aesthetically pleasing and satisfying to use.

The usability of Pandaiku received an overall mean of 4.07 and can be verbally interpreted as "Very Acceptable". The results shows that in terms of usability, Pandaiku meets the expectations of the weavers and the agriculturist. The findings shows that he device not just facilitate the processes itself but also increase the satisfaction of the users.

Table 4.29. Weavers' and Agriculturist's Evaluation Results Based on Reliability

Criteria	Mean	Verbal Interpretation
Maturity	4	Very Acceptable
Availability	4.5	Very Acceptable
Fault Tolerance	4	Very Acceptable
Overall Mean	**4.17**	**Very Acceptable**

The agriculturist and the weavers as the beneficiaries of Pandaiku assessed the device's reliability and consistency in their work setting. Based on Table 4.29, the device earned mean scores of 4.00 for maturity and 4.50 for availability, both of which are verbally interpreted as “Very Acceptable.” These results suggest that the components within the device is dependable during normal functioning and available most of the time. High score in availability shows that,

when the device is needed, it is always accessible and ready to use, thus reducing the chance of delays. Moreover, the fault tolerance criterion also attained a mean score of 4.00 considered as “Very Acceptable,” which suggests that, in the opinion of the beneficiaries, the device was still operational with minor troubles.

In general, the device has an overall mean of 4.17. The results indicate that the weavers and agriculturist perceive that the device does not fail, is reliable, and will withstand day-to-day usage. Such dependability is perceived by users as an assurance that the device can be accepted as a reliable instrument that can be integrated with traditional work activities.

Table 4.30. Weavers’ and Agriculturist’s Evaluation Results Based on Maintainability

Criteria	Mean	Verbal Interpretation
Analyzability	4.17	Very Acceptable
Modifiability	3.67	Very Acceptable
Testability	3.67	Very Acceptable
Overall Mean	**3.83**	**Very Acceptable**

Above is the results of the evaluation conducted by the beneficiaries of the device to regarding the maintainability of Pandaiku. Table 4.30 depicts the device’s score of 4.17, which verbally translates into “Very Acceptable.” This means that the users assessed the impact of changes and attempted to diagnose possible issues or failures when they believe it would be helpful. This enhances the user’s confidence in the device’s assessability for review concerning maintenance. Moreover, the device received a mean score of 3.67 on both modifiability and

testability, which has also been interpreted as “Very Acceptable.” This means that the weavers and agriculturists consider the device capable and can adapt changes without compromising the quality and retesting to confirm that it performed well.

The results, with the overall mean of 3.83, indicate that the users are contented with the device’s ease of maintenance concerning a stable functioning, reliable, adaptable, and manageable in assisting pandan leaf processing particularly the process of drying and pressing by the weavers.

Table 4.31. Weavers’ and Agriculturist’s Evaluation Results Based on Portability

Criteria	Mean	Verbal Interpretation
Adaptability	4.17	Very Acceptable
Installability	3.83	Very Acceptable
Replaceability	3.83	Very Acceptable
Overall Mean	**3.94**	**Very Acceptable**

Table 4.31. illustrates the weavers and agriculturists’ evaluation of the device’s portability. Considered as “very acceptable,” at 4.17,” the device was believed to be capable of effective adjustment to different or changing environments with success. Both installability and replaceability scored 3.83, interpretated as “Very Acceptable” as well, indicating that the users seem to understand that the device can be easily installed or uninstalled and can replace other devices serving the same function in the weavers' working environment.

Evaluation results where the overall mean is 3.94 indicate actually the device portability functions to reasonable extent as expected by the users. It then

becomes clear that the device is indeed practical and versatile to the users for the drying and pressing of pandan leaves.

Table 4.32. Weavers' and Agriculturist's Hardware Evaluation Results

Criteria	Mean	Verbal Interpretation
Q1	4.17	Very Acceptable
Q2	4.17	Very Acceptable
Q3	4.33	Very Acceptable
Q4	4.33	Very Acceptable
Q5	3.83	Very Acceptable
Overall Mean	**4.04**	**Very Acceptable**

Tables 4.32 presents the hardware evaluation results of the device as assessed by the weavers and agriculturist. The project scored mean scores of 4.00 to 4.33 for all the criteria, thus all items were verbally accepted as "Very Acceptable." Based on the results, the users consider that the design objectives of the device is achieved, its efficiency in performance is high, and quality remains reasonable. Additionally, users also perceive the device as easy to operate, maintain and store, usability, reliability, durability and aesthetics. The evaluation suggests that the device's hardware is acceptable to the users with an overall mean of 4.04 signifying that the device is indeed functional, user-friendly and suitable for users undergoing the drying and pressing procedures of the pandan leaves.

Table 4.33. Weavers' and Agriculturist's Evaluation Results Summary on the Device Software

Criteria	Mean	Verbal Interpretation
Functional Suitability	4	Very Acceptable
Performance Efficiency	3.83	Very Acceptable
Compatibility	3.75	Very Acceptable
Usability	4.07	Very Acceptable
Reliability	4.17	Very Acceptable
Maintainability	3.83	Very Acceptable
Portability	3.94	Very Acceptable
Overall Mean	**3.92**	**Very Acceptable**

Table 4.33 reflect the summary of the evaluation conducted by the agriculturist and weavers. The mean received by all criteria is ranging from 3.75 to 4.17 including functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability where all considered very acceptable, thus the overall mean was about 3.92 which shows that users consider the software of the device reliable, effective and satisfactory in meeting their demands in the drying and pressing of pandan leaves.

Project Benefits

The benefit of this project is to help the weavers to ease their manual labor in pandan leaf processing specially in drying and pressing of pandan leaves. This device will reduce the consumed time required for the two processes and help the

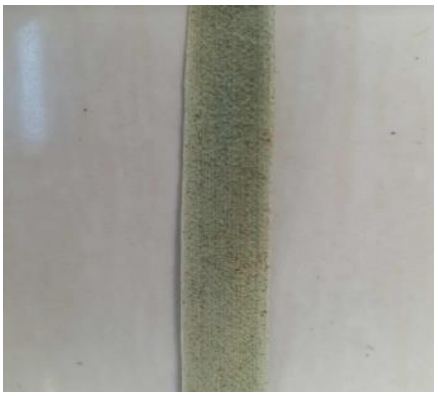
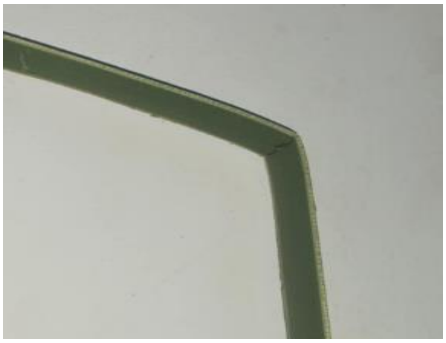
weavers to produce more products which will lead them to have an additional income.

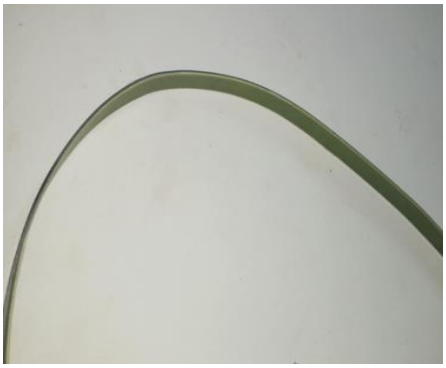
Table 4.34. Comparison Between Traditional and Arduino-Based Methods for Pressing and Drying Pandan Leaves

Without Arduino-based Pandaiku	With Arduino-based Pandaiku
Taking too long to dry and press the pandan leaves	Automated Easy Method for Drying and Pressing the pandan leaves
The pandan weavers only know the old traditional method of drying the pandan leaves by the use of sun drying which it is placed into the open field	The pandan weavers learns a new method of drying with pressing of pandan leaves in possible shortest time
In pressing the pandan leaves weavers tend to use their traditional method which is to use '*ilohan*' which is a large trunk of tree to ensure that the pandan leaves are pressed evenly.	In pressing process, the leaves are pressed slowly by a roller that weighs 20 kilograms which will be responsible for pressing the leaves back and forth in achieving a pliable and flexible pandan leaves ready for weaving.

Table 4.35. Effectiveness of Traditional Method Versus Arduino-Based Drying and Preesing Method (Pandaiku) on Pandan Leaves

Actual Image	Description
	The result of drying the pandan leaves using the sun drying methods takes a longer day to meet the required quantity and the dry of it takes around 1-2 days depending on the sunlight. Leaves may dry unevenly and the color of it may be changed differently. Through the use of the device as shown in the picture within a couple of minutes (for 5 minutes) in the drying it have a direct effect on the leaves where the leaves changes the color at the edges as an indication that it is starting to dry.
	In aproximately 10 minutes of drying in the device, the discoloration of the pandan leaves is now visible where some of its parts have turned into light green. Meanwhile using the weavers' traditional method which is sun drying, they consumed hours for them to achieved this kind of result.

	Through Pandaiku, the weavers will be able to dry pandan leaves and generate good results for about less than an hour. However using sun drying, it usually take more than one (1) day for them to fully dry a batch of pandan leaves since there are some inconsistencies regarding their weather condition.
	The longer it takes to dry the pandan leaves in the manual process can affect its color. When the leaves are exposed to water or rain, this may cause the leaves to turn into a yellowish tone which cannot be used to the production of handicraft product.
	Using either ‘ilohan’ which is their traditional tool or Pandaiku, will cause the the pandan leaves becomes brittle or easily cracks when it is not pressed enough.

	In traditional method, weavers spent several minutes to press the pandan leaves evenly exerting too much strength due to the heaviness of *ilohan.* On the other hand, using Pandaiku will give the weavers ease in the pressing process of pandan leaves due to its automated function that will make them pliable or flexible and ready for weaving even without exerting too much effort.

The comparison provided by the tables above (Table 4._ and Table 4._) presents the effectiveness of using Pandaiku is pandan leaf processing particularly the drying and pressing process. This reflects how the device will optimize eavh processes offering ease for the weavers without compromising the quality of pandan leaves used in weaving, thus ensuring increased in productivity and income of the weavers.

Project Economic Feasibility

Table 4.36.Total Budget for the Project

BILLS OF MATERIALS		
PARTS NAME	**QUANTITY**	**PRICE**
Caster Wheel W/ Lock	4	₱640.00
Lock	4	₱200,00
Sprocket 40x20	2	₱700.00
Sprocket 40x15	2	₱600.00

Chain #40	4	₱920.00
Wiper Motor	1	₱1,750.00
Limit Switch	2	₱100.00
Heater	8	₱15,200.00
Blower Fan 220v	4	₱2,400.00
6" Tube	1	₱7,000.00
Plainsheet 202	5	₱9,500.00
Piano Hinges	2	₱100.00
Tubular 1/2 X 1/2	7	₱1,610.00
Tubular 1/2 X 1	1	₱350.00
RKC	1	₱2,200.00
12v 12.5a Switching Power Supply 150w	1	₱849.00
Lcd 20x4 Dispaly I2c White On Blue	1	₱278.00
Buzzer Continuous Sound Electronic Active Buzzer Sfm-27 Dc 3v-24v	1	₱50.00
Arduino Mega 2560 R3 Board Based On Arduino	1	₱1,049.00
4x4 Matrix Membrane Keypad	1	₱50.00
Dc-Dc Buck Converter LM2596S	1	₱60.00
Labor	3	₱10,000.00
	TOTAL	₱59,406

This innovative device will efficiently benefits weavers on their business. This not only ease the process and reduce manual process but also allows them to speed up the process and to produce more handicraft products within a couple of minutes. The initial investment for constructing the device, including electronic components and miscellaneous expenses is ₱49,406. Additionally, fabrication by a professional aluminum worker and electrical wiring construction by skilled technician would add ₱10,000.00 to the initial cost.

According to Luisiana Weavers the price of baskets ranging from ₱100.00-₱200.00 per baskets, for instances the price of a basket may vary if there is a

design or color on it and its ranges from ₱150.00-₱300.00. This indicate that the price increased depends on the appearance of the baskets. This suggest that the flexibility of the pricing have a high potential return on investment. Through the consistency and faster production of pandan leaves of the device, weavers can increase the number of produce products and their profits.

Operational Cost Analysis

The operational cost analysis for drying pandan leaves involves assessing the expenses related to electricity usage. In April 2025, the developers conducted a test to check the electric consumption of the device meant for drying and pressing the pandan leaves. The device's maximum power consumption reached 0.684 kWh at the peak of the process. The electricity cost in this period was ₱13.00 per kWh. Normally, the energy cost incurred when drying 70 pieces of pandan leaves is around 0.342 kWh over 30 minutes and in the pressing process, the energy cost incurred is around 0.171 kWh over 15 minutes also. In total, 0.513 kWh is consumed in a single cycle or round. By utilizing these numbers, the energy cost becomes at operational cost per cycle for drying and pressing of pandan leaves approximately equal to, or about ₱6.67. Considering no additional factors such as the cost of pandan leaves, the estimated electricity expenses for operating the drying and pressing device in 1 month consume of the electricity is ₱600.21 and the cost of 3 weeks consume of electricity is ₱420.15, for the 2 weeks cost consume of the electricity ₱280.10.

Potential Profitability Analysis

A sample profitability calculation was performed for drying and pressing 70 leaves of pandan leaves. In one process of it contains 30 minutes drying + 15 minutes pressing which cost the total operational electricity of ₱9.00.

To produce one basket its average that it needed 30 pandan leaves so the 70 leaves can approximately make 2 baskets (70 ÷ 30 ≈ 2.33, rounded down to 2 for practical output). Given a market price of ₱200.00 per baskets, the total gross revenue per cycle is ₱400 (2 baskets x ₱200.00). Subtracting the operational cost of ₱9.00 result in a net profit per cycle is ₱391.00 (₱400.00-₱9.00).

Assume for one day cycles, this leads to a daily profit of ₱18,768.00. Over a 30-day month, the potential monthly profit would be ₱563,040.00, showing that the device has a strong income potential foe pandan based handicraft production.

Total Initial Investment (Cost)	₱59,406
Operational Cost per Cycle	₱9.00
Production per Cycle	2 baskets (from 70 pcs pandan leaves)
Selling price per basket	₱200

Revenue per cycle = 2 × ₱200 = ₱400

Net profit per cycle

Revenue - Operational cost = ₱400 - ₱9 = ₱391

Daily profit (assuming 48 cycles/day)	₱18,768
Monthly profit (30 days)	₱563,040

Calculating the ROI

Total Investment	₱59,406
Monthly Net Profit	₱563,040

$$ROI\ (1\ month) = \frac{Net\ Profit}{Investment} x\ 100\%$$

$$ROI\ (1\ month) = \frac{₱563{,}040}{₱59{,}406} x\ 100\%$$

$$ROI\ (1\ month) = \approx 947.7\%$$

Calculating the Payback period

$$Payback\ Period\ (months) = \frac{Investment}{Monthly\ Net\ Profit}$$

$$Payback\ Period\ (months) = \frac{59{,}406}{563,040} \approx 0.105\ months \approx 3.15\ days$$

Calculating the Cost Efficiency Ratio

$$Cost\ Efficiency\ Ratio = \frac{Monthly\ Net\ Profit}{Investment}$$

$$Cost\ Efficiency\ Ratio = \frac{563,040}{59,406} = 9.47$$

Project Schedule Feasibility

Table 4.37. Project Development Schedule

Description	Activity	Date Started	Date Finished	Duration
Plan	User Requirements	02-17-2025	02-28-2025	14 days
	System Requirements	02-28-2025	03-16-2025	16 days
	Hardware Requirements	02-28-2025	03-16-2025	16 days
Design	Design of the Prototype	01-16-2025	03-20-2025	34 days
	System Design	02-09-2025	03-09-2025	31 days
Develop	Components Gathering	02-02-2925	02-16-2025	14 days
	Building and Wiring	02-27-2025	03-31-2025	31 days
	Programming	02-20-2025	04-04-2025	12 days
Test	System Debugging Hardware Testing	3-28-2025	4-06-2025	9 days
	Effectivity Testing	04-11-2025	04-26-2025	14 days
Evaluation	Prototype Evaluation	04-27-2025	04-28-2025	1 days

The development of this project follows the agile methodology see Table 4.37 , which is designed to cope with change during the development cycle, the developers conducted through research and observation to comprehend the current situation and significant challenges weavers in the selected Barangay Zone VI, Luisiana Laguna**.** This approach enables a balance between structure and flexibility which aids in the accomplishment of project goals. First, surveys are conducted to gather important data that helps in identifying the most pressing

issues and provides a range of possible solution specifications. Additional insights come from directly talking to the client through an interview. After this, the development team chooses the appropriate tools which include the IDE and the hardware as well as other materials that are supposedly essential for the project.

Deployment Results

Pandaiku was successfully deployed on June 13, 2025 in Barangay Zone VI, Luisiana, Laguna. It was done by the developers accompanied by Engr. Ronel D. Braga, Dr. Teresa A. Yema, and Dean Estelita Cura, three representative from the College of Engineering at Pamantasan ng Lungsod ng San Pablo. This device will surely help the weavers particularly the members of Luisiana Weavers Organization during the drying and pressing process of pandan leaves mainly used in weaving handicraft products.

Approval from the Beneficiaries

The first phase of the deployment process of Pandaiku is obtaining the client's approval. The developers first informed the clients regarding the said deployment including the date and time of the event. On the date of the actual deployment, June 13, 2025, the weavers signed the Memorandum of Understanding (MOU) ensuring the collaboration and agreement between the school and the community.

Setting up the Device

The developers encountered some minor problems due to the transport of the device but was immediately resolved. After arriving at Luisiana Weavers Hub, they setup Pandaiku which took approximately 30 minutes. During this time, the developers carefully reviewed the components and wiring to ensure everything

was functioning correctly and safely. A manual check was conducted to identify any possible issues before actual operation.

Hand over the Device

Once everything was set up and group already double-checked that all parts were working, they handed the device over. The developers spoke briefly with the client representatives, explaining them each key function of the Pandaiku. The user manual was then formally passed to the weavers, giving them a handy reference for troubleshooting and maintenance.

Training

To ensure smooth usage of the Pandaiku device, a training session was conducted. This short demonstration allowed the weavers to familiarize themselves with operating the device, including starting the heating process, monitoring temperature, and properly pressing the pandan leaves. Client feedback was welcomed during this time, ensuring that any clarifications were addressed immediately.

The developers, clients, as well as the representives from College of Engineering at Pamantasan ng Lungsod ng San Pablo also schedule a presentation to Mayor Jomapher U. Alvarez, Municipal Mayor of Luisiana, Laguna, on June 23, 2025 to introduce Pandaiku as a potential help to their weavers during the pandan leaf processing. This will include the functions of Pandaiku, how it works, as well as to discuss its advantages.

Figure 4.22. Deployment of the Project

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter provides a brief summary of the project's key findings, and the project's conclusions and recommendations.

Summary of Findings

The development of Pandaiku aimed at addressing the challenges commonly face by weavers during their manual drying and pressing of pandan leaves used in weaving purposes. To evaluate the device, the developers was assessed by five (5) CpE Practitioners, five (5) weavers, and one (1) Agriculturist from the Municipality of Luisiana, Laguna. The evaluators were chosen for they have the knowledge regarding the device or the process and functionalities that it covers as well as they can provide meaningful insights that will help in further improvement of the device.

Based on the testing regarding the maintaining of temperature inside the device, the results shows that in fifteen minutes, Pandaiku was able to increase its temperature from 41°C to 57°C which is closer to the set temperature in the PID controller.

On the other hand, three tests has been made to determine the exact time that pandan leaves will be dried. On the first testing with a set temperature of 60°C, it took thirty (30) for a batch of fifty (50) to seventy (70) of pandan leaves to be dried. Another test has been made where the temperature was set to 70°C and it took twenty (20) minutes for the pandan leaves to be dried. While it only took fifteen (15) minutes for the device to dry pandan leaves when the set temperature was

about 80°C. Moreover, the testing results show that drying pandan leaves at 60°C for 30 minutes produced the highest quality, with 91.43% good leaves and minimal damage. At 70°C for 20 minutes, 82.86% good leaves were achieved, while 80°C for 15 minutes yielded 72.86%, with increased brittleness observed.

