

**APPCYCLE: AI-ASSISTED WEB APPLICATION FOR THE SALE AND PURCHASE  
OF SCRAP MATERIALS IN SUPPORT OF THE CIRCULAR ECONOMY**



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## **ABSTRACT**

Driven by the need for sustainable resource management, APPCycle, a user-friendly web application, aims to provide a platform for selling and purchasing reusable goods, practicing the circular economy concept. This paper examines the usability of the web application as a means to address the issue of waste production by focusing on its purpose as an accessible platform to buy and sell scrap materials. By integrating Google Teachable Machine (GTM), APPCycle provides precise image recognition of scrap materials submitted to verify the scrap material based on the following scrap material classes: textile, e-waste, and metal. Using the Post-Study System Usability Questionnaire (PSSUQ) for system usability evaluation, the system indicated a high satisfaction across various system aspects, with notable improvements in interface quality for buyers (mean overall score 1.35) and sellers (mean overall score 1.41) post-enhancements. The successful implementation of the system allows for the exploration of possible solutions to waste production with a technological approach, such as artificial intelligence, to minimize its effects on the environment and maximize the usage of produced goods by repurposing instead of disposing of the product

*Keywords:* sustainable resource management, circular economy, web application, Google Teachable Machine, Post-Study System Usability Questionnaire

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## CHAPTER I

### 1.0 Introduction

Traditional recycling is the most well-known type of recycling. In this process, materials are sorted by type, cleaned, ground, and processed to be used in new products. However, this linear economic model, characterized by a "take-make-consume-throw away" pattern, is increasingly being challenged. Bourguignon (2016) contrasts this approach with the concept of a circular economy, which emphasizes sharing, leasing, reusing, repairing, refurbishing, and recycling in a continuous loop where products and materials are highly valued. Closing the loop involves creating systems that enable the efficient exchange of resources, thereby reducing waste. The circular economy (CE) approach integrates practical policy and business goals, emphasizing the use of renewable energy sources such as solar, wind, biomass, and waste-derived energy throughout the product value chain and cradle-to-cradle lifecycle. It also highlights the importance of cascading, upgrading, and reusing products, components, and materials (Ellen MacArthur Foundation, 2013; Rashid et al., 2013; Mihelcic et al., 2003; Braungart et al., 2007).

A circular economy is a holistic approach to economic development that aims to eliminate waste and promote the continual use of resources. It is based on principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems. Manufacturing organizations face increasing resource supply uncertainty, which significantly impacts their competitiveness. Along with meeting environmental regulations at minimal cost, heightened competition for access to vital or limited resources has become a significant challenge for the manufacturing industry (European Commission, 2014b). The idea of a circular economy

is seen as a means to reconcile goals for economic growth and environmental conservation, addressing the inherent constraints of a linear economy's take-make-use-dispose model. As a developing country, the Philippines faces significant challenges in waste management. Estimates indicate that the country produced 16.6 million tons of garbage in 2020 (Environmental Management Bureau, 2019). With increasing resource use, waste production is projected to rise, with the Philippines anticipated to experience the highest growth in annual resource consumption among ASEAN countries (ASEAN stats, 2019). This growth will substantially impact the country's material footprint (MF) if the current socio-technical regime persists. By adopting a circular economy, the Philippines can mitigate future waste management issues and enhance environmental sustainability. This paradigm shift can help decouple resource use from waste production.

Specifically, in General Santos City, Pareja (n.d.) reports that in 2016, plastic waste comprised 51.25% of the total waste, followed by paper at 28.53%, yard waste at 11.83%, and kitchen waste at 2.74%. The remaining 5.65% consisted of specific waste, glass, metal, rubber, and hazardous waste. In 2016, the city disposed of 41.065 tons of plastic waste, 22.85 tons of paper waste, 9.48 tons of yard waste, 2.19 tons of kitchen waste, and 4.52 tons of other waste. This data highlights the predominance of plastic waste, which poses significant environmental challenges due to its long decomposition time. The substantial proportion of paper waste indicates an opportunity for increased recycling and reduced paper consumption. The relatively low rate of kitchen waste suggests potential for improvement in food waste reduction and composting efforts.

To address these challenges, infrastructure and technological advancements are crucial. Widmer et al. (2018) emphasize that gaps in infrastructure and technology hinder the adoption of a circular economy, while De Brito Haaker (2016) asserts that digital platforms are vital for

efficient material exchange. These platforms act as transaction facilitators, essential to the circular economy (McIntyre & Srinivasan, 2017). Bocken & Ritala (2022) and Lüdeke-Freund et al. (2019) propose CE-based business models, including platform-based resource marketplaces, which are integral to modern circular economy strategies.

Artificial intelligence (AI) also plays a significant role in enhancing these strategies. AI enables computers and devices to mimic human intelligence and problem-solving skills. AI has garnered attention for its potential to drive growth in both developed countries like the United States and Europe and developing nations like China and India (Lu et al., 2017). As a field of computer science, AI includes machine learning and deep learning, which involve developing algorithms modeled after human decision-making processes to learn from data and make increasingly accurate predictions over time ("What Is Artificial Intelligence (AI)??" n.d.). Incorporating innovative AI technology, as demonstrated by Google Teachable Machine, is crucial for sustainable waste management and implementing a circular economy model. This integration underscores a commitment to a more environmentally responsible and sustainable approach to waste management, aligning with global initiatives for a greener future.

The principles of the circular economy focus on eliminating waste and pollution, maximizing resource use, and regenerating natural systems. A web-based application facilitates efficient material exchange, reducing waste by enabling the buying and selling of scrap materials at reasonable prices. AI-powered image validation enhances operational efficiency, promoting resource optimization and waste reduction. This study aims to inspire others to adopt similar technological approaches, contributing to a circular economy, and offers a practical tool for homeowners to reduce waste.

## **1.1 General Objective of the Study**

The project aims to develop a web-based application that makes it simple for users to buy and sell reusable goods. The circular economy is a system in which resources are used, reused, and recycled in a closed loop. Materials are recycled into the same product and create a continuous cycle instead of being discarded. The website is meant to support its guiding principles. The software will allow users to buy products manufactured from recycled materials and sell goods like fabric scraps, electronic wastes, and metal cans. This could encourage the use of sustainable products and help reduce waste.

## **1.2. Specific Objectives of the Study**

Specifically, the project aims to:

- Design and develop a web-based application that has the following features:
  - ❖ Homepage Design: To create a homepage that displays a comprehensive list of available items for purchase or sale, including detailed information such as the item's category, description, price, quantity, and seller information.
  - ❖ User Transactions: To enable the sale and purchase of scrap materials listed on the web application by users registered as sellers in the system.
  - ❖ User Management: To facilitate users in managing their personal information, shop profiles, item status tracking, addition of new products, and viewing and printing transaction histories.

- ❖ Communication: To incorporate messaging features that allow direct communication between users and sellers.
- ❖ Admin Management: To support admin-side management with PayPal and API SMS configuration for efficient transaction processing.
- ❖ Product Approval Feedback: To provide sellers with remarks and feedback for disapproved products upon upload by the admin.
- Integrate machine learning algorithm for precise categorization of scrap materials using Google Teachable Machine.
- Evaluate the system's usability between sellers and buyers using the Post-Study System Usability Questionnaire (PSSUQ).

### **1.3 Significance of the Study**

This project aims to develop a digital marketplace, a web-based application, for selling waste materials. As the middle class in emerging economies grows, there will be a substantial increase in global purchasing power. Upcycling, the process of transforming waste materials or discarded products into higher-quality items, plays a crucial role in this context. This digital marketplace will save time for buyers by allowing them to compare costs and products from a single source rather than contacting each supplier separately. The generalization of this work will significantly benefit both the environment and the general population. Integrating upcycling into this digital marketplace can promote sustainable consumption, reduce waste, and help create a more circular economy, which is crucial for achieving a sustainable future. The findings of this study could have significant implications and be particularly beneficial to the following groups:

**Sellers:** This platform allows sellers to market and sell their abandoned goods without the need to create a separate website. By utilizing this digital platform, sellers will have flexible business opportunities with relatively minimal start-up costs. Moreover, the system will effectively reach its target audience, enhancing their market potential.

**Buyers:** This platform satisfies the demand for reusing materials to create higher-quality or more valuable items without the hassle of extensive online searches for waste materials. The digital marketplace will provide updated information on prices and availability, making it easier for buyers to secure the best deals. Additionally, upcycling fosters creativity, offering buyers a rewarding activity that encourages innovation in repurposing materials. Creating unique items from discarded materials can be fulfilling and environmentally beneficial, reducing their carbon footprint.

**Policymakers:** This study provides valuable insights and practical solutions that can inform and influence public policy. By demonstrating the benefits of a circular economy and the effective use of upcycling, policymakers can develop and implement regulations and incentives to promote sustainable practices. The success of this digital marketplace can serve as a model for similar initiatives, encouraging the adoption of policies that support environmental sustainability, waste reduction, and resource efficiency. Additionally, the study's findings can help policymakers understand the economic and social impacts of sustainable consumption, aiding in the formulation of strategies to enhance environmental protection and resource management.

## **1.4 Scope and Limitations**

This study's scope includes the technical aspects of creating a web-based application for waste materials. The best practices for platform design, development, and implementation are applied in this context, such as writing the code for the system, including the system's essential functions and UI/UX development, and developing a prototype for testing that includes the system's basic functionalities. The scope of this study is limited to three specific types of scrap materials: electronic waste (e-waste), metal, and textile. These materials were chosen based on their significant impact on recycling and repurposing efforts. The implications of using a web-based application for transactions involving repurposing waste materials include convenience for buyers and sellers, cost savings, and improved access to a broader variety of resources.

## **1.5 Definition of Terms**

The following terms are defined conceptually and operationally to understand the study better.

**Artificial intelligence (AI)** is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. Operationally, it refers to the system's encompassed algorithms and data processing that enables pattern recognition, prediction making, and adaptation to new information autonomously.

**Circular economy** is a system in which materials are circulated via reuse, recycling, composting, and maintenance to prevent the generation of waste and regenerate nature (*Circular Economy Introduction*, n.d.). Operationally, it refers to the system that the web application is based on to reduce waste generation.

**Google Teachable Machine** is an AI experiment by Google. It is a web-based tool that makes it fast and easy to create machine learning models without any expertise or coding accessible to everyone. Operationally, it refers to the machine learning tool used in the system for identifying and validating scrap materials.

**In transit** means the item is in the process of being transported and is on its way to the recipient's address. Operationally, it refers to the shipment process of the web application.

**Order completed** means the item has been delivered successfully and received by the customer. Operationally, it refers to the shipment process of the web application.

**Order pending** means the item has been purchased and is awaiting confirmation to be processed from the seller. Operationally, it refers to the shipment process of the web application.

**Order confirmed** is an official confirmation that validates and binds an agreement between the buyer and seller. This lets the customer know that the seller is preparing the item. Operationally, it refers to the shipment process of the web application.

**PayPal** is an electronic e-commerce company that facilitates payments between parties through online fund transfers (Investopedia, 2024). Operationally, it refers to the e-wallet payment method in the web application.

**Recyclable material** is material that can be used to create another material sharing the same or different purpose through the process of recycling (Rinkesh, 2022). Operationally, it refers to the waste class the objects that are being sold in the web application belong to.

**Recycling** is converting waste materials into new or reusable materials and objects for their original or different purpose. Operationally, it refers to the goal of the web application, which is to allow users to recycle waste being commercialized on the platform.

**Upcycling** is the process of taking waste materials and reusing them to create a product of higher quality than the original product. Operationally, this refers to the process the users of the web application can follow after purchasing a product on the platform to reduce waste generation.

**Web application** is an application that is stored on a server and is delivered over the internet through a web browser interface such as Google or Firefox (Contributor, 2023). Operationally, it refers to the application used to achieve a circular economy's goals.

**Waste** is unwanted or unusable remains of a material after it has been fully used or becomes unusable due to becoming defective. Operationally, it refers to the objects sold in the web application that may be reused and recycled to achieve a circular economy.

## CHAPTER II

## **REVIEW OF RELATED LITERATURE AND TECHNOLOGIES**

### **2.0 Literature Review**

Recyclable waste from households has been researched and studied by many countries before. There are proper waste management solutions – each with its advantages and disadvantages. A Swedish case study on the life cycle analysis to determine the Swedish RWH system's advantages and disadvantages was conducted in 2011. Through active and effective recycling and sorting practices, the RWH system was determined to have a more significant positive environmental impact (Bernstad et al., 2011).

The United States Environmental Protection Agency (n.d.) stated that there is a potential for households to generate more waste than before. Families also produce more garbage than usual because they need to properly dispose of waste such as cans, papers, and scrap stainless steel. Additionally, the Philippines has 2.7 million metric tons of plastic waste annually, with 17% of collected waste and 31% of uncollected garbage flowing into the ocean. The government projects that by 2025, around 23.6 million metric tons of waste will be produced from 21.4 million metric tons in 2020 ("Circular Economy Pushed as Philippines Faces Waste Crisis," 2022). Still, there is also an opportunity to focus on waste prevention, increase reuse and recycling efforts, and use food more efficiently. An ordinary plastic bottle, for example, can be broken down into a t-shirt or sweater, a fleece jacket, or jacket insulation, and recycled plastic can also be used to make sleeping bags, backpacks, and carpeting (Team Arcadia, 2017).

From a narrower and local perspective, municipal governments sometimes need help to collect all household waste. Alternative waste management solutions are to be proposed and used.

One of the alternative solutions is community-based waste management or CBWM. This system depends on residents to manage and participate in waste-related matters, such as collecting, transporting, and diversifying waste (Parizeau et al., 2006). A CBWM system typically gathers household waste from individual homes (primary collection) and deposits it into a central area for pickup by the municipality (secondary display). The collection method frequently entails hiring waste collectors or requires homeowners to deliver their garbage to a central place (Ahsan et al., 2009).

A study by Figueroa et al. (2021) described several programs implemented by the Philippines to reduce waste production while also promoting waste management, which was run into a simulation by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) to determine the resource efficiency of the Philippines such as Republic Act 9003 of 2001 or the Ecological Solid Waste Management Act of 2000 which provided ecological solid waste management programs in the Philippines such as the establishment of material recovery facilities (MRFs) to reduce household waste management. Another solution to waste management is the implementation of circular economy strategies to reduce the impact of domestic material consumption, primarily found in households. The Philippines also had the Green Energy Option Programs in which renewable energy is used as an alternative power source. The simulation revealed that the Philippines could reduce domestic material consumption (DMC) by 41.75% from 2000 to 2016, indicating a significant contribution towards the circular economy concept.