The developers also test the pressing mechanism of Pandaiku. It took fifteen (15) minutes for the pandan leaves to be flexible and pliable enough to be used in weaving handicraft products. The pressing test showed that pandan leaves dried at 60°C were the most pliable and suitable for weaving after 15 minutes of pressing. Leaves dried at 70°C showed slight brittleness, while those dried at 80°C were more prone to cracking during pressing.

Regarding the results of the evaluation conducted by the five (5) CpE Practitioners, Pandaiku received overall mean scores of 4.68 for software evalution and 4.64 for hardware evaluation which can be both verbally interpreted as “Highly Acceptable”. On the other hand, the evaluation conducted by the agriculturist and the weavers results to the overall mean score of 3.92 for software evaluation while 4.23 for hardware evaluation and can be both considered as “Very Acceptable”.

Conclusions

Based on the accuracy of the results from the gathered data, the following conclusions were drawn:

1. The developed device successfully performed the following functions:

    a) Drying Pandan Leaves using Infrared Heating Element;

b) Monitored processes of drying and pressing using the Thermocouple, PID Controller, and Arduino Mega;

c) Automatically stop drying based on the present time by powering off the heating element and fans, relays, and Solid State Relay (RRS);

d) Controlled the pressing mechanism using Arduino-Mega through Solid State Relay (SSR), Wiper Motor, and limit switch;

e) Notified user using the Alarm System;

2. The device was highly accepted by the CpE practitioners, while weavers, and Department of Agriculture officials evaluated it as very acceptable under the ISO 25010 characteristic of functional sustainability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability, according to evaluation results by the developers.

3. The deployment plan of the Pandaiku: An Arduino-Based Dying and Pressing Device for Pandan Leaves to support the Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna was successful. After completing the tasks outlined in the deployment plan, the Luisiana weaver organization signed an acceptance letter formally endorsing the project proposal created by the developers.

Recommendations

Based on the findings and results of the evaluations and experimentation conducted with the device, the following statements are the recommendations of the project:

1. To encourage the adoption of new way of drying and pressing of pandan leaves, aiming to maximize and increase the production of ready to weave pandan leaves.
2. To implement and integrate an arduino based drying and pressing device to weavers' organization, aiming to increase a better quality of pandan leaves while minimizing manual labor and time consume of the process. This approach aims to decrease potential issues encountered by the weavers during the process.
3. For future developers:

   a.) Detect the color of leaves using a sensor to ensure they reach the dryness preferred by the user;

   b.) Explore to dry different leaves, enhancing the capability of drying part;

   c.) Provide additional back up power for the device to operate even without the electricity supply from the outlet.

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APPENDICES

Appendix A: Recommendation Letter of the Adviser and the Dean to the Client

PAMANTASAN NG LUNGSOD NG SAN PABLO
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March 27, 2025

ENGR. ESTELITA U. CURA, MMENG'G-MGT
Dean, College of Engineering
Pamantasan ng Lungsod ng San Pablo

Dear Engr. Cura:

Greetings of Peace and Prosperity from the innovators at the College of Engineering!

In partial fulfillment of our requirements for the CPE421 – CpE Practice and Design 2 of the fourth-year students of the Bachelor of Science in Computer Engineering in the Academic Year 2024 – 2025 at the Pamantasan ng Lungsod ng San Pablo, we are conducting a design project titled, **"Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna"**

In line with this, we are conducting an evaluation regarding the functionalities and performance of our Pandaiku device. We ask your permission to conduct the discussion in these barangays/offices: *Luisiana Weavers Organization at Barangay Zone VI, Luisiana, Laguna,* to help us obtain vital information and data we need for our study.

We would be grateful and greatly appreciate your consent to our request.

Respectfully yours,

Dessa May T. Sanchez

Joven S. Arias
Hitler L. Calayag
Andrei Rudy C. Larona
Joy D. Lupig
Angel M. Martinez
Princess Nina G. Zara

Noted by:

ENGR. ANGELICA C. SAMORTIN, MSECE
Methods of Research Adviser

Approved by:

ENGR. ESTELITA U. CURA, MMENG'G-MGT
Dean, College of Engineering

Appendix B: Letter of Client's Approval to be Project's Subject

PAMANTASAN NG LUNGSOD NG SAN PABLO
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March 27, 2025

Mrs. Gemma N. Salvan
Luisiana Weavers Organization
Barangay Zone VI, Luisiana, Laguna

Dear Mrs. Salvan,

Greetings of peace and prosperity from the innovators at the College of Engineering!

We, the students of Pamantasan ng Lungsod ng San Pablo, are currently pursuing a Bachelor of Science in Computer Engineering. As part of our academic requirements, we are undertaking a Design Project titled " Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna ".

In this regard, we, the developers, we respectfully request your permission to participate as client for our design project/device. Your valuable insights and feedback will help us refine and improve our system to better meet the needs and requirements of the said device. We assure you that the data gathered will be strictly for design project purposes only.

Thank you very much, and God bless you!

Respectfully yours,

Dessa May T. Sanchez

Joven S. Arias
Hitler L. Calayag
Andrei Rudy C. Larona
Joy D. Lupig
Angel M. Martinez
Princess Nina G. Zara

Noted by:

ENGR. ANGELICA C. SAMORTIN, MSECE
Project Design Adviser

Approved by: G. Salvan
Name : Gemma N. Salvan
Designation : Weaver
Date : April 3, 2025

PAMANTASAN NG LUNGSOD NG SAN PABLO
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March 27, 2025

Mrs. Agnes Natnat
Luisiana Weavers Organization
Barangay Zone VI, Luisiana, Laguna

Dear Mrs. Natnat,

Greetings of peace and prosperity from the innovators at the College of Engineering!

We, the students of Pamantasan ng Lungsod ng San Pablo, are currently pursuing a Bachelor of Science in Computer Engineering. As part of our academic requirements, we are undertaking a Design Project titled " Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna ".

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Thank you very much, and God bless you!

Respectfully yours,

Dessa May T. Sanchez

Joven S. Arias
Hitler L. Calayag
Andrei Rudy C. Larona
Joy D. Lupig
Angel M. Martinez
Princess Nina G. Zara

Noted by:

ENGR. ANGELICA C. SAMORTIN, MSECE
Project Design Adviser

Approved by:
Name : AGNES N. NATNAT
Designation : Weaver

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March 27, 2025

Mrs. Eladia L. Oblepias
Luisiana Weavers Organization
Barangay Zone VI, Luisiana, Laguna

Dear Mrs. Oblepias,

Greetings of peace and prosperity from the innovators at the College of Engineering!

We, the students of Pamantasan ng Lungsod ng San Pablo, are currently pursuing a Bachelor of Science in Computer Engineering. As part of our academic requirements, we are undertaking a Design Project titled " Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna ".

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Thank you very much, and God bless you!

Respectfully yours,

Dessa May T. Sanchez

Joven S. Arias
Hitler L. Calayag
Andrei Rudy C. Larona
Joy D. Lupig
Angel M. Martinez
Princess Nina G. Zara

Noted by:

ENGR. ANGELICA C. SAMORTIN, MSECE
Project Design Adviser

Approved by:
Name : Eladia L. Oblepias
Designation : Weaver
Date : April 3, 2025

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March 27, 2025

Mrs. Mayline Lorico
Luisiana Weavers Organization
Barangay Zone VI, Luisiana, Laguna

Dear Mrs. Lorico,

Greetings of peace and prosperity from the innovators at the College of Engineering!

We, the students of Pamantasan ng Lungsod ng San Pablo, are currently pursuing a Bachelor of Science in Computer Engineering. As part of our academic requirements, we are undertaking a Design Project titled " Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna ".

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Thank you very much, and God bless you!

Respectfully yours,

Dessa May T. Sanchez

Joven S. Arias
Hitler L. Calayag
Andrei Rudy C. Larona
Joy D. Lupig
Angel M. Martinez
Princess Nina G. Zara

Noted by:

ENGR. ANGELICA C. SAMORTIN, MSECE
Project Design Adviser

Approved by:
Name : Mayline V. Lorico
Designation : Weaver
Date : April 3, 2025

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March 27, 2025

Mrs. Josephine Salayong
Luisiana Weavers Organization
Barangay Zone VI, Luisiana, Laguna

Dear Mrs. Salayong,

Greetings of peace and prosperity from the innovators at the College of Engineering!

We, the students of Pamantasan ng Lungsod ng San Pablo, are currently pursuing a Bachelor of Science in Computer Engineering. As part of our academic requirements, we are undertaking a Design Project titled " Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna ".

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Andrei Rudy C. Larona
Joy D. Lupig
Angel M. Martinez
Princess Nina G. Zara

Noted by:

ENGR. ANGELICA C. SAMORTIN, MSECE
Project Design Adviser

Approved by:
Name : Josephine D. Salayong
Designation : Weaver
Date : April 3, 2025

Appendix C: Informed Consent

PAMANTASAN NG LUNGSOD NG SAN PABLO
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PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

INFORMED CONSENT FORM

Developers:

Joven S. Arias	cpe.arias.joven@gmail.com
Hitler L. Calayag	toybitscalayag@gmail.com
Andrei Rudy C. Larona	andrei.rcl13@gmail.com
Joy D. Lupig	joylupig0712@gmail.com
Angel M. Martinez	cpe.martinez.angel@gmail.com
Dessa May T. Sanchez	cpe.sanchez.dessamay@gmail.com
Princess Nina G. Zara	princessninazara19@gmail.com

Part I. Information Sheet

PURPOSE OF THE RESEARCH

You are being invited to take part in a research study. Before you decide to participate in this study, it is important that you understand why the research is being done and what your participation will involve. Please read the following information carefully and feel free to ask the researcher if there is anything that is not clear or if you need more information.

The purpose of the study is to evaluate the effectiveness and efficiency of Pandaiku, an Arduino-based drying and pressing device designed for pandan leaves, which will support the Luisiana Weavers Organization. Your participation is essential in assessing the device's usability, performance, and functionality to ensure it meets the needs of local weavers.

TYPE OF RESEARCH INTERVENTION

This study involves an implementation of a prototype which is in this case, the Pandaiku, an Arduino-based device, designed to dry and press pandan leaves. Participants will interact with the device directly, conducting tests and answering structured evaluation forms based on ISO/IEC 25010 related to feedback on the device's performance.

PARTICIPANT SELECTION

You are invited to take part in this study since you are a member of Luisiana Weavers Organization, and has relevant experience in pandan leaf weaving and processing. Your contribution will be essential in assessing if the device is functionally applicable to local weavers.

VOLUNTARY PARTICIPATION

Your participation in this study is entirely voluntary. It is up to you whether or not you decide to participate. If you decide to participate, you will be asked to sign this consent form. After you sign this consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the

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researcher. If you choose to withdraw before the data collection is completed, your responses will be excluded from the study.

STUDY PROCEDURES

If you agree to participate in this study, you will be asked to:

- Evaluate Pandaiku based on the ISO 25010 Evaluation Model to test the acceptability of the device in different criteria such as functionality, compatibility, usability, reliability, security, maintainability, and portability.
- Answer close-ended questions regarding your experience upon using and testing the device.
- Provide comments and suggestions regarding the effectiveness of the device in the process of drying and pressing batch of pandan leaves.

DURATION

Upon your participation, the evaluation process of Pandaiku, will took 1-3 hours only which will be enough to fully test and evaluate the device.

RISKS

There is only a minimal risk in this study. But you can withdraw from the study at any time that you feel some discomfort. Safety will be guaranteed by taking all the precautions that the researchers take during the evaluation process.

BENEFITS

Although there is no direct personal benefits, your participation in this project will contribute a lot in having improvement of Pandaiku that will surely benefit the Luisiana Weavers Organization and the community involved in the weaving industry of pandan leaves. The results and findings from this study/project can be used to have further developments and advancements in the future with regards to pandan leaf weaving particularly in drying and pressing processes.

REIMBURSEMENTS

Please note that you will not receive any payment for participating in this study. However, any minor expenses you incur directly because of your participation such as transportation or meals during the evaluation session will be reimbursed by the developers, if applicable.

CONFIDENTIALITY

Your responses in this research will be anonymous. Every effort will be made by the researcher to preserve your confidentiality. Some measures taken to ensure confidentiality are listed below:

1. Employing codes/pseudonyms for the each participants instead of their name or other personal identifiers.
2. Having all the information collected in a secure location where the researchers/developers has only the access to it.
3. Ensuring that any published findings will not include information that can identify individual participants.

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SHARING THE RESULTS

The Luisiana Weavers Organization will be given access to the outcomes from this research and those outcomes may also be shared in research presentations, reports, and even academic publications. However, data will be shared in combined form and identifying data of individual participants will not be shared. If you wish, you can request a summary of the study's findings by contacting the researchers.

RIGHT TO REFUSE OR WITHDRAW

You have the right to refuse to participate or withdraw from the study at any time, without penalty or loss of benefits to which you are otherwise entitled. Your decision will not affect your relationship with the researchers, the university, or the Luisiana Weavers Organization.

CONTACT INFORMATION

This study has been approved by the University Data Privacy Officer of Pamantasan ng Lungsod ng San Pablo. For any questions or concerns regarding your rights as a participant, or if you experience anything unusual as a result of participating, you may contact:
University Data Privacy Office: Christian Dior S. Diaz
Intellectual Property Rights Head - Paul Adrian S. Avecilla
Email: ovpripisp@gmail.com |
Phone: (049) 508-7295

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PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant: _____
Signature of Participant: _____
Date: [MM/DD/YYYY]: _____

If Illiterate
A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Witness: _____
Signature of Witness: _____
Date: [MM/DD/YYYY]: _____

Thumb Print of Participant

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher: _____
Signature of Researcher: _____
Date: [MM/DD/YYYY]: _____

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

Appendix E.1: Filled-out Informed Consent

PAMANTASAN NG LUNGSOD NG SAN PABLO
OFFICE OF THE VICE PRESIDENT
FOR RESEARCH AND INNOVATION
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PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

INFORMED CONSENT FORM

Developers:

Joven S. Arias	cpe.arias.joven@gmail.com
Hitler L. Calayag	toybitscalayag@gmail.com
Andrei Rudy C. Larona	andrei.rcl13@gmail.com
Joy D. Lupig	joylupig0712@gmail.com
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Part I. Information Sheet

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TYPE OF RESEARCH INTERVENTION

This study involves an implementation of a prototype which is in this case, the Pandaiku, an Arduino-based device, designed to dry and press pandan leaves. Participants will interact with the device directly, conducting tests and answering structured evaluation forms based on ISO/IEC 25010 related to feedback on the device's performance.

PARTICIPANT SELECTION

You are invited to take part in this study since you are a member of Luisiana Weavers Organization, and has relevant experience in pandan leaf weaving and processing. Your contribution will be essential in assessing if the device is functionally applicable to local weavers.

VOLUNTARY PARTICIPATION

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- Answer close-ended questions regarding your experience upon using and testing the device.
- Provide comments and suggestions regarding the effectiveness of the device in the process of drying and pressing batch of pandan leaves.

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BENEFITS

Although there is no direct personal benefits, your participation in this project will contribute a lot in having improvement of Pandaiku that will surely benefit the Luisiana Weavers Organization and the community involved in the weaving industry of pandan leaves. The results and findings from this study/project can be used to have further developments and advancements in the future with regards to pandan leaf weaving particularly in drying and pressing processes.

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Phone: (049) 508-7295

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PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant: CHRISTIAN GIL EXCONDE
Signature of Participant: _____
Date: [MM/DD/YYYY]: April 23, 2025

If Illiterate
A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Witness: _____
Signature of Witness: _____
Date: [MM/DD/YYYY]: _____

Thumb Print of Participant

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher: Jessa May T. Sanchez
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 04-23-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

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INFORMED CONSENT FORM

Developers:

Joven S. Arias	cpe.arias.joven@gmail.com
Hitler L. Calayag	toybitscalayag@gmail.com
Andrei Rudy C. Larona	andrei.rcl13@gmail.com
Joy D. Lupig	joylupig0712@gmail.com
Angel M. Martinez	cpe.martinez.angel@gmail.com
Dessa May T. Sanchez	cpe.sanchez.dessamay@gmail.com
Princess Nina G. Zara	princessninazara19@gmail.com

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Print Name of Participant: Jannah Yvette Villaruz
Signature of Participant: _____
Date: [MM/DD/YYYY]: 04/26/25

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Signature of Witness: _____
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Print Name of Researcher: DESSA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 04-26-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

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Developers:

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Andrei Rudy C. Larona	andrei.rcl13@gmail.com
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Print Name of Participant: RAMWELL SAHAGUN
Signature of Participant: _____
Date: [MM/DD/YYYY]: 04-22-2025

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Print Name of Researcher: DEISA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 04-22-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

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INFORMED CONSENT FORM

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Andrei Rudy C. Larona	andrei.rcl13@gmail.com
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Print Name of Participant: KARLA ANGELA S. PETRASANTA
Signature of Participant: _____
Date: [MM/DD/YYYY]: April 26, 2025

If Illiterate
A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

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Print Name of Researcher: DEICA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 04-28-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

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REIMBURSEMENTS

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SHARING THE RESULTS

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Email: ovpripisp@gmail.com |
Phone: (049) 508-7295

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PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant: CLARENCE G. DURIAN
Signature of Participant: _____
Date: [MM/DD/YYYY]: April 27, 2025

If Illiterate
A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Witness: _____
Signature of Witness: _____
Date: [MM/DD/YYYY]: _____

Thumb Print of Participant

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher: DEGIA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 04-27-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

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INFORMED CONSENT FORM

Developers:

Joven S. Arias	cpe.arias.joven@gmail.com
Hitler L. Calayag	toybitscalayag@gmail.com
Andrei Rudy C. Larona	andrei.rcl13@gmail.com
Joy D. Lupig	joylupig0712@gmail.com
Angel M. Martinez	cpe.martinez.angel@gmail.com
Dessa May T. Sanchez	cpe.sanchez.dessamay@gmail.com
Princess Nina G. Zara	princessninazara19@gmail.com

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- Answer close-ended questions regarding your experience upon using and testing the device.
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Print Name of Participant: AGNES N. NATNAT
Signature of Participant: _____
Date: [MM/DD/YYYY]: 5/02/2025

If Illiterate
A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

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Print Name of Witness: _____
Signature of Witness: _____
Date: [MM/DD/YYYY]: _____

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Print Name of Researcher: DESSA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 05-01-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

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INFORMED CONSENT FORM

Developers:

Joven S. Arias	cpe.arias.joven@gmail.com
Hitler L. Calayag	toybitscalayag@gmail.com
Andrei Rudy C. Larona	andrei.rcl13@gmail.com
Joy D. Lupig	joylupig0712@gmail.com
Angel M. Martinez	cpe.martinez.angel@gmail.com
Dessa May T. Sanchez	cpe.sanchez.dessamay@gmail.com
Princess Nina G. Zara	princessninazara19@gmail.com

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Print Name of Participant: Josephine D. Sapyong
Signature of Participant: _____
Date: [MM/DD/YYYY]: May 2, 2025

If Illiterate
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Signature of Witness: _____
Date: [MM/DD/YYYY]: _____

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Print Name of Researcher: DEICA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 05-02-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

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INFORMED CONSENT FORM

Developers:

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Hitler L. Calayag	toybitscalayag@gmail.com
Andrei Rudy C. Larona	andrei.rcl13@gmail.com
Joy D. Lupig	joylupig0712@gmail.com
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Print Name of Participant: Eladia L. Olepia
Signature of Participant: _____
Date: [MM/DD/YYYY]: 05-02-2025

If Illiterate
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Print Name of Researcher: DESSA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 05-02-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

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University Data Privacy Officer

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- Provide comments and suggestions regarding the effectiveness of the device in the process of drying and pressing batch of pandan leaves.

DURATION

Upon your participation, the evaluation process of Pandaiku, will took 1-3 hours only which will be enough to fully test and evaluate the device.

RISKS

There is only a minimal risk in this study. But you can withdraw from the study at any time that you feel some discomfort. Safety will be guaranteed by taking all the precautions that the researchers take during the evaluation process.

BENEFITS

Although there is no direct personal benefits, your participation in this project will contribute a lot in having improvement of Pandaiku that will surely benefit the Luisiana Weavers Organization and the community involved in the weaving industry of pandan leaves. The results and findings from this study/project can be used to have further developments and advancements in the future with regards to pandan leaf weaving particularly in drying and pressing processes.

REIMBURSEMENTS

Please note that you will not receive any payment for participating in this study. However, any minor expenses you incur directly because of your participation such as transportation or meals during the evaluation session will be reimbursed by the developers, if applicable.