Didorosi (2022) adds that millions of tons of scrap metal are sitting unused in garages and basements across the US and may be used to earn money for the people storing scraps. Scraps are always sold at a discount, so manufacturers have an economic incentive to segregate, as Croft and Seay (2014) stated. Selling electronics is also another way to make money from recycling. An

example of this method is selling the phone back to the manufacturer or a private party willing to use it via reusing the device (Earth911, 2018). Other people may also bring these materials to reuse and make new products. According to Osmanski (2020), companies can cut old fabric scraps into rags to clean various machinery and vehicles. Osmanski (2020) has also stated that fabric can be recycled by cutting it up into tiny strips and then turning them into insulation. Companies can then cut up old fabric scraps into rags, using them to clean various machinery and vehicles.

The South China Morning Post article discusses how some Philippine fashion designers use unconventional materials such as plastic waste, newspapers, and rice sacks to create unique and sustainable fashion designs. The article emphasizes that the fashion industry is one of the most polluting industries in the world and that one way to reduce waste and pollution is to use unconventional materials in fashion design. The article also mentions that unconventional materials are frequently less expensive than traditional fabrics, which can help make plans more affordable to consumers. The report also includes some examples of designers' work: (1) Vania Romoff, a designer who created a collection of gowns made from discarded plastic bags collected from the streets of the Philippines. (2) Another designer, Jef Albea, creates unique and sustainable fashion pieces from recycled materials such as newspapers, rice sacks, and plastic bags. This concludes that plastics and other waste materials can still be used to make new products by simply recycling materials to create various items. It also provides people with jobs and economic opportunities. Hence, developing fashion pieces out of recyclable waste is a creative way to make something beautiful while being mindful of our environmental impact (*The Gown That Beauty Pageant Contestant's Wearing? It's Made of Rice Sacks*, 2022).

Making a digital marketplace to buy and sell recyclable wastes shortens the process in the CBWM system because the only people involved are the seller and the buyer. This platform also

helps reduce the gasoline usage of garbage trucks that collect waste. According to new research (*Philippines Petroleum Consumption, 2020-2022* - knoema.com, 2023), the Philippines used 454.33 thousand barrels daily in June 2022. Although the Philippines' oil consumption has fluctuated significantly over the past few months, it has generally increased from July 2021 to June 2022. June 2022: 454.33 thousand barrels per day. With this revealed, the digital marketplace not only helps the environment but also helps in reducing recyclable wastes found in households. With the help of recycling, less waste would be produced, and the valuable lives of recyclables would be significantly increased. Aside from recycling, it also promotes upcycling. Upcycling is the reuse of discarded products or materials in a way that creates a more beneficial effect or is of higher quality than the original (Oxford Learner's Dictionary, 2022).

## **2.1 Recycling and Waste Management**

According to research from Peura (2022), the public is becoming increasingly aware that recycling and trash management are not only necessary but also desired as an opposition to society's "throwaway culture." In a circular economy, waste generation is avoided altogether as it is founded on three design-driven principles: eliminate pollution and waste, distribute goods and supplies (at their highest value), and regenerate nature (Arora & Sagar, 2022). It is supported by a shift to renewable energy and resources (Ellen MacArthur Foundation, 2020). Research from Iceland Liechtenstein Norway Grants (2022) also indicates that a circular economy dissociates the use of limited resources from economic activity. It is a sustainable structure that benefits society, the economy, and the environment (Circular et al.). In general, the circular economy is built on extending the lifespan of products. To do this, current developments are reused, recycled, repaired, and renovated as much as possible while maintaining feasibility. The resources used to make a

product are repurposed at the end of its life cycle to be used again, contributing to the economy for a more extended period.

Recyclable waste has been as essential as the household level of a community and may be a problem if the issue needs to be addressed correctly. Moh & Abd Manaf (2014) stated in their study that at most 70% to 80% of municipal solid waste, commonly referred to as trash or garbage, is found in households in Malaysia. The researchers have also stated that recycling has yet to play a large part in Malaysia's way of life at around 5% compared to the developed countries' recycling rate of 30-47%. However, the government aims to reach the target recycling rate of 22%. This statement means that while recycling may have been implemented, it has not played a crucial role in one's way of life and may cause an environmental problem. Additionally, Huang et al. (2020) substantiate the claim that recycling has not been given attention as stated in their study in which they performed a face-to-face questionnaire survey to determine the public awareness of household solid waste (HSW) recycling in Chinese cities where it was discovered that both knowledge and a general understanding of recycling has been inadequate with manual workers, people with low educational attainment, people with higher monthly income, and the elderly having less knowledge in HSW recycling. In contrast, white-collar workers, those with high educational attainment, and people with lower monthly payments were instead less willing to participate in HSW recycling.

At the national level, it is also observed that waste recycling and treatment are not practiced, and neither are waste reduction and collection. A study that involved monitoring the solid waste management practices of several state universities in CALABARZON concluded that while the state universities themselves are knowledgeable in solid waste

management, the rules for waste recycling and treatment can still be improved with careful planning and have recommended that material recovery facilities (MRFs) should be put up in universities to allow recycling to be practical, functional, and marketable to attract recycling entrepreneurs (Gequinto, 2017). The researcher also added that by having MRFs put up, partnerships with local or private recycling businesses would be established, allowing university utility workers to earn extra income for collecting and segregating waste. This recommendation is supported by Paul et al. (2012), who studied Iloilo City's USWAG Calahunan Livelihood Association Inc. (UCLA), which was formed to answer the complications concerning waste management and a method for the informal sector to earn money. They concluded that integrating the informal sector into the local government's waste management program is feasible. However, they added that additional investment and effort must be made by the municipalities involved with the project.

Locally, the community-based organizations of General Santos City and Sarangani Province initiated several activities supporting Sarangani Bay's coastal resource management (CRM). Calva (2018) reports that the municipalities involved in the study implemented activities such as developing marine protected areas and alternative livelihood projects in coastal waters in Sarangani Province, while General Santos City focuses on coastal clean-ups, "bantay-dagat" which refers to sea patrol units that monitor the waters of Sarangani Bay, and solid waste management. While it is reported that the success is supported by local government units (LGUs), national government agencies, civil society groups, and other institutions that participated in supporting the cause, financial and technological support has been the topmost hindering factor as Calva (2018) has stated that there is a need for people with selfless commitment and dedication in

participating in these services despite a lack or absence of income for an organization that focuses on maintaining the CRM of Sarangani Bay. This problem, however, can be addressed via external support from stakeholders who wish to support their project in preserving the CRM as seen in the success stories of Cabog Fisherfolks and Farmers Multi-Purpose Cooperative (CAFIFAMCO) and Muslim-Christian Marginalized Fisherfolks Organization (MCMFO) described in the article. Although this does not include a method of earning income regarding waste management, financial support allows people to participate in waste management to address the environmental issues that may be caused by waste in the community.

## **2.2 Electronic Waste**

Electronic waste, also known as e-waste, is the term used to describe discarded electronic devices and appliances that are no longer functional or have reached the end of their intended use. According to Widmer et al. (2005), e-waste is becoming more of a problem given the volume of electronic waste generated and the abundance of harmful and valuable components in it. Furthermore, according to Heacock et al. (2016) estimated globally to be 41.8 million tons of e-waste were generated in 2014. Its handling and disposal in developing countries are frequently unsafe and result in contaminated environments.

E-waste is often shipped to developing countries, where it contributes to pollution and other environmental issues. Additionally, in the study of Needhidasan et al. (2014), electronic gadgets are meant to make our lives happier and more straightforward. Still, its toxicity makes their disposal and recycling a health nightmare. Most users must be aware

of the potential negative impact of the rapidly increasing use of computers, monitors, and televisions.

The use of electronic devices has expanded in recent decades, and the quantity of electronic devices disposed of, such as PCs, mobile phones, and entertainment electronics, is increasing rapidly worldwide. Moreover, in the study of Widmer et al. (2005), valuable materials such as gold and copper can be found in e-waste such as personal computers, laptops, mobile devices, etc. The recovery of these materials from e-waste has evolved into a profitable business, resulting in global, cross-border e-waste trade. Countries like China and India are dealing with an increasing amount of e-waste, domestically generated and illegally imported. This material flows from waste imports provide a business potential for emerging markets and meet the demand for cheap second-hand electrical and electronic equipment (Widmer et al., 2005).

In the Philippines, based on the findings of Carisma (2019), there are four primary modes of final electronic disposal: reused, recycled, stored, and landfilled. However, no official or unofficial data is available that determines the volume or percentage of the e-waste stream that goes to a specific mode of disposal. For most waste types, landfilling remains the most popular final disposal method, including e-waste, particularly those not captured by informal recyclers for further processing. Metropolitan Manila and its surrounding provinces currently need more landfill space for municipal waste, and indiscriminate solid waste disposal is ordinary. Municipal solid waste mixed with e-waste scraps may end up in creeks, ravines, and water bodies, potentially contaminating the soil and water. Electronics contain many hazardous and toxic materials, and continued improper disposal could pose a severe public health risk.

General Santos City is currently a growing city in population and economic development. Considering the downside of progress, pollution and garbage generation must be controlled to avoid a threat to the environment. In the study of Robles (2015), General Santos City frequently employs proper waste management. The observation implies they still need to fully absorb good waste management practices. Any unintended contamination could have an impact on people's health.

### **2.3 Textile Waste**

Textile waste, or textile waste streams, refers to discarded clothes, fabrics, and other material products that are no longer used or needed. The issue of textile waste is becoming increasingly pressing as the global population continues to grow and consume more clothing, leading to a significant increase in textile waste (Flynn et al., 2017). According to the United Nations Environment Programme, the textile industry is one of the most polluting industries in the world, and the global production of textiles generates 1.2 billion tons of CO<sub>2</sub> emissions per year (UNEP, 2018). Furthermore, textile waste can negatively impact the environment and human health due to hazardous chemicals in the dyes and finishes used in textile production (European Commission, 2019).

One of the most wasteful consumer sectors in the world is fashion. Apparel has changed from a durable item to an everyday buy with the introduction of fast fashion, stylish, affordable clothing made by international fashion labels. The idea of the circular economy, a framework for a more effective, closed-loop economy, has recently become a crucial step toward developing a more sustainable and waste-free fashion industry.

The fashion industry has seen a significant transition during the past 30 years. Fast fashion has taken over as the primary method of production and consumption in the modern

fashion industry thanks to innovations in global supply chains (Tokatli, 2008), lean retailing (Abernathy et al., 1999), digitization (Crewe, 2017), and direct-to-consumer online retailers (Wood et al., 2019). Fast fashion has transformed clothing from a durable good to a daily purchase for many consumers (cf. Barnes and Lea-Greenwood, 2006; Bhardwaj & Fairhurst, 2010; Bick et al., 2018; Pal & Gander, 2018; Tokatli, 2008), who enjoy the "thrill" of the deal and frequently shop to restock their closets (Beard, 2008; Leslie et al., 2014). The frequency of wearing a clothing item has reduced as garment production has increased (European Environment Agency, 2014; Ellen MacArthur Foundation, 2017). As a result, according to various estimates, the business produces enormous volumes of trash, which has led to a problem in social and environmental sustainability (Bick et al., 2018).

According to research done in Ontario, 27% of participants said they cleaned their closets regularly, 27% said they did it in the spring and fall, and 28% said they did it when they realized they had things they did not want or need anymore (Weber, 2015). Additionally, Nrup et al. (2018) assert that because apparel and home textiles are rarely thrown away every day, a high sample size regarding volume and amount is required to quantify textile waste. To better understand the causes of textile waste, it is necessary to consider both aspects.

Many Australian nongovernmental organizations (NGOs) and fashion and textile producers are also becoming more aware of the need to reduce the issue of fashion waste by handling such waste primarily through recycling and upcycling (Bianchi & Birtwistle, 2010; Kant Hvass, 2014). The current study is based on a project a regional Australian mattress manufacturer started inside their Melbourne production plant. The producer is a

well-known company with over a century of experience making mattresses, pillows, blankets, and other bedding accessories. The company's children's bed is one of its best-selling items, and Australian customers are drawn to it because it uses wool.

Over the past ten years, clothing sales have risen dramatically in the Philippines while global apparel consumption has been falling. The country can see a global surge in apparel sales because, since 2012, foreign garment imports have significantly outpaced domestic exports. While millennials purchase more than 50% of the new items they own within a year, 29% of Filipinos discard their clothing after only one use. (Sustainability.ph, n.d). Just picture the volume of textile waste produced by these consumer practices, given how frequently Filipinos buy and discard apparel. Since this purchasing behaviour is also accepted, the creation of garments will continue contributing to water pollution and laundry-related plastic waste. 2017 YouGov Omnibus research showed that the negative impact of fast fashion—mountains of disposable clothing thrown away in landfills—has already reached the Philippines as more Filipinos buy new garments and throw away old ones every year. According to statistics, 64 percent of Filipino people threw away clothing at some point between 2016 and 2017, and 24 percent threw away more than ten pieces of apparel during that time.

The Philippine textiles industry has strategies for achieving sustainability by implementing environmentally friendly production processes, using sustainable materials, and promoting fair labor practices. Companies may also focus on reducing their carbon footprint, conserving resources, and promoting circular economy practices. Implementing certifications such as GRS, OEKO-TEX, and organic cotton can also be a way for textile companies to demonstrate their commitment to sustainability. Collaborating with NGOs

and other organizations to promote sustainable practices and educate the public about sustainable textiles is also essential. However, everyone must participate for it to happen, including producers, critics, and customers.