CONFIDENTIALITY

Your responses in this research will be anonymous. Every effort will be made by the researcher to preserve your confidentiality. Some measures taken to ensure confidentiality are listed below:

1. Employing codes/pseudonyms for the each participants instead of their name or other personal identifiers.
2. Having all the information collected in a secure location where the researchers/developers has only the access to it.
3. Ensuring that any published findings will not include information that can identify individual participants.

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Email Address: plspofficial@plsp.edu.ph

SHARING THE RESULTS

The Luisiana Weavers Organization will be given access to the outcomes from this research and those outcomes may also be shared in research presentations, reports, and even academic publications. However, data will be shared in combined form and identifying data of individual participants will not be shared. If you wish, you can request a summary of the study's findings by contacting the researchers.

RIGHT TO REFUSE OR WITHDRAW

You have the right to refuse to participate or withdraw from the study at any time, without penalty or loss of benefits to which you are otherwise entitled. Your decision will not affect your relationship with the researchers, the university, or the Luisiana Weavers Organization.

CONTACT INFORMATION

This study has been approved by the University Data Privacy Officer of Pamantasan ng Lungsod ng San Pablo. For any questions or concerns regarding your rights as a participant, or if you experience anything unusual as a result of participating, you may contact:
University Data Privacy Office: Christian Dior S. Diaz
Intellectual Property Rights Head - Paul Adrian S. Avecilla
Email: ovpripisp@gmail.com |
Phone: (049) 508-7295

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PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant: Gemma N. Salvan
Signature of Participant: G Salvan
Date: [MM/DD/YYYY]: 5-12-25

If Illiterate
A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Witness: _____
Signature of Witness: _____
Date: [MM/DD/YYYY]: _____

Thumb Print of Participant

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher: DENA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 05-12-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

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PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

INFORMED CONSENT FORM

Developers:

Joven S. Arias	cpe.arias.joven@gmail.com
Hitler L. Calayag	toybitscalayag@gmail.com
Andrei Rudy C. Larona	andrei.rcl13@gmail.com
Joy D. Lupig	joylupig0712@gmail.com
Angel M. Martinez	cpe.martinez.angel@gmail.com
Dessa May T. Sanchez	cpe.sanchez.dessamay@gmail.com
Princess Nina G. Zara	princessninazara19@gmail.com

Part I. Information Sheet

PURPOSE OF THE RESEARCH

You are being invited to take part in a research study. Before you decide to participate in this study, it is important that you understand why the research is being done and what your participation will involve. Please read the following information carefully and feel free to ask the researcher if there is anything that is not clear or if you need more information.

The purpose of the study is to evaluate the effectiveness and efficiency of Pandaiku, an Arduino-based drying and pressing device designed for pandan leaves, which will support the Luisiana Weavers Organization. Your participation is essential in assessing the device's usability, performance, and functionality to ensure it meets the needs of local weavers.

TYPE OF RESEARCH INTERVENTION

This study involves an implementation of a prototype which is in this case, the Pandaiku, an Arduino-based device, designed to dry and press pandan leaves. Participants will interact with the device directly, conducting tests and answering structured evaluation forms based on ISO/IEC 25010 related to feedback on the device's performance.

PARTICIPANT SELECTION

You are invited to take part in this study since you are a member of Luisiana Weavers Organization, and has relevant experience in pandan leaf weaving and processing. Your contribution will be essential in assessing if the device is functionally applicable to local weavers.

VOLUNTARY PARTICIPATION

Your participation in this study is entirely voluntary. It is up to you whether or not you decide to participate. If you decide to participate, you will be asked to sign this consent form. After you sign this consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the

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researcher. If you choose to withdraw before the data collection is completed, your responses will be excluded from the study.

STUDY PROCEDURES

If you agree to participate in this study, you will be asked to:

- Evaluate Pandaiku based on the ISO 25010 Evaluation Model to test the acceptability of the device in different criteria such as functionality, compatibility, usability, reliability, security, maintainability, and portability.
- Answer close-ended questions regarding your experience upon using and testing the device.
- Provide comments and suggestions regarding the effectiveness of the device in the process of drying and pressing batch of pandan leaves.

DURATION

Upon your participation, the evaluation process of Pandaiku, will took 1-3 hours only which will be enough to fully test and evaluate the device.

RISKS

There is only a minimal risk in this study. But you can withdraw from the study at any time that you feel some discomfort. Safety will be guaranteed by taking all the precautions that the researchers take during the evaluation process.

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Although there is no direct personal benefits, your participation in this project will contribute a lot in having improvement of Pandaiku that will surely benefit the Luisiana Weavers Organization and the community involved in the weaving industry of pandan leaves. The results and findings from this study/project can be used to have further developments and advancements in the future with regards to pandan leaf weaving particularly in drying and pressing processes.

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Print Name of Participant: Mayline V. Lorico
Signature of Participant: Mayline Lorico
Date: [MM/DD/YYYY]: 05/02/2025

If Illiterate
A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Witness: _____
Signature of Witness: _____
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Print Name of Researcher: DESSA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 05-02-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

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INFORMED CONSENT FORM

Developers:

Joven S. Arias	cpe.arias.joven@gmail.com
Hitler L. Calayag	toybitscalayag@gmail.com
Andrei Rudy C. Larona	andrei.rcl13@gmail.com
Joy D. Lupig	joylupig0712@gmail.com
Angel M. Martinez	cpe.martinez.angel@gmail.com
Dessa May T. Sanchez	cpe.sanchez.dessamay@gmail.com
Princess Nina G. Zara	princessninazara19@gmail.com

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PART II: CERTIFICATE OF CONSENT

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Print Name of Participant: Christine Mae Roquel
Signature of Participant: _____
Date: [MM/DD/YYYY]: 05/02/2025

If Illiterate
A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print Name of Witness: _____
Signature of Witness: _____
Date: [MM/DD/YYYY]: _____

Thumb Print of Participant

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Print Name of Researcher: DESSA MAY T. SANCHEZ
Signature of Researcher: _____
Date: [MM/DD/YYYY]: 05-02-2025

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Project Design Adviser

Approved by:

Christian Dior S. Diaz
University Data Privacy Officer

Appendix D: Ethics Clearance

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ETHICS CLEARANCE FORM

Research Title:
PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

Names of Student Researcher(s):
Joven S. Arias
Hitler L. Calayag
Andrei Rudy C. Larona
Joy D. Lupig
Angel M. Martinez
Dessa May T. Sanchez
Princess Nina G. Zara

College/ Department:
College of Engineering

Course/Program:
Bachelor of Science in Computer Engineering

Expected Duration of the Project: from: **September 2024** to: **May 2025**

Ethical Principles observed/violated.

	OBSERVED	VIOLATED
To be checked before data gathering		
1. Honesty	✓	
2. Objectivity	✓	
3. Informed Consent	✓	
4. Data Privacy / Confidentiality	✓	
To be checked before submitting the final paper		
5. Fabrication		
6. Falsification		
7. Plagiarism		

To the best of my knowledge, the ethical issues listed above have been addressed in the research.

Engr. Angelica C. Samortin, MSECE
Name and Signature of Adviser/Mentor
First Review Date
Second Review Date:

Noted by:
Engr. Jake C. Magpily
Name and Signature of the Program Chairperson
First Review Date
Second Review Date:

Reviewed by:

Engr. Angelica C. Samortin, MSECE
Adviser
First Review Date:
Second Review Date:

Christian Dior S. Diaz
University Data Privacy Officer
First Review Date:
Second Review Date:

"Primed to Lead and Serve for Progress"

Appendix E: Letter of Acceptance

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COLLEGE OF ENGINEERING
Brgy. San Jose, San Pablo City
Tel No.: (049) 536-7830
Email Address: plspofficial@plsp.edu.ph website: plsp.coe@plsp.edu.ph

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March 29, 2025

ENGR. ESTELITA U. CURA, MMENG'G-MGT
Dean, College of Engineering
Pamantasan ng Lungsod ng San Pablo

Dear Engr. Cura,

Greetings of peace and prosperity.

This is to certify the acceptance of the design project entitled " Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna", developed by the following engineering students: Mr. Joven S. Arias, Mr. Hitler L. Calayag, Mr. Andrei Rudy C. Larona, Ms. Joy D. Lupig, Ms. Ms. Angel M. Martinez, Ms. Dessa May T. Sanchez, and Ms. Princess Nina G. Zara.

Luisiana Weavers Organization appreciated the developed device, it would be a big help for the organization and the weavers by providing an Arduino-based drying and pressing device for pandan leaves. The device will be used at Luisiana Weavers Organization located at Estrellado Street Barangay Zone VI, Luisiana, Laguna.

Thank you very much.

Accepted by,

Mayline Lorico
MS. MAYLINE LORICO
President
Luisiana Weavers Organization

Appendix F: Memorandum of Understanding

Appendix G: Gantt Chart

Project Title	PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA																					
Task #	Task Description	Task Duration	September				October				November				December				January			
			Week1	Week2	Week3	Week4	Week1	Week2	Week3	Week4	Week1	Week2	Week 3	Week4	Week1	Week2	Week3	Week4	Week1	Week2	Week3	Week4
1	Working Title	3 weeks	■	■	■																	
2	Chapter 1	2 weeks					■	■														
3	Title Proposal Defense	1 day							■													
4	Revision of Chapter 1	1 week								■												
5	Chapter 2	2 weeks									■	■										
6	Planning of the Device	2 weeks										■	■									
7	Autocad layout of the Device	2 weeks												■	■							
8	Block Diagram of the Device	3 days														■						
9	Flowchart of the Device	2 days														■						
10	Chapter 3	4 weeks														■	■	■	■			
11	Pre-oral Defense	1 day																		■		
12	Revision of Chapter 3	2 weeks																		■	■	
13	Canvassing of materials	3 weeks																		■	■	■

Task #	Task Description	Task Duration	February				March				April				May			
			Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4	Week 1	Week 2	Week 3	Week 4
14	Components Gathering	2 weeks	■	■														
15	Building the Prototype	5 weeks		■	■	■	■	■										
16	Wiring of the Components	3 weeks				■	■	■										
17	Programming	3 weeks					■	■	■									
18	System Debugging and Testing	4 weeks					■	■	■	■								
19	Preparation for the Evaluation	2 weeks							■	■								
20	Signing of Informed Consent, Ethics Clearance, and other letters	4 weeks								■	■	■	■					
21	Evaluation of CpE Practitioners	2 days												■				
22	Evaluation of Weavers and Agriculturist	1 day												■	■			
23	Chapter 4	7 days												■	■			
24	Chapter 5	7 days														■		
25	Final Defense	1 day															■	
Project Duration		7 months and 12 days																

Appendix H:

Project Evaluation Instrument of Weavers, CpE Practitioners,

and Agriculturist

Appendix H.1: Sample Evaluation Instrument

"PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA"

Name: _____
Put a (/) if you are :

☐ **Weaver** ☐ **Agriculturist** ☐ **Computer Engineering Practitioner**

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives. *(Nagagawa ng device lahat ng kailangan at layunin.)*					
	Functional Correctness	The device provides the correct results with the needed degree of precision. *(Nagbibigay ang device ng tamang resulta na sapat ang kasiguruhan o tama ang sukat.)*					
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives. *(Gumagana ang device para mapadali ang pagtapos ng mga takdang gawain at layunin.)*					
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements. *(Ang dami at klase ng resources ng device ay sapat kapag ginagawa nito ang tungkulin at tinutupad ang mga kailangan.)*					
	Resource Utikzation	The maximize limits of the device parameter meet the requirements. *(Ang pinakamataas na kaya ng device ay pasok sa mga kailangan o hinihingi.)*					
	Capacity	The device can perform its functions efficiently while sharing a familiar. *(Kayang gawin ng device ang tungkulin nito nang mahusay habang ginagamit ito nang pamilyar o madali sa gumagamit.)*					
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products. *(Kayang gawin ng device nang maayos ang tungkulin nito habang nakikibahagi sa parehong kapaligiran at resources kasama ng ibang produkto.)*					
	Interoperability	The device can exchange information and use the information that has been exchanged . *(Kayang makipagpalitan ng impormasyon ang device at gamitin ang impormasyong napalitan na.)*					
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs. *(Madaling nakikita ng mga gumagamit na nakakatulong ang device at kaya nitong tugunan ang kanilang pangangailangan.)*					
	Leamability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction. *(Ang mga tinukoy na gumagamit ay kayang matutunan ang paggamit ng device nang epektibo, mahusay, ligtas, at may kasiyahan.)*					
	Operability	The device has attributes that make it easy to operate and control. *(May mga katangian ang device na nagpapadali sa paggamit at pagkontrol nito.)*					
	User Error Protection	The device protects the user against making errors. *(Pinoprotektahan ng device ang gumagamit laban sa pagkakamali.)*					
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying. *(Ang interface ng device ay nagbibigay ng kaaya-aya at nakasisiya na pakikipag-ugnayan sa gumagamit.)*					
Reliablity	Maturity	The device components meet the need for reliability under regular operation. *(Ang mga bahagi ng device ay maaasahan sa normal na paggamit.)*					

	Availability	The device components are operational and accessible when required to use. *(Ang mga bahagi ng device ay gumagana at madaling ma-access kapag kailangan gamitin.)*					
	Fault Tolerance	The device component operates as intended despite hardware or software faults. *(Ang bahagi ng device ay patuloy na gumagana ayon sa dapat kahit may sira sa hardware o software.)*					
Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access. *(Tinitiyak ng device na ang data ay naa-access lang ng mga awtorisado)*					
	Integrity	The device component prevents unauthorized access to or modification of data. *(Pinipigilan ng bahagi ng device ang hindi awtorisadong pag-access o pagbabago ng data.)*					
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later. *(Maaaring mapatunayang nangyari ang mga aksyon o pangyayari ng device kaya hindi ito maikakaila sa hinaharap.)*					
	Accountability	The device actions of an entity can be traced uniquely. *(Ang mga aksyon ng isang entidad sa device ay maaaring matunton nang natatangi.)*					
	Authenticity	The device can identify the subject or resource. *(Kayang kilalanin ng device ang paksa o resource.)*					
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures. *(Kayang suriin ng device ang epekto ng inaasahang pagbabago sa isa o higit pang bahagi nito, o tukuyin ang mga kakulangan o sanhi ng pagkasira.)*					
	Modifiability	The device can be without introducing defects or degrading existing product quality *(Kayang gumana ng device nang hindi nagdadala ng sira o nagpapababa sa kasalukuyang kalidad ng produkto.)*					
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met. *(Maaaring magtakda at subukan ang device batay sa mga pamantayan para malaman kung natugunan ang mga iyon.)*					
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments. *(Kayang mag-adjust ng device sa iba't ibang klase o nagbabagong hardware, software, o iba pang operational o usage environment.)*					
	Installability	The device can be installed and uninstalled in a specified environment. *(Maaaring i-install at i-uninstall ang device sa tinukoy na kapaligiran.)*					
	Replaceability	The device can replace other products for the same purpose in the same environment *(Kayang palitan ng device ang ibang produkto para sa parehong gamit sa parehong kapaligiran.)*					
Comments/Suggestions (Komento/Mungkahi: _____							

HARDWARE EVALUATION					
Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)					
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, alagaan, at itago at hindi nakakalito.)					
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)					
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)					
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)					
Comments/Suggestions (Komento/Mungkahi: _____					

SOFTWARE	
Summary	**Average**
Functional :	
Suitability:	
Performance:	
Efficiency:	
Compatibility:	
Usability:	
Reliability:	
Security:	
Maintainability:	
Portability:	
Total Score	
Interpretation	
HARDWARE	
Totality: (Kabuuan)	
Interpretation	

Certified True Copy and Corrected By:

_____

Signature over Printed Name of the Evaluator

_____

Date:

Appendix H.2: Raw Data Evaluation Results of Weavers and Agriculturist

SOFTWARE EVALUATION							
Criteria	1	2	3	4	5	6	Mean
Functional Suitability							
Functional Completeness	4.00	3.00	3.00	5.00	5.00	4.00	4.00
Functional Correctness	4.00	4.00	4.00	3.00	5.00	5.00	4.17
Functional Appropriateness	4.00	4.00	4.00	3.00	4.00	4.00	3.83
Subtotal	4.00	3.67	3.67	3.67	4.67	4.33	4.00
Performance Efficiency							
Time Behavior	4.00	4.00	4.00	3.00	4.00	5.00	4.00
Resource Utilization	4.00	4.00	4.00	3.00	4.00	4.00	3.83
Capacity	3.00	4.00	4.00	3.00	3.00	5.00	3.67
Subtotal	3.67	4.00	4.00	3.00	3.67	4.67	3.83
Compatibility							
Co-existence	4.00	4.00	4.00	3.00	3.00	4.00	3.67
Interoperability	4.00	4.00	4.00	3.00	4.00	4.00	3.83
Subtotal	4.00	4.00	4.00	3.00	3.50	4.00	3.75
Usability							
Appropriateness Recognizability	4.00	4.00	4.00	3.00	4.00	4.00	3.83
Learnability	4.00	4.00	5.00	3.00	3.00	5.00	4.00
Operability	4.00	5.00	4.00	3.00	4.00	5.00	4.17
User Error Protection	4.00	4.00	5.00	3.00	5.00	4.00	4.17
User Interface Aesthetic Accessibility	4.00	4.00	5.00	3.00	4.00	5.00	4.17
Subtotal	4.00	4.20	4.60	3.00	4.00	4.60	4.07
Reliability							
Maturity	4.00	4.00	4.00	3.00	5.00	4.00	4.00
Availability	4.00	5.00	4.00	4.00	5.00	5.00	4.50
Fault Tolerance	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Subtotal	4.00	4.33	4.00	3.67	4.67	4.33	4.17
Security							
Confidentiality	4.00	4.00	4.00	3.00	3.00	4.00	3.67
Integrity	4.00	4.00	4.00	3.00	3.00	4.00	3.67
Non-repudiation	4.00	4.00	5.00	3.00	3.00	5.00	4.00
Accountability	4.00	4.00	4.00	3.00	3.00	4.00	3.67
Authenticity	4.00	4.00	5.00	3.00	4.00	4.00	4.00
Subtotal	4.00	4.00	4.40	3.00	3.20	4.20	3.80
Maintainability							
Analyzability	4.00	4.00	5.00	4.00	3.00	5.00	4.17
Modifiability	4.00	4.00	4.00	3.00	3.00	4.00	3.67
Testability	4.00	4.00	4.00	3.00	3.00	4.00	3.67
Subtotal	4.00	4.00	4.33	3.33	3.00	4.33	3.83
Portability							
Adaptability	4.00	5.00	5.00	3.00	3.00	5.00	4.17
Installability	4.00	4.00	4.00	3.00	3.00	5.00	3.83
Replaceability	4.00	4.00	5.00	3.00	3.00	4.00	3.83
Subtotal	4.00	4.33	4.67	3.00	3.00	4.67	3.94
SOFTWARE EVALUATION TOTAL	3.95	4.07	4.21	3.21	3.71	4.39	3.92
HARDWARE EVALUATION							
Q1	4.00	5.00	5.00	3.00	3.00	5.00	4.17
Q2	4.00	4.00	5.00	3.00	4.00	5.00	4.17
Q3	4.00	5.00	4.00	4.00	4.00	5.00	4.33
Q4	4.00	4.00	5.00	4.00	4.00	5.00	4.33
Q5	4.00	4.00	4.00	3.00	3.00	5.00	3.83
HARDWARE EVALUATION TOTAL	4.00	4.40	4.60	3.40	3.60	5.00	4.17
EVALUATION TOTAL PER EVALUATOR	3.98	4.24	4.41	3.31	3.66	4.70	4.04

Appendix H.3: Filled Out Evaluation Results of Weavers and Agriculturist

"PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA"

Name: AGNES H. NATNAT

Put a (/) if you are :