## **2.4 Metal Waste**

According to Britannica (2021), scrap metal is a term used to describe used metals that are a significant source of industrial metals and alloys, particularly in manufacturing steel, copper, lead, aluminium, and zinc. Tin, nickel, magnesium, and other precious metals are recovered in small quantities from scrap. Scrap metal is commonly used in the manufacturing process of these metals and alloys, and the recovery of these materials from waste helps to conserve natural resources and reduce the environmental impact of mining and refining new metals. The effect of metals on the environment is significant due to the large amounts of waste produced during manufacturing. Conventional recycling methods such as melting result in high metal losses and environmental pollution, as well as high energy consumption and operating costs. New techniques such as pulverizing and sintering have been proposed to increase recycling efficiency and reduce environmental impact. The direct conversion method has resulted in significant material, energy, and labor savings and potentially recovered a substantial amount of metal from chips. Additionally, investigations have been conducted on strengthening particles to improve the properties of extruded final products. Recycling metal products is crucial for environmental protection and resource conservation (Gronostajski & Matuszak, 1999).

The recycling of metal waste, specifically aluminium chips, is a process that has been developed in recent years to produce sintered products with pre-determined

properties. However, the conventional recycling process (CRP) of chips is carried out with a melting phase as a fundamental step which can result in high metal losses, high energy consumption, and high operating costs. The CRP of chips is characterized by low recovery efficiency due to melting loss and post-melting waste processing, as well as environmental contamination caused mainly by fumes formed during the melting stage. Other chip recycling methods beyond dissolving have recently attracted more attention. Examples include pulverized chips treated through sintering and hot working or comminuted chunks processed through direct conversion. This applies to iron, copper, and their alloys, in addition to aluminium and its alloys. The natural conversion method results in 40% material, 26-31% energy, and 16-60% labor savings (“Conserve Energy Future,” 2022).

According to new research, recycling metal is a necessary process that helps to conserve natural resources, reduce energy consumption, and protect the environment. By recycling metal, the researchers could extract valuable metals from used products, reducing the need to mine for new metals. This conserves natural resources and reduces the environmental impact of mining and refining contemporary metals (“Conserve Energy Future,” 2022).

One of the most significant benefits of recycling metal is reducing greenhouse gas emissions. When metal is extracted from ore, it requires considerable energy to process and refine. This energy is usually generated by burning fossil fuels, which results in the release of greenhouse gases. Recycling metal can significantly reduce the energy required to produce new metal products and reduce greenhouse gas emissions (“Conserve Energy Future,” 2022).

Recycling metal also saves energy and money. When new metal is produced, significant power is required to extract the metal from ore and refine it. However, when recycling metal, the energy required is significantly less. This means recycling metal is more energy efficient and less expensive than producing new metal. Recycling metal can save manufacturers money because recycled metal is often cheaper than new metal (“Conserve Energy Future,” 2022). Recycling metal is a necessary process that significantly benefits the environment and the economy. It helps to conserve natural resources, reduce energy consumption, and protect the environment.

In research from Dapilos (2022), Makati Development Corporation (MAP) provides information on the "Waste-to-Energy" program in the Philippines, which aims to turn waste into energy using waste-to-energy (WTE) technology. Metal waste is a type of waste that can be recycled and turned into energy with WTE technology. There are also other ways to make these metals into new products. According to the article Conserve Energy Future (2022), there are several ways to recycle metal and turn it into new products or energy:

- 1.) **Melting:** Metal can be melted and used to produce new products such as cans, car parts, and construction materials.
- 2.) **Shredding:** Metal can be shredded and used to produce small pieces used in various products, such as steel beams, pipes, and wire.
- 3.) **Incineration:** Metal can be burned in an incinerator to generate heat and electricity.

4.) **Gasification:** Metal can be gasified and used to produce syngas, which can be used to generate electricity or plant chemicals.

5.) **Chemical Recycling:** Metal waste can be transformed into chemical compounds to produce new materials or chemicals.

6.) **Biological and Physical Treatment Methods:** Metal waste can be treated biologically or physically to recover the metals.

## 2.5 Google Teachable Machine Image Model

Google Teachable Machine (GTM) is a web-based tool made by Google Creative Lab which serves as a fast and easy way to create machine learning models by entering images, sounds, and poses without requiring any code involved in machine learning which can be easily exported to be used for websites, apps, and other technologies (Google Creative Lab, 2019). The tool is based on Tensorflow.js which is an open-source JavaScript library for training and deploying machine learning models and serves as the JavaScript version of the original TensorFlow library in Python (*TensorFlow.js Guide*, n.d.).

As of to date, GTM has three machine learning models that can be generated using the tool: an image model which learns based on fed images through image files or webcam images, an audio model which learns based on one-second sounds coming from audio files or microphone audio, and a pose model which learns similarly to the image model via image files or webcam images but emphasizes on the figure's posture instead of the object presented in the image.

In an image model, the model recognizes the object of the image based on what it learned from the images it was fed with using a deep learning algorithm called Convolutional Neural Network (CNN) which is designed for object recognition such as image classification, detection, and segmentation (Keita, 2023). This algorithm is being applied to real life through self-driving cars, surveillance cameras, and other internet of things (IoTs) and as such CNN plays an important role in the technological field.

Keita (2023) adds this by highlighting its capabilities such as an automatic feature extraction which extracts the features from its images without requiring human interaction which makes it efficient. CNNs can recognize patterns from data and extract features regardless of its orientation through its convolutional layer which serves as the filter in extracting relevant patterns in feature extraction. CNNs are also capable of non-image classification such as speech recognition and time series analysis, making the network flexible depending on what is needed for the model.

The training of an image model in GTM is done by grouping objects of similar nature in one class which is named based on what object is in the images. These images can be taken from datasets containing image files or through the webcam captures. Once a set of classes were established, settings involved in model training such as sample epochs, batch sizes, and the model training rate can be adjusted to fit the needs of the system where the sample epoch serves as the number of times the model goes through the given samples, the batch size serves as the number of sets the samples are divided into in an epoch, and the learning rate serves as the control on the speed of the model learning based on the given samples when training. After setting configurations on its training settings, the model can

be trained based on the provided samples and training settings which result in a provided TensorFlow.js model with its learnings based on the settings it was provided.

## **2.1 Review of Related Existing Online Marketplaces**

Several existing online marketplace applications currently exist and are being used commercially. The researchers have reviewed and identified how these existing online marketplace applications work and have studied the essential functions of these applications to help provide a better understanding of the subject matter.

The following are the systems the researchers have reviewed:

- a. Amazon
- b. Craigslist
- c. eBay
- d. Etsy
- e. ScrapMonster
- f. Facebook Marketplace

### **2.1.1 Amazon**

Amazon is a global online marketplace where people and companies can sell and buy various products and services. A linear economy, in which resources are extracted, consumed, and then discarded as trash, can result from Amazon's business strategy, primarily selling new products. Amazon does not explicitly focus on the sale and procurement of reusable and recyclable materials in favor of a circular economy, even if it does provide some products manufactured from recycled materials and opportunities for customers to recycle their products through the Amazon recycling program.

Furthermore, Amazon has been criticized for its environmental impact and lack of transparency in its sustainability practices. The company has faced criticism for its large carbon footprint, particularly about its shipping and logistics operations, and for the amount of packaging waste generated by its products.

### **2.1.2 Craigslist**

Due to its user-friendly layout, substantial user base, and broad range of categories, Craigslist has developed into an entire marketplace for buying and selling recyclable materials. Users can quickly locate recyclable materials online because of their wide varieties. For instance, the subcategories "Materials," "Free stuff," and "Arts & Crafts" are all related to recycling and repurposing materials and can be found under the "For Sale" category. This makes the website user-friendly and an effective platform for buying and selling recycled goods because it makes it simple for users to explore and locate what they are looking for.

The popularity of Craigslist as a marketplace for buying and selling recycled materials is primarily due to the platform's vibrant user community, which is dedicated to recycling and repurposing items. By often exchanging knowledge and materials about where to find and how to recycle things, this user community promotes more participation in the recycling process. Unfortunately, spammers routinely target Craigslist, posting false ads or bombarding consumers with spam. Users may need help identifying legitimate adverts as a result.

### **2.1.3 eBay**

eBay, a global online market, is an increasingly popular site for purchasing and selling recyclable commodities like scrap metal, plastic, and paper. The portal offers a wide

range of categories and a sizable user base for people and companies wishing to buy or trade recyclable products. Additionally, consumers and sellers feel confident in transactions thanks to eBay's reputation as a trustworthy and safe marketplace.

eBay, however, could be better, just like every other internet market. A specific section for recycling materials is one of the critical negatives because it can make it more difficult for buyers and sellers to find the resources they are looking for. Additionally, the platform's auction-style structure may require more work for buyers and sellers to locate fair-priced items.

#### **2.1.4 Etsy**

Etsy is a global online platform that allows individuals and small businesses to sell handmade, vintage, and unique goods. It demonstrates the potential and challenges of creating an online marketplace that connects buyers and sellers of unique and specialized interests. The marketplace has a wide range of repurposed waste materials, such as furniture and home decor items made from reclaimed wood, clothing and accessories made from recycled textiles, and jewelry made from upcycled materials.

The platform has created a community of users who value and appreciate using repurposed materials in their purchases. However, some sellers have reported that it takes work to see their products seen by potential customers, particularly for new sellers, which can make it challenging to build a customer base.

#### **2.1.5 ScrapMonster**

An international online market called ScrapMonster specializes in purchasing and selling scrap materials, mainly scrap metal recycling. The website offers various services, such as market analysis, scrap prices, and a list of scrap yards and recycling facilities. It is

a practical and effective platform for purchasing and selling recyclable materials because users may post and search for advertising for scrap materials.

However, there are a few issues with ScrapMonster that users need to be aware of. The platform's primary concentration on scrap metal and metal recycling, which restricts the range of materials accessible for purchasing and selling, is one of its significant downsides. Additionally, not all countries have access to the platform, which may make it challenging for buyers and sellers from some locations to use it.

### **2.1.6 Facebook Marketplace**

Facebook Marketplace is a digital platform that has emerged as a significant player in the online marketplace industry. Since its launch in 2016, Facebook Marketplace has become a popular destination for buying and selling various goods and services, from household items and electronics to cars and real estate. The platform allows users to quickly and easily list waste materials for sale, and potential buyers can search for and purchase these materials with just a few clicks. This makes it a convenient and accessible option for individuals and small businesses who may not have access to more traditional waste management channels.

However, several flaws are associated with Facebook Marketplace as a platform for repurposing waste materials. One of the biggest challenges is ensuring that the sold materials are safe and appropriate for repurposing. Unlike traditional waste management channels, Facebook Marketplace does not have the same regulatory oversight or quality control measures to ensure that sold materials are safe for use. Additionally, there is a risk of fraud and misrepresentation on the platform, with some users misrepresenting the quality or safety of sold materials. This can lead to potential safety hazards or legal liabilities for

buyers and sellers. Another challenge associated with Facebook Marketplace is the limited geographic reach of the platform. While the platform has a large user base, it may not be accessible or relevant to all potential buyers and sellers, particularly those in rural or remote areas.

Comparison of Related Systems vs. General Santos City's Web-Based Application for Scrap Materials' Transactions

Marketplaces	Homepage Listing	Item Details	Messaging	Purchase/Sales History	Item Status	Database to store information	AI Integration	Recyclable Materials Focus	Shipping Integration	Printable Sales Reports
Amazon	Available	Available	Available	Available	Available	Available	Not Available	X	Available	Available
Craigslist	Available	Available	Available	Not Available	Available	Available	Not Available	X	Not Available	Not Available
eBay	Available	Available	Available	Available	Available	Available	Not Available	X	Available	Available
Etsy	Available	Available	Available	Available	Available	Available	Not Available	X	Available	Available
ScrapMonster	Available	Available	Available	Not Available	Not Available	Available	Not Available	✓	Not Available	Not Available
Facebook Marketplace	Available	Available	Available	Not Available	Available	Available	Not Available	X	Available	Not Available
APPCycle by MSU -GSC	Available	Available	Available	Available	Available	Available	Available	✓	Not Available	Available

**Table 1** Comparison of the Proposed System's Features vs Related Systems

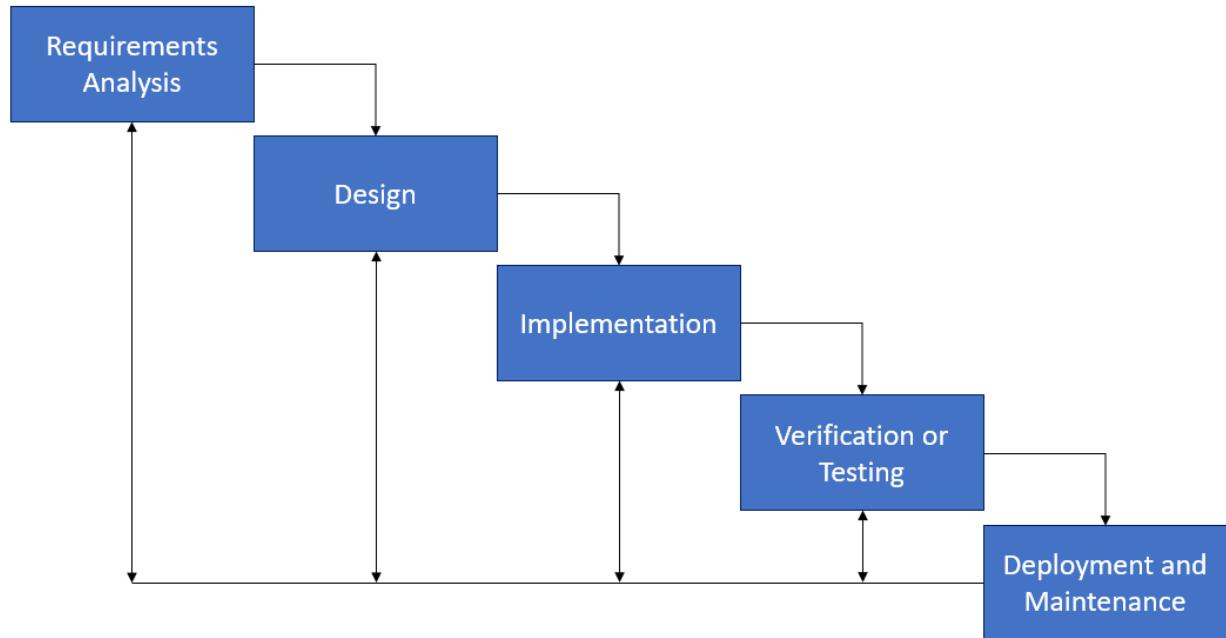
Based on the data shown in Table 1, Amazon, eBay, Etsy, and Facebook Marketplace are popular online marketplaces offering various features for listing, viewing, and purchasing items. All four platforms have a homepage listing feature that allows users to browse items for sale and detailed item pages that provide information about each product. All four platforms also have messaging systems enabling buyers and sellers to communicate and purchase, and sales history features allow users to track their transactions. However, as it enables users to buy and sell any material, it is not a marketplace primarily focused on recyclable resources. On the other hand, Craigslist is a more basic marketplace that needs some of the more advanced features offered by Amazon, eBay, and Etsy. For example, while Craigslist does have a homepage listing feature and item details pages, it does not have a messaging system or a purchase/sales history feature. ScrapMonster is a recycling-focused marketplace similar to Craigslist in that it lacks some of the more advanced features offered by the other platforms. For example, it does not have a messaging system or a purchase/sales history feature and also does not have a feature that allows users to track the status of their items. As for the downloadable sales reports, Amazon, eBay, Etsy, and APPCycle by MSU-GSC offer this capability whereas Craigslist, ScrapMonster, and Facebook Marketplace lack this feature. Lastly, APPCycle by MSU-GSC is a web-based application for recyclable materials transactions in the General Santos City area. Although it seems to offer many of the same features as the other platforms, such as homepage listing, messaging, item details, and purchase/sales history, printable sales reports, what sets it apart from the other platforms is that it places more emphasis on recycling because its application is geared toward the online sale and purchase of reusable materials. Additionally, APPCycle by MSU-GSC utilizes an AI model in product listing as a way to identify and validate scrap materials.