☑ Weaver ☐ Agriculturist ☐ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives. *(Nagagawa ng device lahat ng kailangan at layunin.)*			✓		
	Functional Correctness	The device provides the correct results with the needed degree of precision. *(Nagbibigay ang device ng tamang resulta na sapat ang kasiguruhan o tama ang sukat.)*		✓			
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives. *(Gumagana ang device para mapadali ang pagtapos ng mga takdang gawain at layunin.)*		✓			
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements. *(Ang dami at klase ng resources ng device ay sapat kapag ginagawa nito ang tungkulin at tinutupad ang mga kailangan.)*		✓			
	Resource Utikzation	The maximize limits of the device parameter meet the requirements. *(Ang pinakamataas na kaya ng device ay pasok sa mga kailangan o hinihingi.)*		✓			
	Capacity	The device can perform its functions efficiently while sharing a familiar. *(Kayang gawin ng device ang tungkulin nito nang mahusay habang ginagamit ito nang pamilyar o madali sa gumagamit.)*		✓			
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products. *(Kayang gawin ng device nang maayos ang tungkulin nito habang nakikibahagi sa parehong kapaligiran at resources kasama ng ibang produkto.)*		✓			
	Interoperability	The device can exchange information and use the information that has been exchanged . *(Kayang makipagpalitan ng impormasyon ang device at gamitin ang impormasyong napalitan na.)*		✓			
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs. *(Madaling nakikita ng mga gumagamit na nakakatulong ang device at kaya nitong tugunan ang kanilang pangangailangan.)*		✓			
	Leamability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction. *(Ang mga tinukoy na gumagamit ay kayang matutunan ang paggamit ng device nang epektibo, mahusay, ligtas, at may kasiyahan.)*	✓				
	Operability	The device has attributes that make it easy to operate and control. *(May mga katangian ang device na nagpapadali sa paggamit at pagkontrol nito.)*		✓			
	User Error Protection	The device protects the user against making errors. *(Pinoprotektahan ng device ang gumagamit laban sa pagkakamali.)*	✓				
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying. *(Ang interface ng device ay nagbibigay ng kaaya-aya at nakasisiya na pakikipag-ugnayan sa gumagamit.)*	✓				
Reliablity	Maturity	The device components meet the need for reliability under regular operation. *(Ang mga bahagi ng device ay maaasahan sa normal na paggamit.)*		✓			
	Availability	The device components are operational and accessible when required to use. *(Ang mga bahagi ng device ay gumagana at madaling ma-access kapag kailangan gamitin.)*		✓			
	Fault Tolerance	The device component operates as intended despite hardware or software faults. *(Ang bahagi ng device ay patuloy na gumagana ayon sa dapat kahit may sira sa hardware o software.)*		✓			

Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access. *(Tinitiyak ng device na ang data ay naa-access lang ng mga awtorisado)*		✓			
	Integrity	The device component prevents unauthorized access to or modification of data. *(Pinipigilan ng bahagi ng device ang hindi awtorisadong pag-access o pagbabago ng data.)*		✓			
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later. *(Maaaring mapatunayang nangyari ang mga aksyon o pangyayari ng device kaya hindi ito maikakaila sa hinaharap.)*	✓				
	Accountability	The device actions of an entity can be traced uniquely. *(Ang mga aksyon ng isang entidad sa device ay maaaring matunton nang natatangi.)*		✓			
	Authenticity	The device can identify the subject or resource. *(Kayang kilalanin ng device ang paksa o resource.)*	✓				
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures. *(Kayang suriin ng device ang epekto ng inaasahang pagbabago sa isa o higit pang bahagi nito, o tukuyin ang mga kakulangan o sanhi ng pagkasira.)*	✓				
	Modifiability	The device can be without introducing defects or degrading existing product quality *(Kayang gumana ng device nang hindi nagdadala ng sira o nagpapababa sa kasalukuyang kalidad ng produkto.)*		✓			
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met. *(Maaaring magtakda at subukan ang device batay sa mga pamantayan para malaman kung natugunan ang mga iyon.)*		✓			
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments. *(Kayang mag-adjust ng device sa iba't ibang klase o nagbabagong hardware, software, o iba pang operational o usage environment.)*	✓				
	Installability	The device can be installed and uninstalled in a specified environment. *(Maaaring i-install at i-uninstall ang device sa tinukoy na kapaligiran.)*		✓			
	Replaceability	The device can replace other products for the same purpose in the same environment *(Kayang palitan ng device ang ibang produkto para sa parehong gamit sa parehong kapaligiran.)*	✓				

Comments/Suggestions (Komento/Mungkahi: _____

HARDWARE EVALUATION					
Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)	✓				
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, alagaan, at itago at hindi nakakalito.)	✓				
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)	✓				
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)	✓				
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)	✓				

Comments/Suggestions (Komento/Mungkahi: _____

SOFTWARE	
Summary	**Average**
Functional :	3.67
Suitability:	
Performance:	4
Efficiency:	4
Compatibility:	4
Usability:	4.6
Reliability:	4
Security:	4.4
Maintainability:	4.3
Portability:	4.67
Total Score	37.64 Average = 4.2
Interpretation	Very Acceptable
HARDWARE	
Totality: (Kabuuan)	25 Average = 5
Interpretation	Highly Acceptable

Certified True Copy and Corrected By:

AGNES N. NATNAT

Signature over Printed Name of the Evaluator

5/1/2025

Date:

"PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA"

Name: Claudia L. Alejar

Put a (/) if you are :

☑ Weaver ☐ Agriculturist ☐ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives. *(Nagagawa ng device lahat ng kailangan at layunin.)*	/				
	Functional Correctness	The device provides the correct results with the needed degree of precision. *(Nagbibigay ang device ng tamang resulta na sapat ang kasiguruhan o tama ang sukat.)*			/		
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives. *(Gumagana ang device para mapadali ang pagtapos ng mga takdang gawain at layunin.)*			/		
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements. *(Ang dami at klase ng resources ng device ay sapat kapag ginagawa nito ang tungkulin at tinutupad ang mga kailangan.)*			/		
	Resource Utikzation	The maximize limits of the device parameter meet the requirements. *(Ang pinakamataas na kaya ng device ay pasok sa mga kailangan o hinihingi.)*			/		
	Capacity	The device can perform its functions efficiently while sharing a familiar. *(Kayang gawin ng device ang tungkulin nito nang mahusay habang ginagamit ito nang pamilyar o madali sa gumagamit.)*			/		
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products. *(Kayang gawin ng device nang maayos ang tungkulin nito habang nakikibahagi sa parehong kapaligiran at resources kasama ng ibang produkto.)*			/		
	Interoperability	The device can exchange information and use the information that has been exchanged . *(Kayang makipagpalitan ng impormasyon ang device at gamitin ang impormasyong napalitan na.)*			/		
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs. *(Madaling nakikita ng mga gumagamit na nakakatulong ang device at kaya nitong tugunan ang kanilang pangangailangan.)*			/		
	Leamability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction. *(Ang mga tinukoy na gumagamit ay kayang matutunan ang paggamit ng device nang epektibo, mahusay, ligtas, at may kasiyahan.)*			/		
	Operability	The device has attributes that make it easy to operate and control. *(May mga katangian ang device na nagpapadali sa paggamit at pagkontrol nito.)*			/		
	User Error Protection	The device protects the user against making errors. *(Pinoprotektahan ng device ang gumagamit laban sa pagkakamali.)*			/		
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying. *(Ang interface ng device ay nagbibigay ng kaaya-aya at nakasisiya na pakikipag-ugnayan sa gumagamit.)*			/		
Reliablity	Maturity	The device components meet the need for reliability under regular operation. *(Ang mga bahagi ng device ay maaasahan sa normal na paggamit.)*			/		
	Availability	The device components are operational and accessible when required to use. *(Ang mga bahagi ng device ay gumagana at madaling ma-access kapag kailangan gamitin.)*		/	w		
	Fault Tolerance	The device component operates as intended despite hardware or software faults. *(Ang bahagi ng device ay patuloy na gumagana ayon sa dapat kahit may sira sa hardware o software.)*		/	w		

			5	4	3	2	1
Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access. *(Tinitiyak ng device na ang data ay naa-access lang ng mga awtorisado)*			✓		
	Integrity	The device component prevents unauthorized access to or modification of data. *(Pinipigilan ng bahagi ng device ang hindi awtorisadong pag-access o pagbabago ng data.)*			✓		
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later. *(Maaaring mapatunayang nangyari ang mga aksyon o pangyayari ng device kaya hindi ito maikakaila sa hinaharap.)*			✓		
	Accountability	The device actions of an entity can be traced uniquely. *(Ang mga aksyon ng isang entidad sa device ay maaaring matunton nang natatangi.)*			✓		
	Authenticity	The device can identify the subject or resource. *(Kayang kilalanin ng device ang paksa o resource.)*			✓		
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures. *(Kayang suriin ng device ang epekto ng inaasahang pagbabago sa isa o higit pang bahagi nito, o tukuyin ang mga kakulangan o sanhi ng pagkasira.)*		✓			
	Modifiability	The device can be without introducing defects or degrading existing product quality *(Kayang gumana ng device nang hindi nagdadala ng sira o nagpapababa sa kasalukuyang kalidad ng produkto.)*			✓		
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met. *(Maaaring magtakda at subukan ang device batay sa mga pamantayan para malaman kung natugunan ang mga iyon.)*			✓		
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments. *(Kayang mag-adjust ng device sa iba't ibang klase o nagbabagong hardware, software, o iba pang operational o usage environment.)*			✓		
	Installability	The device can be installed and uninstalled in a specified environment. *(Maaaring i-install at i-uninstall ang device sa tinukoy na kapaligiran.)*			✓		
	Replaceability	The device can replace other products for the same purpose in the same environment *(Kayang palitan ng device ang ibang produkto para sa parehong gamit sa parehong kapaligiran.)*			✓		

Comments/Suggestions (Komento/Mungkahi): ____

HARDWARE EVALUATION

Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)			✓		
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, alagaan, at itago at hindi nakakalito.)		✓			
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)		✓			
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)		✓			
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)			✓		

Comments/Suggestions (Komento/Mungkahi): [illegible]

SOFTWARE	
Summary	**Average**
Functional :	
Suitability:	
Performance:	
Efficiency:	
Compatibility:	
Usability:	
Reliability:	
Security:	
Maintainability:	
Portability:	
Total Score	
Interpretation	
HARDWARE	
Totality: (Kabuuan)	
Interpretation	

Certified True Copy and Corrected By:

Elodia A. Alejal

Signature over Printed Name of the Evaluator

05/12/2025

Date:

"PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA"

Name: JOSEPHINE D. SALAYONG

Put a (/) if you are :

☑ Weaver ☐ Agriculturist ☐ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives. *(Nagagawa ng device lahat ng kailangan at layunin.)*	/				
	Functional Correctness	The device provides the correct results with the needed degree of precision. *(Nagbibigay ang device ng tamang resulta na sapat ang kasiguruhan o tama ang sukat.)*	/				
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives. *(Gumagana ang device para mapadali ang pagtapos ng mga takdang gawain at layunin.)*		//			
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements. *(Ang dami at klase ng resources ng device ay sapat kapag ginagawa nito ang tungkulin at tinutupad ang mga kailangan.)*		/			
	Resource Utikzation	The maximize limits of the device parameter meet the requirements. *(Ang pinakamataas na kaya ng device ay pasok sa mga kailangan o hinihingi.)*		/			
	Capacity	The device can perform its functions efficiently while sharing a familiar. *(Kayang gawin ng device ang tungkulin nito nang mahusay habang ginagamit ito nang pamilyar o madali sa gumagamit.)*			/		
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products. *(Kayang gawin ng device nang maayos ang tungkulin nito habang nakikibahagi sa parehong kapaligiran at resources kasama ng ibang produkto.)*			/		
	Interoperability	The device can exchange information and use the information that has been exchanged . *(Kayang makipagpalitan ng impormasyon ang device at gamitin ang impormasyong napalitan na.)*		/			
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs. *(Madaling nakikita ng mga gumagamit na nakakatulong ang device at kaya nitong tugunan ang kanilang pangangailangan.)*		/			
	Leamability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction. *(Ang mga tinukoy na gumagamit ay kayang matutunan ang paggamit ng device nang epektibo, mahusay, ligtas, at may kasiyahan.)*			/		
	Operability	The device has attributes that make it easy to operate and control. *(May mga katangian ang device na nagpapadali sa paggamit at pagkontrol nito.)*		/			
	User Error Protection	The device protects the user against making errors. *(Pinoprotektahan ng device ang gumagamit laban sa pagkakamali.)*	/				
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying. *(Ang interface ng device ay nagbibigay ng kaaya-aya at nakasisiya na pakikipag-ugnayan sa gumagamit.)*		/			
Reliablity	Maturity	The device components meet the need for reliability under regular operation. *(Ang mga bahagi ng device ay maaasahan sa normal na paggamit.)*	/				
	Availability	The device components are operational and accessible when required to use. *(Ang mga bahagi ng device ay gumagana at madaling ma-access kapag kailangan gamitin.)*	/				
	Fault Tolerance	The device component operates as intended despite hardware or software faults. *(Ang bahagi ng device ay patuloy na gumagana ayon sa dapat kahit may sira sa hardware o software.)*		/			

Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access. *(Tinitiyak ng device na ang data ay naa-access lang ng mga awtorisado)*			✓		
	Integrity	The device component prevents unauthorized access to or modification of data. *(Pinipigilan ng bahagi ng device ang hindi awtorisadong pag-access o pagbabago ng data.)*			✓		
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later. *(Maaaring mapatunayang nangyari ang mga aksyon o pangyayari ng device kaya hindi ito maikakaila sa hinaharap.)*			✓		
	Accountability	The device actions of an entity can be traced uniquely. *(Ang mga aksyon ng isang entidad sa device ay maaaring matunton nang natatangi.)*			✓		
	Authenticity	The device can identify the subject or resource. *(Kayang kilalanin ng device ang paksa o resource.)*					
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures. *(Kayang suriin ng device ang epekto ng inaasahang pagbabago sa isa o higit pang bahagi nito, o tukuyin ang mga kakulangan o sanhi ng pagkasira.)*			✓		
	Modifiability	The device can be without introducing defects or degrading existing product quality *(Kayang gumana ng device nang hindi nagdadala ng sira o nagpapababa sa kasalukuyang kalidad ng produkto.)*			✓		
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met. *(Maaaring magtakda at subukan ang device batay sa mga pamantayan para malaman kung natugunan ang mga iyon.)*			✓		
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments. *(Kayang mag-adjust ng device sa iba't ibang klase o nagbabagong hardware, software, o iba pang operational o usage environment.)*			✓		
	Installability	The device can be installed and uninstalled in a specified environment. *(Maaaring i-install at i-uninstall ang device sa tinukoy na kapaligiran.)*			✓		
	Replaceability	The device can replace other products for the same purpose in the same environment *(Kayang palitan ng device ang ibang produkto para sa parehong gamit sa parehong kapaligiran.)*			✓		

Comments/Suggestions (Komento/Mungkahi: kulang ng kadena sa kabilang side para di tumagilid pagroroll ng gin. kailangan ng [illegible] bintana para doon makita kung ~~[illegible]~~ ok na ang nasa loob.

HARDWARE EVALUATION					
Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)			✓		
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, alagaan, at itago at hindi nakakalito.)			✓		
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)		✓			
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)		✓			
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)			✓		

Comments/Suggestions (Komento/Mungkahi: Kailangan pagkatapos patuyuin palamigin ng [illegible] sala [illegible] para di sayang ang [illegible] sa natural ng device mas maganda sa natural ng pressing method (ilohan)

SOFTWARE	
Summary	**Average**
Functional :	4.67
Suitability:	
Performance:	3.67
Efficiency:	3.67
Compatibility:	3.5
Usability:	4
Reliability:	4.67
Security:	3
Maintainability:	3
Portability:	3
Total Score	53.18 Average = 3.69
Interpretation	Very Acceptable

HARDWARE	
Totality: (Kabuuan)	16 Average = 3.2
Interpretation	Acceptable

Certified True Copy and Corrected By:

Josephine D Sabayong

Signature over Printed Name of the Evaluator

May 2, 2025

Date:

"PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA"

Name: Gemma N. Salvan
Put a (/) if you are :

☑ Weaver ☐ Agriculturist ☐ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.
5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives. *(Nagagawa ng device lahat ng kailangan at layunin.)*			✓		
	Functional Correctness	The device provides the correct results with the needed degree of precision. *(Nagbibigay ang device ng tamang resulta na sapat ang kasiguruhan o tama ang sukat.)*		✓			
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives. *(Gumagana ang device para mapadali ang pagtapos ng mga takdang gawain at layunin.)*		✓			
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements. *(Ang dami at klase ng resources ng device ay sapat kapag ginagawa nito ang tungkulin at tinutupad ang mga kailangan.)*		✓			
	Resource Utikzation	The maximize limits of the device parameter meet the requirements. *(Ang pinakamataas na kaya ng device ay pasok sa mga kailangan o hinihingi.)*		✓			
	Capacity	The device can perform its functions efficiently while sharing a familiar. *(Kayang gawin ng device ang tungkulin nito nang mahusay habang ginagamit ito nang pamilyar o madali sa gumagamit.)*		✓			
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products. *(Kayang gawin ng device nang maayos ang tungkulin nito habang nakikibahagi sa parehong kapaligiran at resources kasama ng ibang produkto.)*		✓			
	Interoperability	The device can exchange information and use the information that has been exchanged . *(Kayang makipagpalitan ng impormasyon ang device at gamitin ang impormasyong napalitan na.)*		✓			
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs. *(Madaling nakikita ng mga gumagamit na nakakatulong ang device at kaya nitong tugunan ang kanilang pangangailangan.)*		✓			
	Leamability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction. *(Ang mga tinukoy na gumagamit ay kayang matutunan ang paggamit ng device nang epektibo, mahusay, ligtas, at may kasiyahan.)*		✓			
	Operability	The device has attributes that make it easy to operate and control. *(May mga katangian ang device na nagpapadali sa paggamit at pagkontrol nito.)*	✓				
	User Error Protection	The device protects the user against making errors. *(Pinoprotektahan ng device ang gumagamit laban sa pagkakamali.)*		✓			
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying. *(Ang interface ng device ay nagbibigay ng kaaya-aya at nakasisiya na pakikipag-ugnayan sa gumagamit.)*		✓			
Reliablity	Maturity	The device components meet the need for reliability under regular operation. *(Ang mga bahagi ng device ay maaasahan sa normal na paggamit.)*		✓			
	Availability	The device components are operational and accessible when required to use. *(Ang mga bahagi ng device ay gumagana at madaling ma-access kapag kailangan gamitin.)*	✓				
	Fault Tolerance	The device component operates as intended despite hardware or software faults. *(Ang bahagi ng device ay patuloy na gumagana ayon sa dapat kahit may sira sa hardware o software.)*		✓			

Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access. *(Tinitiyak ng device na ang data ay naa-access lang ng mga awtorisado)*		✓			
	Integrity	The device component prevents unauthorized access to or modification of data. *(Pinipigilan ng bahagi ng device ang hindi awtorisadong pag-access o pagbabago ng data.)*		✓			
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later. *(Maaaring mapatunayang nangyari ang mga aksyon o pangyayari ng device kaya hindi ito maikakaila sa hinaharap.)*		✓			
	Accountability	The device actions of an entity can be traced uniquely. *(Ang mga aksyon ng isang entidad sa device ay maaaring matunton nang natatangi.)*		✓			
	Authenticity	The device can identify the subject or resource. *(Kayang kilalanin ng device ang paksa o resource.)*		✓			
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures. *(Kayang suriin ng device ang epekto ng inaasahang pagbabago sa isa o higit pang bahagi nito, o tukuyin ang mga kakulangan o sanhi ng pagkasira.)*		✓			
	Modifiability	The device can be without introducing defects or degrading existing product quality *(Kayang gumana ng device nang hindi nagdadala ng sira o nagpapababa sa kasalukuyang kalidad ng produkto.)*		✓			
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met. *(Maaaring magtakda at subukan ang device batay sa mga pamantayan para malaman kung natugunan ang mga iyon.)*		✓			
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments. *(Kayang mag-adjust ng device sa iba't ibang klase o nagbabagong hardware, software, o iba pang operational o usage environment.)*	✓				
	Installability	The device can be installed and uninstalled in a specified environment. *(Maaaring i-install at i-uninstall ang device sa tinukoy na kapaligiran.)*		✓			
	Replaceability	The device can replace other products for the same purpose in the same environment *(Kayang palitan ng device ang ibang produkto para sa parehong gamit sa parehong kapaligiran.)*		✓			

Comments/Suggestions (Komento/Mungkahi: _____

HARDWARE EVALUATION Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)	✓				
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, alagaan, at itago at hindi nakakalito.)	✓				
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)		✓			
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)	✓				
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)		✓			