Features that APPCycle by MSU-GSC has over the other existing platforms:

- **Recyclable Materials Focus:** As the table indicates, APPCycle by MSU-GSC specifically focuses on recycling materials. Therefore, it may have a more dedicated user base and a more specialized selection of products.
- **AI Integration:** This feature in APPCycle sets itself apart from other existing platforms because it applies a machine learning model made using Teachable Machine which functions as a verifier of the user's image input when submitting an entry to the system to verify whether or not the item in the image is classified as one of the recyclable wastes trained in the model as a way to simplify the identification of recyclable waste by submitting an image of the item and allowing the trained model to identify and classify the item captured in the image. Accordingly, it serves its purpose in the system by simplifying the identification process instead of having to manually identify the material due to the model handling the identification process instead of the user.

## CHAPTER III

### METHODOLOGY



**Figure 1.** Iterative Waterfall Model

The researchers used the Iterative Waterfall Methodology to develop the application. The researchers chose this methodology as it provides a straightforward process to follow by establishing the phases the research must undergo to complete the process. It also shows a clear end goal by defining the methodology's expected result while providing information on the flow of the method in each phase. Additionally, going back to previous phases allows the researchers to revisit and polish the earlier steps in case revisions involving the actions mentioned above are introduced later in the methodology. The model uses the traditional waterfall model but enhances the process by using feedback paths or cycles called iterations on every phase, acting as mini-waterfall models that enable the developers to go back to any previous phase before the current phase in development for any possible corrections that may be present during development,

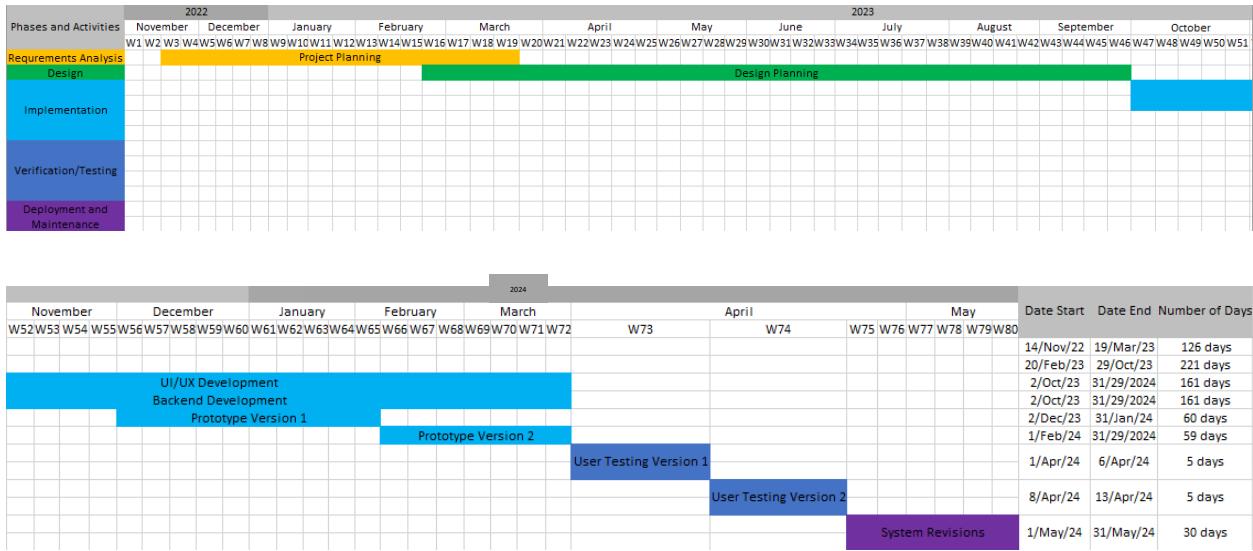
overcoming the main drawback of the traditional waterfall model (Kaur & Kumar, 2015). The model's capability of going back a phase for possible revisions is based on the characteristic of the iterative development model in which it is a rework rescheduling strategy that sets aside the time spent in development to revise and improve parts of the developing system by going through several cycles (Okesola et al., 2020). The Iterative Waterfall Methodology has five (5) steps: Requirements Analysis, Design, Implementation, Verification/Testing, and Deployment and Maintenance.

<b>Objectives</b>	<b>Activities</b>	<b>Results</b>
<p>1. To create a homepage that displays a list of available items for purchase or sale with detailed information about the items listed on the web application, such as the item's category, description, price, quantity, and as well as the seller's information.</p> <p>2. To manage personal information as well as their shop profile, check item status tracking, add new products, and view</p>	<p>1. Requirements Analysis</p> <p>2. Design</p> <p>3. Implementation</p> <p>4. Verification/Testing</p> <p>5. Deployment and Maintenance</p>	APPCycle: AI-Assisted Web Application for the Sale and Purchase of Scrap Materials in Support of the Circular Economy

<p>and print transaction history.</p> <ul style="list-style-type: none"> <li>3. To enable direct communication via messaging features between users and sellers.</li> <li>4. To maximize machine learning for precise scrap material categorization.</li> <li>5. To facilitate admin-side management with PayPal and API SMS configuration.</li> <li>6. To offer remarks for disapproved products upon upload for sellers by the admin.</li> </ul>		
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**Table 2 System's Objectives, Activities, and Results**

Table 2 describes the objectives the project achieved at the end of its development, the activities the project underwent to achieve its goals, and the project results produced at the end. The objectives column contains the objectives the researchers achieved for the project's success. The activities column contains the phases or steps the project underwent to meet its goals and produce its results. The results column contains the expected output of the project, which is an online marketplace used for repurposing recyclable waste material.



**Figure 2. Phases of the System's Development GANTT Chart**

Figure 2 describes the GANTT Chart for the schedules as to when a phase of the methodology was performed. The researchers started with the development of the system by gathering the necessary information required to develop the system. In the requirements analysis phase highlighted in yellow, the researchers first planned on the development of the system by looking for current issues that may be addressed by technology in which recyclable waste management is selected to be addressed through conducting a pilot interview for needs analysis.