Comments/Suggestions (Komento/Mungkahi: _____

SOFTWARE	
Summary	**Average**
Functional :	(4) 3.67
Suitability:	(4)
Performance:	(4) 4
Efficiency:	(4) 4
Compatibility:	4
Usability:	4 4.2
Reliability:	4.3
Security:	4
Maintainability:	4
Portability:	4.3
Total Score	36.47 Average = 4.05
Interpretation	Very Acceptable
HARDWARE	
Totality: (Kabuuan)	83 Average = 4.6
Interpretation	Highly Acceptable

Certified True Copy and Corrected By:

G. Salvan
Gemma N. Salvan
Signature over Printed Name of the Evaluator

5-1-25
Date:

"PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA"

Name: Mayline V. Lorico
Put a (/) if you are :

☑ Weaver ☐ Agriculturist ☐ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.
5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives. *(Nagagawa ng device lahat ng kailangan at layunin.)*		/			
	Functional Correctness	The device provides the correct results with the needed degree of precision. *(Nagbibigay ang device ng tamang resulta na sapat ang kasiguruhan o tama ang sukat.)*	/				
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives. *(Gumagana ang device para mapadali ang pagtapos ng mga takdang gawain at layunin.)*		/			
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements. *(Ang dami at klase ng resources ng device ay sapat kapag ginagawa nito ang tungkulin at tinutupad ang mga kailangan.)*	/				
	Resource Utikzation	The maximize limits of the device parameter meet the requirements. *(Ang pinakamataas na kaya ng device ay pasok sa mga kailangan o hinihingi.)*		/			
	Capacity	The device can perform its functions efficiently while sharing a familiar. *(Kayang gawin ng device ang tungkulin nito nang mahusay habang ginagamit ito nang pamilyar o madali sa gumagamit.)*	/				
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products. *(Kayang gawin ng device nang maayos ang tungkulin nito habang nakikibahagi sa parehong kapaligiran at resources kasama ng ibang produkto.)*		/			
	Interoperability	The device can exchange information and use the information that has been exchanged . *(Kayang makipagpalitan ng impormasyon ang device at gamitin ang impormasyong napalitan na.)*		/			
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs. *(Madaling nakikita ng mga gumagamit na nakakatulong ang device at kaya nitong tugunan ang kanilang pangangailangan.)*		/			
	Leamability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction. *(Ang mga tinukoy na gumagamit ay kayang matutunan ang paggamit ng device nang epektibo, mahusay, ligtas, at may kasiyahan.)*	/				
	Operability	The device has attributes that make it easy to operate and control. *(May mga katangian ang device na nagpapadali sa paggamit at pagkontrol nito.)*	/				
	User Error Protection	The device protects the user against making errors. *(Pinoprotektahan ng device ang gumagamit laban sa pagkakamali.)*		/			
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying. *(Ang interface ng device ay nagbibigay ng kaaya-aya at nakasisiya na pakikipag-ugnayan sa gumagamit.)*	/				
Reliablity	Maturity	The device components meet the need for reliability under regular operation. *(Ang mga bahagi ng device ay maaasahan sa normal na paggamit.)*		/			
	Availability	The device components are operational and accessible when required to use. *(Ang mga bahagi ng device ay gumagana at madaling ma-access kapag kailangan gamitin.)*	/				
	Fault Tolerance	The device component operates as intended despite hardware or software faults. *(Ang bahagi ng device ay patuloy na gumagana ayon sa dapat kahit may sira sa hardware o software.)*		/			

Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access. *(Tinitiyak ng device na ang data ay naa-access lang ng mga awtorisado)*		/			
	Integrity	The device component prevents unauthorized access to or modification of data. *(Pinipigilan ng bahagi ng device ang hindi awtorisadong pag-access o pagbabago ng data.)*		/			
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later. *(Maaaring mapatunayang nangyari ang mga aksyon o pangyayari ng device kaya hindi ito maikakaila sa hinaharap.)*	/				
	Accountability	The device actions of an entity can be traced uniquely. *(Ang mga aksyon ng isang entidad sa device ay maaaring matunton nang natatangi.)*		/			
	Authenticity	The device can identify the subject or resource. *(Kayang kilalanin ng device ang paksa o resource.)*		/			
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures. *(Kayang suriin ng device ang epekto ng inaasahang pagbabago sa isa o higit pang bahagi nito, o tukuyin ang mga kakulangan o sanhi ng pagkasira.)*	/				
	Modifiability	The device can be without introducing defects or degrading existing product quality *(Kayang gumana ng device nang hindi nagdadala ng sira o nagpapababa sa kasalukuyang kalidad ng produkto.)*		/			
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met. *(Maaaring magtakda at subukan ang device batay sa mga pamantayan para malaman kung natugunan ang mga iyon.)*		/			
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments. *(Kayang mag-adjust ng device sa iba't ibang klase o nagbabagong hardware, software, o iba pang operational o usage environment.)*	/				
	Installability	The device can be installed and uninstalled in a specified environment. *(Maaaring i-install at i-uninstall ang device sa tinukoy na kapaligiran.)*	/				
	Replaceability	The device can replace other products for the same purpose in the same environment *(Kayang palitan ng device ang ibang produkto para sa parehong gamit sa parehong kapaligiran.)*		/			

Comments/Suggestions (Komento/Mungkahi): _____

HARDWARE EVALUATION					
Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)	/				
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, alagaan, at itago at hindi nakakalito.)		/			
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)	/				
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)		/			
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)		/			

Comments/Suggestions (Komento/Mungkahi): Kailangan siguro na magkabila ang kapeng at (ang) makikita kung okey na ba ang thyn nya at dagdag pa sa oras may silipan para mai nasan yoong open and close

SOFTWARE	
Summary	**Average**
Functional :	4.33
Suitability:	4
Performance:	4.67
Efficiency:	4.67
Compatibility:	4
Usability:	4.6
Reliability:	4.33
Security:	4.2
Maintainability:	4.3
Portability:	4.67
Total Score	39.8 Average = 4.42
Interpretation	Very Acceptable
HARDWARE	
Totality: (Kabuuan)	22 Average = 4.4
Interpretation	Very Acceptable

Certified True Copy and Corrected By:

_____

Signature over Printed Name of the Evaluator

_____

Date:

"PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA"

Name: Christine Mae Noguel
Put a (/) if you are :

☐ Weaver ☑ Agriculturist ☐ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.
5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives. *(Nagagawa ng device lahat ng kailangan at layunin.)*		/			
	Functional Correctness	The device provides the correct results with the needed degree of precision. *(Nagbibigay ang device ng tamang resulta na sapat ang kasiguruhan o tama ang sukat.)*		/			
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives. *(Gumagana ang device para mapadali ang pagtapos ng mga takdang gawain at layunin.)*		/			
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements. *(Ang dami at klase ng resources ng device ay sapat kapag ginagawa nito ang tungkulin at tinutupad ang mga kailangan.)*		/			
	Resource Utikzation	The maximize limits of the device parameter meet the requirements. *(Ang pinakamataas na kaya ng device ay pasok sa mga kailangan o hinihingi.)*		/			
	Capacity	The device can perform its functions efficiently while sharing a familiar. *(Kayang gawin ng device ang tungkulin nito nang mahusay habang ginagamit ito nang pamilyar o madali sa gumagamit.)*		/			
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products. *(Kayang gawin ng device nang maayos ang tungkulin nito habang nakikibahagi sa parehong kapaligiran at resources kasama ng ibang produkto.)*		/			
	Interoperability	The device can exchange information and use the information that has been exchanged . *(Kayang makipagpalitan ng impormasyon ang device at gamitin ang impormasyong napalitan na.)*		/			
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs. *(Madaling nakikita ng mga gumagamit na nakakatulong ang device at kaya nitong tugunan ang kanilang pangangailangan.)*		/			
	Leamability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction. *(Ang mga tinukoy na gumagamit ay kayang matutunan ang paggamit ng device nang epektibo, mahusay, ligtas, at may kasiyahan.)*		/			
	Operability	The device has attributes that make it easy to operate and control. *(May mga katangian ang device na nagpapadali sa paggamit at pagkontrol nito.)*		/			
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	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying. *(Ang interface ng device ay nagbibigay ng kaaya-aya at nakasisiya na pakikipag-ugnayan sa gumagamit.)*		/			
Reliablity	Maturity	The device components meet the need for reliability under regular operation. *(Ang mga bahagi ng device ay maaasahan sa normal na paggamit.)*		/			
	Availability	The device components are operational and accessible when required to use. *(Ang mga bahagi ng device ay gumagana at madaling ma-access kapag kailangan gamitin.)*		/			
	Fault Tolerance	The device component operates as intended despite hardware or software faults. *(Ang bahagi ng device ay patuloy na gumagana ayon sa dapat kahit may sira sa hardware o software.)*		/			

Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access. *(Tinitiyak ng device na ang data ay naa-access lang ng mga awtorisado)*		✓			
	Integrity	The device component prevents unauthorized access to or modification of data. *(Pinipigilan ng bahagi ng device ang hindi awtorisadong pag-access o pagbabago ng data.)*		✓			
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later. *(Maaaring mapatunayang nangyari ang mga aksyon o pangyayari ng device kaya hindi ito maikakaila sa hinaharap.)*		✓			
	Accountability	The device actions of an entity can be traced uniquely. *(Ang mga aksyon ng isang entidad sa device ay maaaring matunton nang natatangi.)*		✓			
	Authenticity	The device can identify the subject or resource. *(Kayang kilalanin ng device ang paksa o resource.)*		✓			
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures. *(Kayang suriin ng device ang epekto ng inaasahang pagbabago sa isa o higit pang bahagi nito, o tukuyin ang mga kakulangan o sanhi ng pagkasira.)*		✓			
	Modifiability	The device can be without introducing defects or degrading existing product quality *(Kayang gumana ng device nang hindi nagdadala ng sira o nagpapababa sa kasalukuyang kalidad ng produkto.)*		✓			
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met. *(Maaaring magtakda at subukan ang device batay sa mga pamantayan para malaman kung natugunan ang mga iyon.)*		✓			
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments. *(Kayang mag-adjust ng device sa iba't ibang klase o nagbabagong hardware, software, o iba pang operational o usage environment.)*		✓			
	Installability	The device can be installed and uninstalled in a specified environment. *(Maaaring i-install at i-uninstall ang device sa tinukoy na kapaligiran.)*		✓			
	Replaceability	The device can replace other products for the same purpose in the same environment *(Kayang palitan ng device ang ibang produkto para sa parehong gamit sa parehong kapaligiran.)*		✓			

Comments/Suggestions (Komento/Mungkahi: _____

HARDWARE EVALUATION Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)		✓			
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, alagaan, at itago at hindi nakakalito.)		✓			
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)		✓			
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)		✓			
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)		✓			

Comments/Suggestions (Komento/Mungkahi: _____

SOFTWARE	
Summary	**Average**
Functional :	4
Suitability:	
Performance:	3.67
Efficiency:	3.67
Compatibility:	4
Usability:	4
Reliability:	4
Security:	4
Maintainability:	4
Portability:	4
Total Score	35.34 Average = 3.93
Interpretation	Very Acceptable
HARDWARE	
Totality: (Kabuuan)	20 Average = 4
Interpretation	Very Acceptable

Certified True Copy and Corrected By:

Christine Mae Pagnel

Signature over Printed Name of the Evaluator

05/02/2025

Date:

Appendix H.4: Raw Data Evaluation Results of CpE Practitioners

SOFTWARE EVALUATION						
Criteria	1	2	3	4	5	Mean
Functional Suitability						
Functional Completeness	5.00	5.00	5.00	4.00	5.00	4.80
Functional Correctness	5.00	4.00	4.00	4.00	5.00	4.40
Functional Appropriateness	5.00	5.00	4.00	5.00	5.00	4.80
Subtotal	5.00	4.67	4.33	4.33	5.00	**4.67**
Performance Efficiency						
Time Behavior	5.00	5.00	4.00	4.00	5.00	4.60
Resource Utilization	5.00	5.00	4.00	5.00	5.00	4.80
Capacity	4.00	5.00	4.00	5.00	5.00	4.60
Subtotal	4.67	5.00	4.00	4.67	5.00	**4.67**
Compatibility						
Co-existence	4.00	5.00	5.00	4.00	5.00	4.60
Interoperability	5.00	5.00	4.00	5.00	4.00	4.60
Subtotal	4.50	5.00	4.50	4.50	4.50	**4.60**
Usability						
Appropriateness Recognizability	5.00	5.00	5.00	5.00	5.00	5.00
Learnability	4.00	5.00	4.00	5.00	5.00	4.60
Operability	5.00	5.00	4.00	4.00	5.00	4.60
User Error Protection	5.00	4.00	4.00	4.00	5.00	4.40
User Interface Aesthetic Accessibility	5.00	5.00	4.00	5.00	5.00	4.80
Subtotal	4.80	4.80	4.20	4.60	5.00	**4.68**
Reliability						
Maturity	5.00	5.00	4.00	5.00	5.00	4.80
Availability	5.00	5.00	5.00	5.00	5.00	5.00
Fault Tolerance	4.00	4.00	4.00	5.00	5.00	4.40
Subtotal	4.67	4.67	4.33	5.00	5.00	**4.73**
Security						
Confidentiality	5.00	4.00	4.00	5.00	5.00	4.60
Integrity	5.00	4.00	4.00	4.00	5.00	4.40
Non-repudiation	5.00	5.00	4.00	5.00	5.00	4.80
Accountability	5.00	5.00	5.00	5.00	5.00	5.00
Authenticity	5.00	5.00	4.00	4.00	5.00	4.60
Subtotal	5.00	4.06	4.20	4.60	5.00	**4.68**
Maintainability						
Analyzability	5.00	5.00	4.00	5.00	5.00	4.80
Modifiability	5.00	4.00	5.00	4.00	5.00	4.60
Testability	5.00	5.00	5.00	5.00	5.00	5.00
Subtotal	5.00	4.67	4.67	4.67	5.00	**4.80**
Portability						
Adaptability	5.00	5.00	4.00	5.00	5.00	4.80
Installability	5.00	5.00	4.00	4.00	5.00	4.60
Replaceability	5.00	5.00	4.00	4.00	5.00	4.60
Subtotal	5.00	5.00	4.00	4.33	5.00	**4.67**
SOFTWARE EVALUATION TOTAL	4.83	4.80	4.27	4.58	4.94	**4.68**
HARDWARE EVALUATION						
Q1	5.00	5.00	4.00	4.00	5.00	4.60
Q2	4.00	4.00	4.00	4.00	5.00	4.20
Q3	5.00	5.00	5.00	4.00	5.00	4.80
Q4	5.00	5.00	5.00	4.00	5.00	4.80
Q5	5.00	5.00	5.00	4.00	5.00	4.80
HARDWARE EVALUATION TOTAL	4.80	4.80	4.60	4.00	5.00	**4.64**
EVALUATION TOTAL PER EVALUATOR	4.82	4.80	4.44	4.29	4.97	**4.66**
OVERALL EVALUATION SCORE						**4.66**

Appendix H.5: Filled Out Evaluation Results of CpE Practitioners

PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

Name: CLARENCE G. DURIAN
Put a (/) if you are :

☐ ~~Student~~ Weaver ☐ Agriculturist ☑ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives	✓				
	Functional Correctness	The device provides the correct results with the needed degree of precision.		✓			
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives.	✓				
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements.	✓				
	Resource Utikzation	The maximize limits of the device parameter meet the requirements.	✓				
	Capacity	The device can perform its functions efficiently while sharing a familiar.	✓				
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products.	✓				
	Interoperability	The device can exchange information and use the information that has been exchanged .	✓				
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs.	✓				
	Learnability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction.	✓				
	Operability	The device has attributes that make it easy to operate and control .	✓				
	User Error Protection	The device protects the user against making errors.		✓			
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying.	✓				
Reliablity	Maturity	The device components meet the need for reliability under regular operation.	✓				
	Availability	The device components are operational and accessible when required to use.	✓				
	Fault Tolerance	The device component operates as intended despite hardware or software faults.		✓			
	Availability	The device components are operational and accessible when required to use .	✓				
Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access.		✓			
	Integrity	The device component prevents unauthorized access to or modification of data.		✓			
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later.	✓				
	Accountability	The device actions of an entity can be traced uniquely.	✓				
	Authenticity	The device can identify the subject or resource.	✓				
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures.	✓				
	Modifiability	The device can be without introducing defects or degrading existing product quality		✓			
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met.	✓				
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments.	✓				
	Installability	The device can be installed and uninstalled in a specified environment.	✓				
	Replaceability	The device can replace other products for the same purpose in the same environment	✓				

Comments/Suggestions (Komento/Mungkahil Suggestion - Maglagay ng emergency stop para sa Temperature at presser , Maglagay ng sticker para na mainit ang face ng device
Comments - Maganda at matibay ang device , mga

HARDWARE EVALUATION Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)	✓				
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, afagaan, at itago at hindi nakakalito.)		✓			
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)	✓				
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)	✓				
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)	✓				

Comments/Suggestions (Komento/Mungkahil Comments - Maganda, matibay at secure ang device maganda ang mga ginamit na materyales.

SOFTWARE	
Summary	**Average**
Functional :	4.67
Suitability:	5
Performance:	5
Efficiency:	5
Compatibility:	5
Usability:	4.8
Reliability:	4.75
Security:	4.6
Maintainability:	4.67
Portability:	5
Total Score	43.49 Ave. = 4.83
Interpretation	Highly Acceptable
HARDWARE	
Totality: (Kabuuan)	24 Ave. = 4.8
Interpretation	Highly Acceptable

Certified True Copy and Corrected By:

CLARENCE G. DUPIAN

Signature over Printed Name of the Evaluator

April 27, 2025

Date:

PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

Name: EXCONDE, CHRISTIAN GIL

Put a (/) if you are :

☐ Student ☐ Agriculturist ☑ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives	/				
	Functional Correctness	The device provides the correct results with the needed degree of precision.	/				
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives.	/				
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements.	/				
	Resource Utikzation	The maximize limits of the device parameter meet the requirements.	/				
	Capacity	The device can perform its functions efficiently while sharing a familiar.	/				
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products.	/				
	Interoperability	The device can exchange information and use the information that has been exchanged .		/			
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs.	/				
	Leamability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction.	/				
	Operability	The device has attributes that make it easy to operate and control .	/				
	User Error Protection	The device protects the user against making errors.	/				
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying.	/				
Reliablity	Maturity	The device components meet the need for reliability under regular operation.	/				
	Availability	The device components are operational and accessible when required to use.	/				
	Fault Tolerance	The device component operates as intended despite hardware or software faults.	/				
	Availability	The device components are operational and accessible when required to use .	/				
Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access.	/				
	Integrity	The device component prevents unauthorized access to or modification of data.	/				
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later.	/				
	Accountability	The device actions of an entity can be traced uniquely.	/				
	Authenticity	The device can identify the subject or resource.	/				
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures.	/				
	Modifiability	The device can be without introducing defects or degrading existing product quality	/				
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met.	/				
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments.	/				
	Installability	The device can be installed and uninstalled in a specified environment.	/				
	Replaceability	The device can replace other products for the same purpose in the same environment	/				

Comments/Suggestions (Komento/Mungkahil _____

HARDWARE EVALUATION Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)	/				
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, afagaan, at itago at hindi nakakalito.)		/			
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)	/				
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)	/				
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)	/				

Comments/Suggestions (Komento/Mungkahil Display User's manual, add stop button incase of emergency yung hindi na rekta switch ang papatayin. make room for the user kung gusto nila makita yung process, you can use borosilicate glass kahit isang side lang

SOFTWARE	
Summary	**Average**
Functional :	5
Suitability:	
Performance:	5
Efficiency:	5
Compatibility:	4.5
Usability:	5
Reliability:	5
Security:	5
Maintainability:	5
Portability:	5
Total Score	94.5 Average = 4.94
Interpretation	Highly Acceptable
HARDWARE	
Totality: (Kabuuan)	24 Average = 4.8
Interpretation	Highly Acceptable

Certified True Copy and Corrected By:

EXCONDE, CHRISTIAM GIL C

Signature over Printed Name of the Evaluator

April 27, 2025

Date:

PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

Name: Engr. Jannah Yvette Villaruz

Put a (/) if you are :

☐ Student ☐ Agriculturist ☑ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives		/			
	Functional Correctness	The device provides the correct results with the needed degree of precision.		/			
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives.	/				
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements.		/			
	Resource Utikzation	The maximize limits of the device parameter meet the requirements.	/				
	Capacity	The device can perform its functions efficiently while sharing a familiar.	/				
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products.		/			
	Interoperability	The device can exchange information and use the information that has been exchanged .	/				
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs.	/				
	Learnability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction.	/				
	Operability	The device has attributes that make it easy to operate and control .		/			
	User Error Protection	The device protects the user against making errors.		/			
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying.	/				
Reliablity	Maturity	The device components meet the need for reliability under regular operation.	/				
	Availability	The device components are operational and accessible when required to use.	/				
	Fault Tolerance	The device component operates as intended despite hardware or software faults.	/				
	Availability	The device components are operational and accessible when required to use .		/			
Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access.	/				
	Integrity	The device component prevents unauthorized access to or modification of data.		/			
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later.	/				
	Accountability	The device actions of an entity can be traced uniquely.	/				
	Authenticity	The device can identify the subject or resource.		/			
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures.	/				
	Modifiability	The device can be without introducing defects or degrading existing product quality		/			
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met.	/				
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments.	/				
	Installability	The device can be installed and uninstalled in a specified environment.		/			
	Replaceability	The device can replace other products for the same purpose in the same environment		/			

Comments/Suggestions (Komento/Mungkahil _____

HARDWARE EVALUATION					
Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)		/			
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, afagaan, at itago at hindi nakakalito.)		/			
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)	/				
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)	/				
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)	/				

Comments/Suggestions (Komento/Mungkahil wiring cover and the belt

SOFTWARE	
Summary	**Average**
Functional :	4.3
Suitability:	
Performance:	4.67
Efficiency:	4.67
Compatibility:	4.5
Usability:	4.6
Reliability:	4.75
Security:	4.6
Maintainability:	4.67
Portability:	4.3
Total Score	41.06 Average = 4.56
Interpretation	Very Acceptable
HARDWARE	
Totality: (Kabuuan)	23 Average = 4.6
Interpretation	Very Acceptable

Certified True Copy and Corrected By:

Jannah Villarus
Signature over Printed Name of the Evaluator

04/26/25
Date:

PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

Name: Karla Rivaranta

Put a (/) if you are :

☐ Student ☐ Agriculturist ☑ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives	/				
	Functional Correctness	The device provides the correct results with the needed degree of precision.		/			
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives.		/			
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements.		/			
	Resource Utilization	The maximize limits of the device parameter meet the requirements.		/			
	Capacity	The device can perform its functions efficiently while sharing a familiar.		/			
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products.	/				
	Interoperability	The device can exchange information and use the information that has been exchanged .		/			
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs.	/				
	Learnability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction.		/			
	Operability	The device has attributes that make it easy to operate and control .		/			
	User Error Protection	The device protects the user against making errors.		/			
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying.		/			
Reliability	Maturity	The device components meet the need for reliability under regular operation.		/			
	Availability	The device components are operational and accessible when required to use.	/				
	Fault Tolerance	The device component operates as intended despite hardware or software faults.		/			
	Availability	The device components are operational and accessible when required to use .	/				
Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access.		/			
	Integrity	The device component prevents unauthorized access to or modification of data.		/			
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later.		/			
	Accountability	The device actions of an entity can be traced uniquely.	/				
	Authenticity	The device can identify the subject or resource.		/			
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures.		/			
	Modifiability	The device can be without introducing defects or degrading existing product quality	/				
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met.	/				
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments.		/			
	Installability	The device can be installed and uninstalled in a specified environment.		/			
	Replaceability	The device can replace other products for the same purpose in the same environment		/			

Comments/Suggestions (Komento/Mungkahil _____

HARDWARE EVALUATION					
Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)		/			
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, afagaan, at itago at hindi nakakalito.)		/			
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)		/			
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)		/			
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)		/			

Comments/Suggestions (Komento/Mungkahil Hard to check safety measurements for the user/s.

SOFTWARE	
Summary	**Average**
Functional :	4.3
Suitability:	
Performance:	4
Efficiency:	4
Compatibility:	4.5
Usability:	4.2
Reliability:	4.5
Security:	4.2
Maintainability:	4.47
Portability:	4
Total Score	98.37 Ave.= 4.34
Interpretation	Very Acceptable
HARDWARE	
Totality: (Kabuuan)	20 Ave.= 4
Interpretation	Very Acceptable

Certified True Copy and Corrected By:

KARLA ANGELA S. PETRASANTA
Signature over Printed Name of the Evaluator

April 26, 2025
Date:

PANDAIKU: AN ARDUINO-BASED DRYING AND PRESSING DEVICE FOR PANDAN LEAVES TO SUPPORT LUISIANA WEAVERS ORGANIZATION IN BARANGAY ZONE VI, LUISIANA, LAGUNA

Name: RAMWELL SAHAGUN

Put a (/) if you are :

☐ Student ☐ Agriculturist ☐ Computer Engineering Practitioner

Instructions: Put a (v) under the corresponding statistical ratings.

5-Highly Acceptable 4-Very Acceptable 3-Acceptable 2-Moderately Acceptable 1-Not Acceptable

Criteria	Characteristics	Context	Marks				
			5	4	3	2	1
Functional Suitability	Functional Completeness	The device covers all the specific functions and objectives	/				
	Functional Correctness	The device provides the correct results with the needed degree of precision.	/				
	Functional Appropriateness	The device works to facilitate the accomplishment of specified tasks and objectives.	/				
Performance Efficiency	Time Behavior	The devices amounts and types of resources when performing their functions and meeting the requirements. requirements.	/				
	Resource Utikzation	The maximize limits of the device parameter meet the requirements.	/				
	Capacity	The device can perform its functions efficiently while sharing a familiar.		/			
Compatibility	Co-existence	The device can perform its functions efficiently while sharing a familiar environment and resources with other products.		/			
	Interoperability	The device can exchange information and use the information that has been exchanged .	/				
Usability	Appropriateness Recognizability	Users easily recognize the device as helpful and can meet their needs.	/				
	Learnability	Specified users can use the device to achieve the goals of learning to use the device with effectiveness, efficiency, freedom from risk, and satisfaction.		/			
	Operability	The device has attributes that make it easy to operate and control .	/				
	User Error Protection	The device protects the user against making errors.	/				
	User Interface Aesthetic Accessibility	The device user interface enables user interaction that is pleasing and satisfying.	/				
Reliablity	Maturity	The device components meet the need for reliability under regular operation.	/				
	Availability	The device components are operational and accessible when required to use.	/				
	Fault Tolerance	The device component operates as intended despite hardware or software faults.		/			
	Availability	The device components are operational and accessible when required to use .	/				
Security	Confidentiality	The device ensures that data are accessible only to those authorized to have access.	/				
	Integrity	The device component prevents unauthorized access to or modification of data.	/				
	Non-repudiation	The device actions or events can be proven to have taken place so that the actions or events cannot be repudiated later.	/				
	Accountability	The device actions of an entity can be traced uniquely.	/				
	Authenticity	The device can identify the subject or resource.	/				
Maintainability	Analyzability	The device can assess the impact of an intended change on one or more of its parts or diagnose deficiencies or causes of failures.	/				
	Modifiability	The device can be without introducing defects or degrading existing product quality					
	Testability	The device with criteria can be established and tested to determine whether those criteria have been met.	/				
Portability	Adaptability	The device can adapt to different or evolving hardware, software, or other operational or usage environments.	/				
	Installability	The device can be installed and uninstalled in a specified environment.	/				
	Replaceability	The device can replace other products for the same purpose in the same environment	/				

Comments/Suggestions (Komento/Mungkahil ADDITIONAL INDICATOR (LIGHT) FOR FUTURE STUDIES

HARDWARE EVALUATION Questions Statement/s	5	4	3	2	1
The project meets its design, objectives, performs efficiently, and has a reasonable quality (Ang proyekto ay naaabot ang mga layunin at disenyo nito, nagaganap nang mabisa, al may katamtamang kalidad.)	/				
The device gives easy operation, maintenance and storage and is not confusing. (Ang aparato ay madaling gamitin, afagaan, at itago at hindi nakakalito.)	/				
The device is very usable to the user. (Ang aparato ay napakadaling gamitin para sa gumagamit.)	/				
The project has the characteristics of reliability and durability. (Ang proyekto ay may mga katangian ng pagiging mapagkakatiwalaan at matibay.)	/				
The hardware has a pleasing appearance and appealed-to-customer value. (Ang hardware ay may kaakit-akit na anyo at nagbibigay ng halaga sa mga mamimili.)	/				

Comments/Suggestions (Komento/Mungkahil REFER COMMENT ABOVE

SOFTWARE	
Summary	**Average**
Functional :	5
Suitability:	
Performance:	4.67
Efficiency:	4.67
Compatibility:	4.5
Usability:	4.8
Reliability:	4.75
Security:	5
Maintainability:	5
Portability:	5
Total Score	43.39 Ave. = 4.82
Interpretation	Highly Acceptable
HARDWARE	
Totality: (Kabuuan)	5
Interpretation	Highly Acceptable

Certified True Copy and Corrected By:

Signature over Printed Name of the Evaluator

04-26-2025

Date:

Appendix I: Total Budget of the Project

BILLS OF MATERIALS		
PARTS NAME	**QUANTITY**	**PRICE**
Caster Wheel W/ Lock	4	₱640.00
Lock	4	₱200,00
Sprocket 40x20	2	₱700.00
Sprocket 40x15	2	₱600.00
Chain #40	4	₱920.00
Wiper Motor	1	₱1,750.00
Limit Switch	2	₱100.00
Heater	8	₱15,200.00
Blower Fan 220v	4	₱2,400.00
6" Tube	1	₱7,000.00
Plainsheet 202	5	₱9,500.00
Piano Hinges	2	₱100.00
Tubular 1/2 X 1/2	7	₱1,610.00
Tubular 1/2 X 1	1	₱350.00
RKC	1	₱2,200.00
12v 12.5a Switching Power Supply 150w	1	₱849.00
Lcd 20x4 Dispaly I2c White On Blue	1	₱278.00
Buzzer Continuous Sound Electronic Active Buzzer Sfm-27 Dc 3v-24v	1	₱50.00
Arduino Mega 2560 R3 Board Based On Arduino	1	₱1,049.00
4x4 Matrix Membrane Keypad	1	₱50.00
Dc-Dc Buck Converter LM2596S	1	₱60.00
Labor	3	₱10,000.00
	TOTAL	**₱59,406**

Appendix J: Pictures during Defense, Evauation, Checking of Papers, and Deployment

Appendix J.1: Topic Presentation

Appendix J.2: Pre-oral Defense

Appendix J.3: Final Defense

Appendix J.4: Project Evaluation for Practitioners

Appendix J.5: Project Evaluation for Client

Appendix J.6. Project Evaluation for Agriculturist

Appendix J.7: Testing of the Project






Appendix J.8: Deployment Plan

Strategy	Activities	Persons Involved	Duration
Approval from beneficiaries	Letters for the PLSP	Client and Developers	10 Minutes
setting up the Device	Assembly and reviewing for potential problem	Developers	30 Minutes
Handover the device	Manual Discussion	Developers	15 Minutes
Training	Hands-on Basic Fundamental of Handling the device	Client and Developers	1 Hour

Appendix K: Hardware / Technical Manual

The Arduino Mega ADK Rev3 board

The Arduino MEGA ADK is a microcontroller board based on the ATmega2560. It has a USB host interface to connect with Android based phones, based on the MAX3421e IC. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs(hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

The MEGA ADK is based on the Mega 2560.

Similar to the Mega 2560 and Uno, it features an ATmega8U2 programmed as a USB-to-serial converter.

Revision 2 of the Mega ADK board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode (https://docs.arduino.cc/retired/hacking/software/DFUProgramming8U2/)

Revision 3 of the board has the following new features:

• 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

• Stronger RESET circuit.

OSH: Schematics

Arduino Mega ADK is open-source hardware! You can build your own board using the following files:

https://docs.arduino.cc/retired/boards/arduino-mega-adk-rev3/

EAGLE FILES IN .ZIP

SCHEMATICS IN .PDF

Power

The Arduino MEGA ADK can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

NB: Because the MEGA ADK is a USB Host, the phone will attempt to draw power from it when it needs to charge. When the ADK is powered over USB, 500mA total is available for the phone and board.The external power regulator can supply up to 1500mA. 750mA is available for the phone and MEGA ADK board. An additional 750mA is allocated for any actuators and sensors attached to the board. A power supply must be capable of providing 1.5A to use this much current.

The board can operate on an external supply of 5.5 to 16 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

• VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

• 5V. This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.

• 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

• GND. Ground pins.

• IOREF. This pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs for working with the 5V or 3.3V.

Memory

The MEGA ADK has 256 KB of flash memory for storing code (of which 8 KB is used for the bootloader), 8 KB of SRAM and 4 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output.

Each of the 50 digital pins on the MEGA ADK can be used as an input or output, using pinMode(),digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

• Serial: 0 (RX) and 1 (TX); Serial 1: 19 (RX) and 18 (TX); Serial 2: 17 (RX) and 16 (TX); Serial 3: 15 (RX) and 14 (TX). Used to receive (RX) and transmit (TX) TTL serial data. Pins 0 and 1 are also connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

• External Interrupts: 2 (interrupt 0), 3 (interrupt 1), 18 (interrupt 5), 19 (interrupt 4), 20 (interrupt 3), and 21 (interrupt 2). These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.

• PWM: 2 to 13 and 44 to 46. Provide 8-bit PWM output with the analogWrite() function.

• SPI: 50 (MISO), 51 (MOSI), 52 (SCK), 53 (SS). These pins support SPI communication using the SPI library. The SPI pins are also broken out on the ICSP header, which is physically compatible with the Uno, Duemilanove and Diecimila.

• USB Host: MAX3421E.

The MAX3421E communicate with Arduino with the SPI bus. So it uses the following pins:

• Digital: 7 (RST), 50 (MISO), 51 (MOSI), 52 (SCK). NB:Please do not use Digital pin 7 as input or output because is used in the communication with MAX3421E

• Non broken out on headers: PJ3 (GP_MAX), PJ6 (INT_MAX), PH7 (SS).

• LED: 13.There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

• TWI: 20 (SDA) and 21 (SCL). Support TWI communication using the Wire library. Note that these pins are not in the same location as the TWI pins on the Duemilanove or Diecimila.

The MEGA ADK has 16 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and analogReference() function.

There are a couple of other pins on the board:

• AREF. Reference voltage for the analog inputs. Used with analogReference().

• Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Communication

The Arduino MEGA ADK has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega2560 provides four hardware UARTs for TTL (5V) serial communication. An ATmega8U2 on the board channels one of these over USB and provides a virtual com port to software on the computer (Windows machines will need a .inf file, but OSX and Linux machines will recognize the board as a COM port automatically. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the ATmega8U2/16U2 chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A SoftwareSerial library allows for serial communication on any of the MEGA ADK's digital pins.

The ATmega2560 also supports TWI and SPI communication. The Arduino software includes a Wire library to simplify use of the TWI bus; see the Wire library for details. For SPI communication, use the SPI library.

The USB host interface given by MAX3421E IC allows the Arduino MEGA ADK to connect and interact to any type of device that have a USB port. For example, allows you to interact with many types of phones, controlling Canon cameras, interfacing with keyboard, mouse and games controllers as Wiimote and PS3.

Programming

The Arduino MEGA ADK can be programmed with the Arduino software (download). For details, see the reference and tutorials.

The ATmega2560 on the Arduino MEGA ADK comes preburned with a bootloader (the same on Mega 2560) that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500v2 protocol (reference, C header files).

You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP or similar; see these instructions for details.

The ATmega8U2 firmware source code is available in the Arduino repository. The ATmega8U2 is loaded with a DFU bootloader, which can be activated by:

• On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.

• On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU bootloader).

Automatic (Software) Reset

Rather then requiring a physical press of the reset button before an upload, the Arduino MEGA ADK is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega2560 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the MEGA ADK is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the bootloader is running on the MEGA ADK. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data.

The MEGA ADK contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line.

USB Overcurrent Protection

The Arduino MEGA ADK has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

Physical Characteristics and Shield Compatibility

The maximum length and width of the MEGA ADK PCB are 4 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Three screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100 mil spacing of the other pins.

The MEGA ADK is designed to be compatible with most shields designed for the Uno, Diecimila or Duemilanove. Digital pins 0 to 13 (and the adjacent AREF and GND pins), analog inputs 0 to 5, the power header, and ICSP header are all in equivalent locations. Further the main UART (serial port) is located on the same pins (0 and 1), as are external interrupts 0 and 1 (pins 2 and 3 respectively). SPI is available through the ICSP header on both the MEGA ADK and Duemilanove / Diecimila.Please note that I2C is not located on the same pins on the MEGA ADK (20 and 21) as the Duemilanove / Diecimila (analog inputs 4 and 5).

Tech Specs

Microcontroller	ATmega
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	54 (of which 15 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 8 KB used by bootloader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz
USB Host Chip	MAX3421E
Length	101.52 mm
Width	53.3 mm
Weight	36 g

PID CONTROLLER

PID temperature REX-C100

PID temperature REX-C100 controller has a dual-line seven segment display. The top line displays the current temperature, which is also known as Process Variable (PV). The bottom line displays the target temperature or Set Variable (SV).

The REX-C100 controller is a standard, panel-mount type PID temperature controller that is available in multiple different combinations. It is a part of the REX-Cxx series PID temperature controllers. There are 5 main types of Cxx series controllers: C900, C700, C400, C410 and C100. C100 is the one that has the smallest footprint.

C100 controllers are easy to install and follow industrial hardware footprints such as standard mounting sizes and wiring nomenclature. They can be powered from 100-240VAC or 24VAC/DC power supplies depending on the configuration.

The Cxx series controllers are based on a microcontroller that has advanced features such as automatic PID tuning. Automatic PID tuning makes tuning the proportional, integral and derivative constants an easy task.

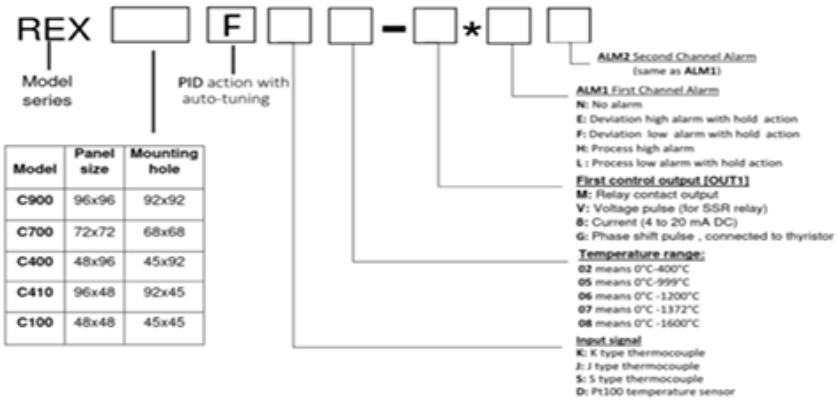
The signal input to the device can be a thermocouple (compatible with type K, J, R, S, B, E, T, N, PLII, W5Re/W26Re, U, L)

REX-C100 datasheet

The REX-C100 PID temperature controller is a device of the Cxx series temperature controllers manufactured by RKC Instruments Inc., Japan. They are a world-renowned brand for industrial automation equipment manufacturing.

Model Identification

There are multiple combinations of REX-Cxx series devices that are available to purchase. Their model numbers are selected according to the features and configurations they have.

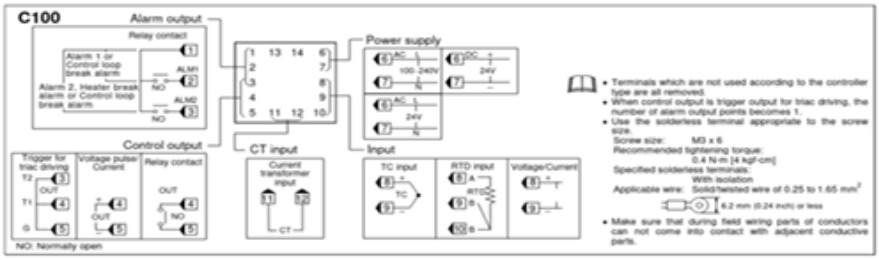


Model	Panel size	Mounting hole
C900	96x96	92x92
C700	72x72	68x68
C400	48x96	45x92
C410	96x48	92x45
C100	48x48	45x45

For example, the C100 series that offer SSR control output, K-type thermocouple input that can measure temperatures from 0°C-400°C in the panel mount 48×48 package has a model name REX-C100FK02-V*EN. This also indicates that there is a deviation upper limit alarm and nos second alarm. The letter 'F' indicates that the device supports intelligent PID self-tuning.

REX-C100 terminal configuration and I/O

The REX series controllers can be powered by either 100-240V AC, 24VDC or 24VDC/AC power sources. The following figure shows the generic terminal configuration of REX-C100 PID temperature controller. The combinations depend on the model and configurations offered.



C100 controller supports multiple configurations of input and output types. For measuring the process temperature parameter (Process Value – PV), it can use a K. J, S type thermocouple or a PT100 resistance-temperature detector (RTD) sensor. C100 has 5 variants for different temperature ranges. In its model number, the two digit ID indicates the following:

- 02– 0°C-400°C
- 05– 0°C-999°C
- 06– 0°C-1200C
- 07– 0°C-1372°C

- 08– 0°C-1600°C

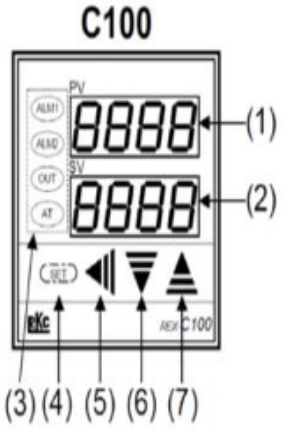
As for the output types, C100 has 4 output types. The type is indicated in the following forms:

- M – Relay contact output
- A normally open relay contact output that can be used to drive a high current relay/contactor to turn on/off a heating element. This is useful when the device is configured in on/off mode.
- V – Voltage pulse output
- An active-high pulse output mode that can be used to control a SSR. SSR (Solid State Relay) is a semiconductor device used to control the average power applied to the heating element to regulate temperature.
- 8 – Current output
- A 4-20mA DC current output proportional to the PID loop output for external use
- G – Phase shifted pulse

This signal can be used to control thyristors for high power control. This is most useful in systems where power electronics circuitry is custom-built and SSRs are not used.

REX-C100 display panel

The unit has a typical yet intuitive front panel which is easy to read and control. There are two digital displays in red and green colors. The top, red color display indicates the measured value (PV). PV is the current temperature of the process measured through the temperature sensor. The bottom display is a green color and displays the set point/set value (SV). This is the target temperature the device tries to maintain.



1) **Measured value (PV) display [Red]** Displays PV or various parameter symbols.
2) **Set value (SV) display [Green]** Displays SV or various parameter set values (or CT input value).
3) **Indication lamps:**
   Alarm output lamps (ALM1, ALM2) [Red]
   ALM1: Lights when alarm 1 output is turned on.
   ALM2: Lights when alarm 2 output is turned on.
   Autotuning (AT) lamp [Green]
   Flashes when autotuning is activated.
   (After autotuning is completed: AT lamp will go out)
   Control output lamps
   (**OUT1** [Yellow], **OUT2** [Green])
   OUT1: Lights when control output is turned on.
   OUT2: Lights when cool-side control output is turned on.
4) **(Set key)** Used for parameter calling up and set value registration.
5) **(Shift key)** Shift digits when settings are changed.
6) **(DOWN key)** Decrease numerals.
7) **(UP key)** Increase numerals.

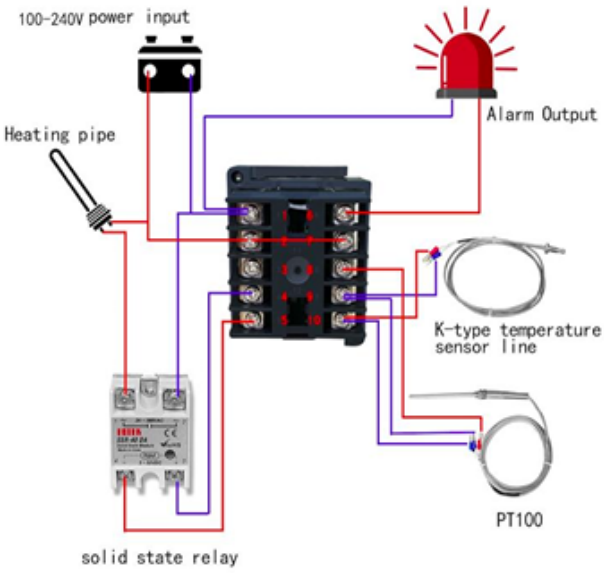
In addition to the main displays, there are 4 LED indicator lamps to indicate the status of alarms, tuning status and the control output status. Alarm output lamps are red and the autotuning lamp flashes green when tuning. Control output lamps are bi-color (green and yellow).

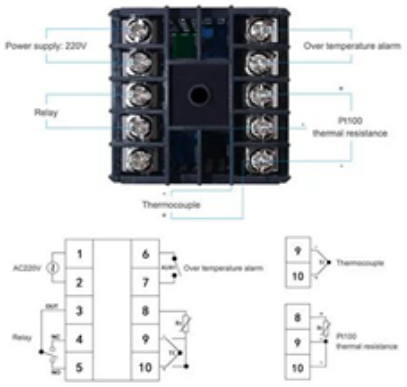
There are four buttons (set, shift, down and up) for navigating through menus and adjusting configurations.

How to use a REX-C100 temperature controller with SSR and thermocouple

Let's discuss how a REX-C100 can be wired with an SSR to control temperature. The figure shown below has the following configuration:

- 100-240VAC powered
- SSR output
- K-type thermocouple input type
- Alarm output for deviation/process indication





Connect the AC supply to pin 1 and 2. To supply power to the alarm relay, connect the live connection to pin 7 as well. In the given configuration, pin 4 and 5 are used to activate the SSR

The heating pipe/heater is connected in series through a solid-state relay (SSR). The output configuration of the chosen C100 controller is voltage pulse type to control the SSR. This is a pulse that rapidly turns on/off the SSR to control the average power supplied to the heating pipe.

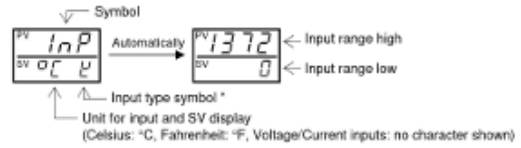
For measuring the process value, the thermocouple is attached to pin 9 and 10. If a PT100 type is selected, use pins 8, 9 and 10 for connections. If a PT100 is being used, make sure the red connector is connected to terminal 8 of REX-C100. The remaining two blue connectors are interchangeable and should be connected to pin 9 and 10.

REX-C100 quick initial setup

Before powering up the system, always double check and ensure that all the connections are correctly done. The REX-C100 temperature controller is a sensitive device and can get instantly damaged if sensor input lines and power input lines are connected in a wrong way.

Initial Setting

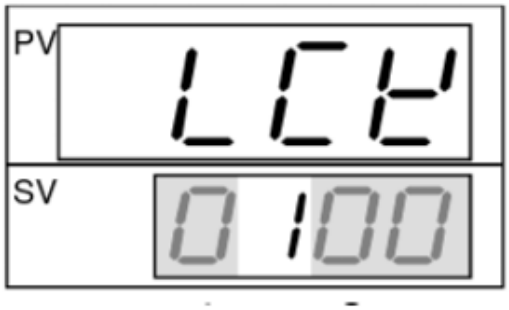
When powered on for the first time, the controller immediately asks for the input type and input temperature range. Select the correct sensor type from the table and use up/down and shift keys to adjust the settings according to the table shown below.



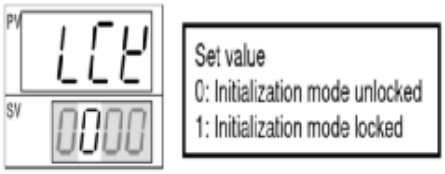
Symbol																
Input type	Thermocouple (TC)											RTD		Voltage input	Current input
	K	J	R	S	B	E	T	N	PL II	W5Re/ W26Re	U	L	JPt 100	Pt 100		

Press the set button once to confirm. As soon as the input type has been confirmed, the device will ask for the temperature range. In this screen, the PV display shows the upper limit and the SV display shows the lower limit for the temperature.

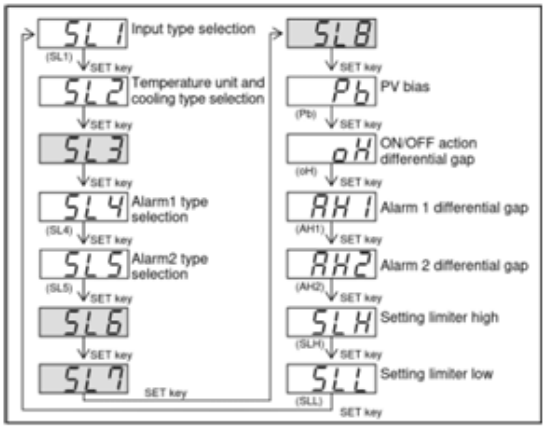
The main procedure to follow after turning on the power for the first time is to initialize the device. This can be done by long pressing the SET key for 5 seconds. When the unit is in parameter setting mode, the display will show 'LCK' as shown below:



Press the shift button to move the cursor blinking in the bottom display below the character C on the top display. Then press down key once to set the digit to 0 as shown below.



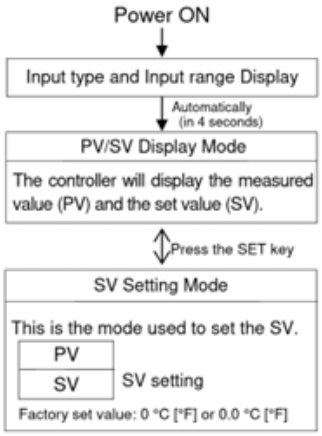
Pressing the set button again stores the set value and unlocks the initialization mode. Press and hold shift key while pressing the set key to enter and exit from the initialization mode at any time. The figure below shows the settings that are available in the initialization mode. Pressing set button cycles between the modes. Use shift key and up/down keys to adjust values in a particular mode.



In this mode, any parameter can be changed by the user without having to unlock the device. While unlocked (LCK mode shows 0000), any parameter can be changed. A value of 0101 indicates that all parameters are locked and 0110 means that only set value can be changed.

Changing operating parameters

The set value is the most frequently changed value. This is the target temperature the temperature controller tries to maintain. The device follows the following sequence upon powering on.



To change the set value, press the set button at the SV/PV monitor screen until SV setting is displayed. In this mode, using the shift key, the cursor can be moved left right and up/down keys can be used to increase/decrease the corresponding digits. After setting the value, press the set key to confirm and save the set value.

How to solve REX-C100 temperature controller not working

Temperature controllers can sometimes malfunction or cease to work at all due to many possible reasons.

Smart controllers such as REX-C100 temperature controllers offer some type of error display methods to indicate a problem. This is usually done through error codes and helps the technicians troubleshoot the problem faster. As a precaution, make sure to power down the system before attempting any electrical changes to prevent electric shock.

Here are some common errors in REX-C100 and how to solve them:

- PV value is not updating
  - Check sensor wiring and make sure the connectors are properly tightened.
- Load is not turning on
  - Check if the output LED is flashing when the system temperature changes. If so, check the SSR or any other control element if not faulty.
- PV value is flashing
  - This indicates that the PV value is outside the range. Check the PV range and temperature sensor connections.

- Flashing 'oooo' text in PV display
  - This indicates that the PV value measured is higher than the specified range. Check the sensor connections and verify the PV range upper limit.
- Flashing 'uuuu'
  - This indicates that the PV value measured is lower than the specified range. Check the sensor connections and verify the PV range lower limit
- Display indicated 'ERR'
  - If this text is displayed, the power should immediately be turned off. Try restarting the unit by turning it back on. If the message does not clear, the unit's memory is corrupted and should be serviced by authorized personnel.

White Ceramic Infrared Sauna Heater Tube Ceramic Heating Tube

Color	Clear / Golden / White	Specification	Sk15 / R7s / Ceramic End Cap, up to 3 meters
Material	Quartz Glass	Certification	CE
Application	Heating / Paint Drying / Pet Bottle Blowing	Length	100-3000mm
Power	200-6000W	Voltage	120-480V
Diameter	10mm / 12mm / 15mm /11X23mm / 15X33mm	Reflector	Gold Reflector / White Reflector

Product Description

White Ceramic Infrared Sauna Heater Tube Ceramic Heating Tube

Compared with convection heating and traditional heating, radiation is a powerful and efficient heating method. In fact, the radiation does not need to be in direct contact with the surface of the object, nor does it need to heat the object through any medium such as air. Radiation is achieved by the heating element conducting energy by releasing electromagnetic rays. Heating performance is affected by the following factors: the temperature of the heating element, the ability of the heated body to absorb radiant heat, and the shape, location and distance between the heated body and the thermal energy source.

Infrared quartz radiators produce infrared wavelengths in the range 3.5 μm (medium wave) and 0.9 μm (short wave). Depending on the properties of the material being heated, infrared rays of different wavelengths can be selected to maximize energy transmission and achieve a faster and more efficient heating process.

If compared to traditional systems using hot air heating, infrared heaters can generate more energy per unit area, which like light can be focused, concentrated, directed and reflected.

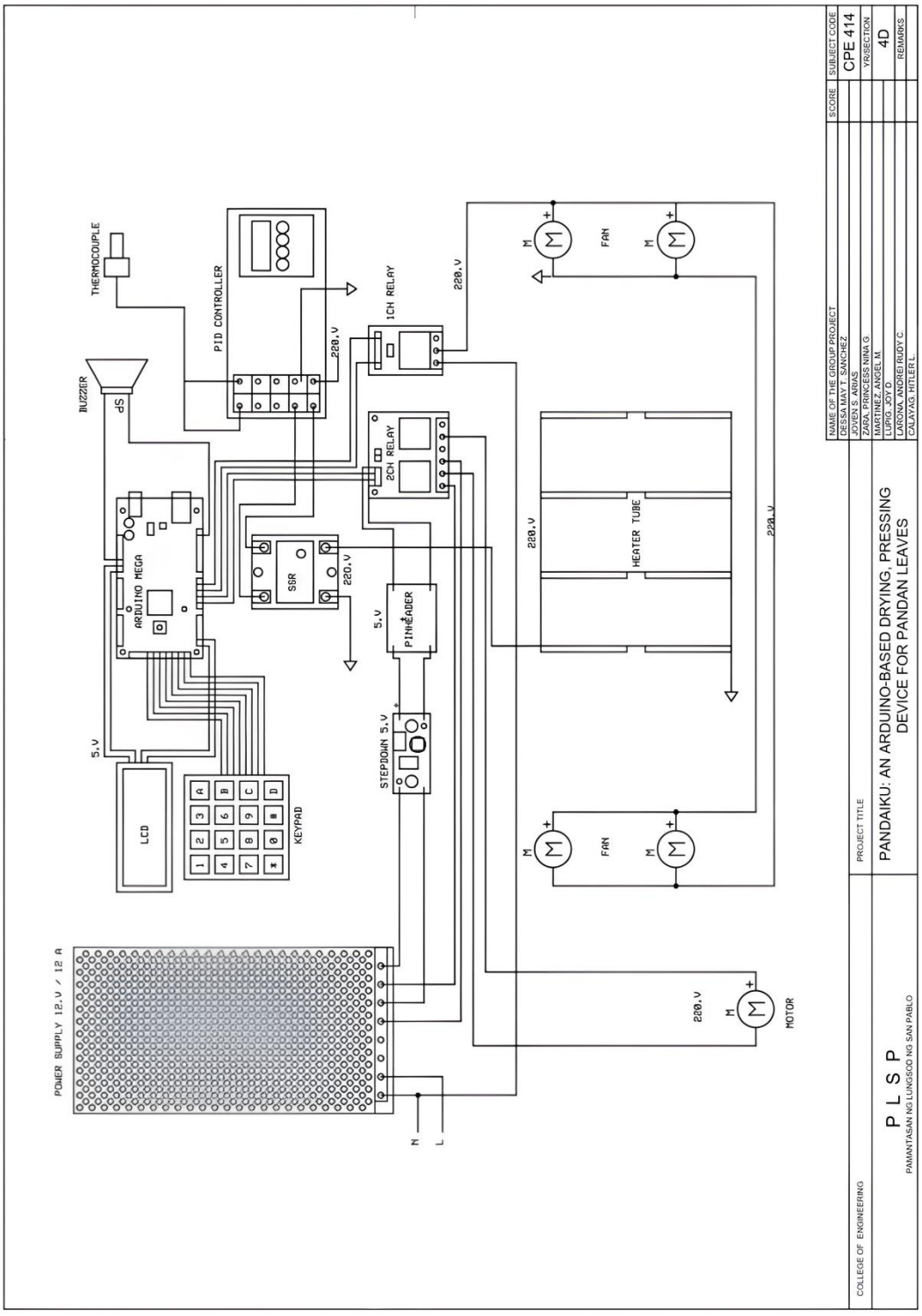
The application of this technology can bring huge benefits:

- Rapid heating process;
- Energy saving and low ambient heat;
- The radiator is easy to control;
- No direct contact with materials and no pollution to the surrounding environment;
- Compared with traditional hot air heating equipment, infrared quartz heating modules and stoves are smaller in size and volume.

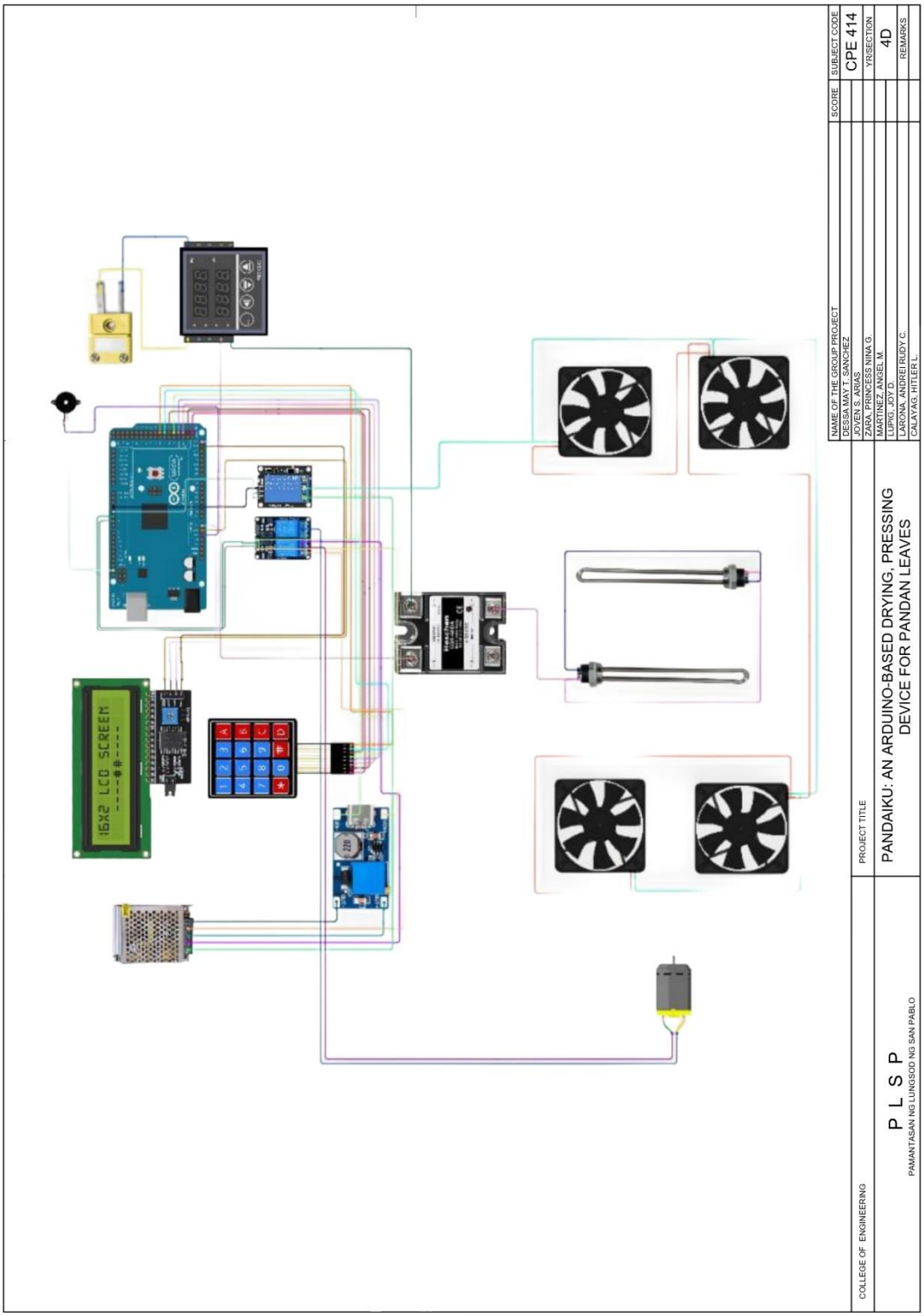
Appendix L: User's Manual

Appendix M: Blueprint of the Project

Appendix M.1: Schematic Diagram



Appendix M.2: Digital Schematic Diagram



Appendix N: Source Code

mainProcess.ino

```
void startHeating(int sheatingHours, int sheatingMinutes, int sheatingSeconds) {
  lcd.clear();
  lcd.setCursor(0, 1);
  lcd.print("Heating...");

  int totalTime = (sheatingHours * 3600) + (sheatingMinutes * 60) + sheatingSeconds;
  int elapsedTime = 0;

  digitalWrite(HEATER, RELAY_OFF);  // Turn on heater
  digitalWrite(FAN, RELAY_ON);     // Turn on fan

  while (elapsedTime < totalTime) {
    delay(1000);  // Wait 1 second
    elapsedTime++;

    // Calculate remaining time
    int remainingTime = totalTime - elapsedTime;
    int hours = remainingTime / 3600;
    int minutes = (remainingTime % 3600) / 60;
    int seconds = remainingTime % 60;

    // Display the remaining time
    lcd.setCursor(0, 2);
    lcd.print("Time Left: ");
    if (hours < 10) lcd.print("0");
    lcd.print(hours); lcd.print(":");
    if (minutes < 10) lcd.print("0");
    lcd.print(minutes); lcd.print(":");
    if (seconds < 10) lcd.print("0");
    lcd.print(seconds); lcd.print(" ");
  }
```

```
  // Stop heater and fan
  digitalWrite(HEATER, RELAY_ON);
  digitalWrite(FAN, RELAY_OFF);

  lcd.clear();
  lcd.setCursor(0, 1);
  lcd.print("Heating Complete");
  delay(2000);
}

void startPressing(int pressingHours, int pressingMinutes, int pressingSeconds) {
  lcd.clear();
  lcd.setCursor(0, 1);
  lcd.print("     Pressing");
  lcd.setCursor(0, 2);
  lcd.print("    Activated!");
  delay(2000);

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Pressing...");

  unsigned long totalMillis = ((unsigned long)pressingHours * 3600UL + pressingMinutes * 60UL + pressingSeconds) * 1000UL
  unsigned long startMillis = millis();
  bool movingForward = true;
```

```
59    while (millis() - startMillis < totalMillis) {
60      if (movingForward) {
61        digitalWrite(MOVE_FWD, RELAY_ON);
62        digitalWrite(MOVE_BWD, RELAY_OFF);
63        if (digitalRead(LMS_FWD) == LOW) {
64          movingForward = false;
65        }
66      } else {
67        digitalWrite(MOVE_FWD, RELAY_OFF);
68        digitalWrite(MOVE_BWD, RELAY_ON);
69        if (digitalRead(LMS_BWD) == LOW) {
70          movingForward = true;
71        }
72      }
73
74      // Update LCD time
75      unsigned long remaining = totalMillis - (millis() - startMillis);
76      int hours = remaining / 3600000UL;
77      int minutes = (remaining % 3600000UL) / 60000UL;
78      int seconds = (remaining % 60000UL) / 1000UL;
79
80      lcd.setCursor(0, 1);
81      lcd.print("Time: ");
82      if (hours < 10) lcd.print("0"); lcd.print(hours); lcd.print(":");
83      if (minutes < 10) lcd.print("0"); lcd.print(minutes); lcd.print(":");
84      if (seconds < 10) lcd.print("0"); lcd.print(seconds); lcd.print("   ");
85
86      delay(50); // small delay for LCD refresh, not blocking
87    }

89    // Stop all movement
90    digitalWrite(MOVE_FWD, RELAY_OFF);
91    digitalWrite(MOVE_BWD, RELAY_OFF);
92
93    lcd.clear();
94    lcd.setCursor(0, 1);
95    lcd.print("    Time Expired!");
96    delay(1500);
97
98    // Return to LMS_BWD (home)
99    digitalWrite(MOVE_BWD, RELAY_ON);
100   while (digitalRead(LMS_BWD) == HIGH) {
101     // Add timeout logic if needed
102     delay(5);
103   }
104   digitalWrite(MOVE_BWD, RELAY_OFF);
105
106   lcd.clear();
107   lcd.setCursor(0, 1);
108   lcd.print("    Pressing");
109   lcd.setCursor(0, 2);
110   lcd.print("    Complete!");
111
112   digitalWrite(BUZZER, RELAY_OFF);
113   delay(5000);
114   digitalWrite(BUZZER, RELAY_ON);
115
116   lcd.clear();
117   displayMenu();
118 }
```

```
120  void setupHeater(int heatingHours, int heatingMinutes, int heatingSeconds) {
121    lcd.clear();
122    lcd.setCursor(0, 1);
123    lcd.print("      Setup");
124    lcd.setCursor(0, 2);
125    lcd.print("      Heater");
126    delay(3000);
127
128    lcd.clear();
129    lcd.setCursor(0, 0);
130    lcd.print("Heater ON");
131
132    int totalTime = (heatingHours * 3600) + (heatingMinutes * 60) + heatingSeconds;
133    int elapsedTime = 0;
134
135    digitalWrite(FAN, RELAY_ON);
136    digitalWrite(HEATER, RELAY_OFF); // Turn on the heater
137
138    while (elapsedTime < totalTime) {
139      char key = keypad.getKey();
140      if (key == 'B') {
141        Serial.print("Heater Stopped");
142        // lcd.clear();
143        // lcd.setCursor(0, 1);
144        // lcd.print("Heater Stopped!");
145        break;
146      }

148      delay(1000);  // Delay 1 second
149      elapsedTime++;
150
151      // Calculate remaining time
152      int remainingTime = totalTime - elapsedTime;
153      int hours = remainingTime / 3600;
154      int minutes = (remainingTime % 3600) / 60;
155      int seconds = remainingTime % 60;
156
157      // Display on LCD
158      lcd.setCursor(0, 1);
159      lcd.print("Time Left: ");
160      if (hours < 10) lcd.print("0");
161      lcd.print(hours); lcd.print(":");
162      if (minutes < 10) lcd.print("0");
163      lcd.print(minutes); lcd.print(":");
164      if (seconds < 10) lcd.print("0");
165      lcd.print(seconds); lcd.print(" ");
166    }
167
168    // Turn off heater
169    digitalWrite(FAN, RELAY_OFF);
170    digitalWrite(HEATER, RELAY_ON);
171
172    lcd.clear();
173    lcd.setCursor(0, 1);
174    lcd.print("     Heater OFF");
175    delay(2000);
```

```
void setupPressing(int pHours, int pMinutes, int pSeconds) {
  lcd.clear();
  lcd.setCursor(0, 1);
  lcd.print("        Setup");
  lcd.setCursor(0, 2);
  lcd.print("       Pressing");
  delay(3000);

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Pressing ON");

  unsigned long totalMillis = ((unsigned long)pHours * 3600UL + pMinutes * 60UL + pSeconds) * 1000UL;
  unsigned long startMillis = millis();
  bool movingForward = true;

  while (millis() - startMillis < totalMillis) {
    if (movingForward) {
      digitalWrite(MOVE_FWD, RELAY_ON);
      digitalWrite(MOVE_BWD, RELAY_OFF);
      if (digitalRead(LMS_FWD) == LOW) {
        movingForward = false;
      }
    } else {
      digitalWrite(MOVE_FWD, RELAY_OFF);
      digitalWrite(MOVE_BWD, RELAY_ON);
      if (digitalRead(LMS_BWD) == LOW) {
        movingForward = true;
      }
    }

      // Update LCD time
      unsigned long remaining = totalMillis - (millis() - startMillis);
      int hours = remaining / 3600000UL;
      int minutes = (remaining % 3600000UL) / 60000UL;
      int seconds = (remaining % 60000UL) / 1000UL;

      lcd.setCursor(0, 1);
      lcd.print("Time: ");
      if (hours < 10) lcd.print("0"); lcd.print(hours); lcd.print(":");
      if (minutes < 10) lcd.print("0"); lcd.print(minutes); lcd.print(":");
      if (seconds < 10) lcd.print("0"); lcd.print(seconds); lcd.print("   ");

      delay(50); // small delay for LCD refresh, not blocking
    }

    // Stop all movement
    digitalWrite(MOVE_FWD, RELAY_OFF);
    digitalWrite(MOVE_BWD, RELAY_OFF);

    lcd.clear();
    lcd.setCursor(0, 1);
    lcd.print("    Time Expired!");
    delay(1500);

    // Return to LMS_BWD (home)
    digitalWrite(MOVE_BWD, RELAY_ON);
    while (digitalRead(LMS_BWD) == HIGH) {
      // Add timeout logic if needed
      delay(5);
    }
```

```
242     digitalWrite(MOVE_BWD, RELAY_OFF);
243
244     lcd.clear();
245     lcd.setCursor(0, 1);
246     lcd.print("    Pressing");
247     lcd.setCursor(0, 2);
248     lcd.print("    Complete!");
249
250     digitalWrite(BUZZER, RELAY_OFF);
251     delay(5000);
252     digitalWrite(BUZZER, RELAY_ON);
253
254     lcd.clear();
255     displayMenu();
256   }
```

Appendix O: Grammarian's Certificate

Appendix P: Grammarly and Plagiarism Results

CHAPTER I

by DONT REMOVE FILES

General metrics

16,448	2,485	137	9 min 56 sec	19 min 6 sec
characters	words	sentences	reading time	speaking time

Score

This text scores better than 93% of all texts checked by Grammarly

Writing Issues

60	11	49
Issues left	Critical	Advanced

Plagiarism

5 sources

2% of your text matches 5 sources on the web or in archives of academic publications

CHAPTER II

by DONT REMOVE FILES

General metrics

19,825	2,769	169	11 min 4 sec	21 min 18 sec
characters	words	sentences	reading time	speaking time

Score

This text scores better than 91% of all texts checked by Grammarly

Writing Issues

77	28	49
Issues left	Critical	Advanced

Plagiarism

10 sources

3% of your text matches 10 sources on the web or in archives of academic publications

CHAPTER III

by DONT REMOVE FILES

General metrics

10,577	1,570	99	6 min 16 sec	12 min 4 sec
characters	words	sentences	reading time	speaking time

Score

This text scores better than 95% of all texts checked by Grammarly

Writing Issues

32	14	18
Issues left	Critical	Advanced

Plagiarism

3 sources

CHAPTER IV

by DONT REMOVE FILES

General metrics

26,690	4,270	306	17 min 4 sec	32 min 50 sec
characters	words	sentences	reading time	speaking time

Score

90

This text scores better than 90% of all texts checked by Grammarly

Writing Issues

131	44	87
Issues left	Critical	Advanced

Plagiarism

1 %

6 sources

1% of your text matches 6 sources on the web or in archives of academic publications

CHAPTER V

by DONT REMOVE FILES

General metrics

3,660	524	35	2 min 5 sec	4 min 1 sec
characters	words	sentences	reading time	speaking time

Score

94

This text scores better than 94% of all texts checked by Grammarly

Writing Issues

11	1	10
Issues left	Critical	Advanced

Plagiarism

2 %

1 source

2% of your text matches 1 sources on the web or in archives of academic publications

Appendix Q: Developers' Consent to Access their Profiles

PAMANTASAN NG LUNGSOD NG SAN PABLO
COLLEGE OF ENGINEERING
Brgy. San Jose, San Pablo City
Tel No.: (049) 536-7830
Email Address: plspofficial@plsp.edu.ph *website:* plsp.coe@plsp.edu.ph

CONSENT

We are the BSCpE students under the College of Engineering, whose names appeared below were the developers of the CPE421 – CPE Practice and Design 2 entitled *"Pandaiku: An Arduino-Based Drying and Pressing Device for Pandan Leaves to Support Luisiana Weavers Organization in Barangay Zone VI, Luisiana, Laguna"*. We are fully aware that Pamantasan ng Lungsod ng San Pablo or its designated representative is duly bound and obligated under the Data Privacy Act of 2012 and its Implementing Rules and Regulations (IRR) effective since September 8, 2016, to protect our personal and sensitive information that collects, processes, and retails upon our application for admission, enrollment, and during our stay in College.

Likewise, we are fully aware that PLSP may share such information to its affiliates or partner organizations as part of its contractual obligations, or with government agencies pursuant to law or legal processes. In this regard, we hereby allow PLSP to collect, process, use, and share our personal data in the pursuit of its legitimate academic, research, and employment purpose and/or interests as an education institution.

Jover S. Arias
Hitler L. Calayag
Andrei Rudy C. Larona
Joy D. Lupig
Angel M. Martinez
Dessa May T. Sanchez
Princess Nina G. Zara

Date: May 11, 2025

"Primed to Lead and Serve for Progress"

Appendix R: Developers' Profile

JOVEN S. ARIAS
cpe.arias.joven@gmail.com
0915-970-8785

Career Objective

" To continuously learn, grow, and positively impact the world around me, fostering meaningful connections and contributing to the well-being and success of others."

Educational Background

PAMANTASAN NG LUNGSOD NG SAN PABLO B.S. Computer Engineering	Brgy. San Jose, San Pablo City, Laguna. May 2025 – present
ASIAN INSTITUTE OF TECHNOLOGY AND EDUCATION ICT(Programming) Senior High School	Tiaong, Quezon (2018- 2020)
GLORIA UMALI INTEGRATED NATIONAL HIGH SCHOOL Junior High School	Ayusan 1 Tiaong, Quezon (2014-2018)
AYUSAN I ELEMENTARY SCHOOL Grade School	Ayusan 1 Tiaong, Quezon (2008-2014)

Skills

- Adaptability
- Problem Solving
- Flexibility

Personal Information

Birthday: March 3, 2001
Civil Status: Single
Religion: Roman Catholic
Address: Brgy. Ayusan 1 Tiaong, Quezon

HITLER L. CALAYAG
toybitscalayag@gmail.com
0921-199-3905

Career Objective

" To have a challenging position in a reputable organization to have more learnings, knowledge, and skills."

Educational Background

PAMANTASAN NG LUNGSOD NG SAN PABLO B.S. Computer Engineering	Brgy. San Jose, San Pablo City, Laguna. May 2025 – present
SAN PABLO COLLEGES STEM (Science, Technology, Engineering, and Mathematics) Senior High School	San Pablo, City (2018- 2020)
LUSACAN NATIONAL HIGH SCHOOL Junior High School	Lusacan Tiaong, Quezon (2014-2018)
LUSACAN ELEMENTARY SCHOOL Grade School	Lusacan, Tiaong, Quezon (2007-2014)

Skills

- Adaptability
- Strong communication skills
- Computer Proficiency

Personal Information

Birthday: February 6, 2001
Civil Status: Single
Religion: Roman Catholic
Address: 1st. St. Alvarez Village, Lusacan, Tiaong, Quezon

ANDREI RUDY C. LARONA
andrei.rcl13@gmail.coM
0961-413-1458

Career Objective

" To secure a challenging position in a reputable organization to expand my learnings, knowledge, and skills."

Educational Background

PAMANTASAN NG LUNGSOD NG SAN PABLO
B.S. Computer Engineering
Brgy. San Jose, San Pablo City, Laguna.
May 2025 – present

LICEO DE CALAUAN
ABM
Senior High School
Calauan, Laguna
(2018- 2020)

LICEO DE CALAUAN
Junior High School
Calauan, Laguna
(2014-2018)

LICEO DE CALAUAN
Grade School
Calauan, Laguna
(2008-2014)

Skills

- Creativity
- Flexibility
- Work Ethic

Personal Information

Birthday: October 13, 2002
Civil Status: Single
Religion: Roman Catholic
Address: 128 A. Marfori St. Brgy. Silangan Calauan Laguna

JOY D. LUPIG
joylupig0712@gmail.com
0963-763-8557

Career Objective

" I seek challenging opportunities where I can fully use my skills for the success of the organization."

Educational Background

PAMANTASAN NG LUNGSOD NG SAN PABLO
B.S. Computer Engineering
Brgy. San Jose, San Pablo City, Laguna.
May 2025 – present

ASIAN INSTITUTE OF TECHNOLOGY AND EDUCATION
ICT(Programming)
Senior High School
Tiaong, Quezon
(2018-2020)

SAINT FRANCIS ACADEMY
Junior High School
San Francisco, Quezon
(2014-2018)

SAN FRANCISCO ELEMENTARY SCHOOL
Grade School
San Francisco, Quezon
(2007-2014)

Skills

- Leadership
- Collaboration
- Flexibility

Personal Information

Birthday: December 7, 2001
Civil Status: Single
Religion: Roman Catholic
Address: Brgy, San Francisco Tiaong Quezon

ANGEL M. MARTINEZ
cpe.martinez.angel@gmail.com
0965-301-7455

Career Objective

"To inspire, empower, and make a positive impact on the world through continuous learning, meaningful connections, and compassionate actions."

Educational Background

PAMANTASAN NG LUNGSOD NG SAN PABLO
B.S. Computer Engineering
Brgy. San Jose, San Pablo City, Laguna.
May 2025 – present

PLARIDEL INTEGRATED NATIONAL HIGH SCHOOL
STEM (Science, Technology, Engineering, and Mathematics)
Senior High School
Banago, Nagcarlan, Laguna
(2019-2021)

LILIW NATIONAL HIGH SCHOOL
Junior High School
Kanlurang Bukal, Liliw, Laguna
(2015-2019)

LILIW CENTRAL ELEMENTARY SCHOOL
Grade School
Rizal St. Liliw, Laguna
(2008-2015)

Skills

- Flexibility
- Communication Skill
- Adaptability to changing circumstances, and handling unexpected challenges.

Personal Information

Birthday: November 8, 2002
Civil Status: Single
Religion: Born Again Christian
Address: Masulong St. Maslun, Liliw, Laguna

DESSA MAY T. SANCHEZ
cpe.sanchez.dessamay@gmail.com
0994-238-9601

Career Objective

"Seeking a challenging opportunity where I will be able to use my strong organizational skills, educational background, and ability to work well with people, which allow me to grow personally and professionally."

Educational Background

PAMANTASAN NG LUNGSOD NG SAN PABLO
B.S. Computer Engineering
Brgy. San Jose, San Pablo City, Laguna.
May 2025 – present

ASIAN INSTITUTE OF TECHNOLOGY AND EDUCATION
ICT(Programming)
Senior High School
Tiaong, Quezon
(2018- 2020)

PANSOL NATIONAL HIGH SCHOOL
Junior High School
Pansol Padre Garcia, Batangas
(2014-2018)

DOMINGO M. ISABEDRA MEMORIAL ELEMENTARY SCHOOL
Grade School
San Antonio, Quezon
(2007-2014)

Skills

- Flexibility
- Strong communication skills
- Computer Proficiency

Personal Information

Birthday: August 27, 2001
Civil Status: Single
Religion: Born Again Christian
Address: 210-A Purok 5, Brgy. Loob, San Antonio, Quezon

PRINCESS NINA G. ZARA
princessninazara19@gmail.com
0991-335-8472

Career Objective

"To apply my academic knowledge, technical expertise and communication abilities in a challenging and rewarding position."

Educational Background

PAMANTASAN NG LUNGSOD NG SAN PABLO
B.S. Computer Engineering
Brgy. San Jose, San Pablo City, Laguna.
May 2025 – present

RECTO MEMORIAL NATIONAL HIGH SCHOOL
ICT(CSS)
Senior High School
Brgy. Quipot, Tiaong, Quezon
(2019-2021)

RECTO MEMORIAL NATIONAL HIGH SCHOOL
Junior High School
Brgy. Quipot, Tiaong, Quezon
(2015-2019)

SAN JOSE ELEMENTARY SCHOOL
Grade School
San Jose, Quezon
(2008-2015)

Skills

- Strategic Thinking
- Effective Communication and Teamwork Skills
- Adaptability and Willingness to Learn New Technology and Tools

Personal Information

Birthday: January 19, 2003
Civil Status: Single
Religion: Roman Catholic
Address: Sitio Ilaya Kaliwa, Brgy Behia Tiaong, Quezon