In the design phase highlighted in green, the researchers planned the system model with the use case, activity, and entity-relationship diagrams as a guide in creating the system. The development of the system was based on the structure made from the gathered and analyzed data from the interviewees. After completed, the developers proceeded with the implementation phase.

The researchers simultaneously began developing the system's UI/UX and backend during the implementation phase, highlighted in light blue. After the system had the essential functions

implemented, the developers developed the prototype version one (1) of the system. After creating a prototype version 1 for the system, the researchers also initiated the verification or testing phase highlighted in blue, where the researchers conducted user testing for the prototype and improve the system based on the suggestions given during the testing phase of the prototype. The researchers returned to the implementation phase to implement the changes and recommendations regarding version 1 to develop a prototype version two (2) for the system. The same testing procedure was done for the prototype to receive additional suggestions and determine if the recommendations from the previous testing were achieved.

After both the implementation and verification phases were complete, the researchers proceeded to the deployment and maintenance phase, highlighted in purple, in which minor system revisions that improve the developed product are implemented alongside performing system maintenance to ensure the system is stable after its implementation.

### **3.1 Iterative Waterfall Methodology Model**

The Iterative Waterfall Methodology Model was used as the basis of the development phase of the proposed system. This model incorporates loops or iterations into the traditional waterfall model, which enables developers to go back to a previous phase if any corrections in the past phases are present. The developers used the Iterative Waterfall Methodology Model as it allows any potential change that might occur during development without the risk of the rigidity of the traditional waterfall model. This is due to the idea that during the development of the system, the project's designs and functionalities change based on the suggestions to the system and from the users who suggested the changes to the system.



## **3.2 Requirements Analysis**

The developers' requirements analysis phase helps inform how the system development will proceed. Alshamrani & Bahattab (2015) describe this phase as the phase in which the agreement between the client and the developers regarding the software specifications and features will be established. This phase began by identifying a current issue that technology may answer. It was then followed by interviews with individuals through a questionnaire (refer to **Appendix C** for the pilot interview survey questionnaire).

### **3.2.1 Inclusion Parameters for Pilot Interview (Needs Analysis)**

- **Sellers/Buyers of Recyclable Materials** – Individuals who are actively involved in buying/selling recyclable materials.
- **Interested in Upcycling/Recycling** – People who are interested in upcycling/recycling waste materials, showing a commitment to sustainable practices.
- **Possess Scrap Materials** – Individuals who have scraps in their households but are unsure about how to manage or dispose of them effectively.
- **Knowledgeable about Digital Marketplaces** – People who are familiar with the functionalities and usage of digital marketplaces, indicating a level of comfort for proficiency in online selling/purchasing platforms.

Once completed, the data gathered in this phase was analyzed by the researchers to determine the project's objectives based on the responses of the interviewed individuals.

### **3.3 Design**

The design phase conceptualizes a process as to how the user will be able to navigate through the application based on the critical information gathered in the requirements analysis phase, which is essential in developing the application. This includes the conceptual database schema, logical diagram design, and data structure definition of the conceptualized application (Alshamrani & Bahattab, 2015). The developers conceptualized the system functions and structure using use case systems, activity diagrams, and the entity-relationship diagram to visualize the required parts of the system after analyzing the data gathered from the previous phase. The researchers created use case systems to determine the actions the users of the system are expected to be able to do when the system is fully functional. The researchers also used activity diagrams to understand better how a use case functions within the system by showing its data flow. Lastly, the researchers created an entity-relationship diagram as a framework for the system. The use case and activity diagram flow through the business processes involved in the system (refer to **Appendix B** to see the system's use case diagram, activity diagrams, and entity-relationship diagram).

### **3.4 Implementation**

The implementation phase involves writing the code for the system, including the system's essential functions and UI/UX development, and developing a prototype for testing that includes the system's basic functionalities. The code created in this phase based its features on the collected data in the Requirements Analysis phase and the concept design created during the Design phase (Alshamrani & Bahattab, 2015). The researchers began this phase by developing both the UI/UX

and the system's backend; once the essential functions had been developed, the researchers proceeded with user testing for the first prototype. After the first user testing, the researchers went back to this phase and continued developing while implementing the suggestions and adding missing functions to the system based on the results of the first user testing. After these suggestions and new procedures were implemented, the researchers proceeded with the second user testing involving the improved prototype from the first prototype, hoping to achieve the tips raised while also aiming for the general objectives set by the researchers.

### **3.4.1 AI Model**

The AI model for the system was trained using datasets obtained from Kaggle, a prominent data science platform hosting a variety of machine learning datasets. These datasets included images of scrap materials categorized as e-waste, metal, and textile, which were used in the web application.

After downloading the necessary image files from these online datasets, the development process began by selecting the standard image model option in the New Project tab of Google Teachable Machine. The proponents then defined three classes for image recognition, corresponding to the three categories of scrap materials in the system: e-waste, metal, and textile.

The model's learning settings were adjusted to optimize performance. The following parameters were configured:

- Epoch count: 80 epochs
- Batch size: 16 samples per batch
- Learning rate: 0.001

With these settings in place, the images were fed into the model according to their respective classes: 3,288 images for the e-waste class, 3,244 images for the metal class, and 3,254 images for the textile class, totaling 9,786 images for training. Once the training process was complete, the model was exported using the Export Model option, which allowed the proponents to upload the trained model to Google's servers and obtain a shareable link for integration into the system. A sample script was provided to test the AI model on a simple HTML page, demonstrating its functionality.

For integration into the product listing form on the seller's side, the script was modified to use file submission instead of a webcam for image validation. The model's identification was also adjusted to return a value corresponding to the three classes based on the highest predicted value. This value was used to verify whether the image matched the seller's selected category, ensuring accurate categorization of scrap materials.

### **3.5 Verification/Testing**

According to Alshamrani & Bahattab (2015), the verification or testing phase involves testing the system and checking the developed system if it meets the original requirements of the clients through evaluation forms. The researchers conducted two testing sessions: one for version one (1) prototype, which has the minimum functions of the system, and another for the version two (2) prototype, which has added functions and implemented suggestions from the first user testing. The researchers started the verification phase by testing the version 1 prototype of the system once version 1 of the prototype has been developed during the implementation phase. The user testing for the version 2 prototype commenced after the version 2 prototype has been created,

including the suggestions from the first user testing session and added functions not implemented during the first user testing. To determine how well the prototypes performed, a questionnaire (refer to **Appendix B** for the System Usability Scale testing survey questionnaire) was given for the testers to fill out based on their experiences with the prototypes used for both user testing sessions).

### **3.5.1 Qualifying Parameters for Usability Testing**

- **Sellers/Buyers of Recyclable Materials** – Individuals who are actively involved in buying/selling recyclable materials.
- **Interested in Upcycling/Recycling** – People who are interested in upcycling/recycling waste materials, showing a commitment to sustainable practices.
- **Possess Scrap Materials** – Individuals who have scraps in their households but are unsure about how to manage or dispose of them effectively.
- **Knowledgeable about Digital Marketplaces** – People who are familiar with the functionalities and usage of digital marketplaces, indicating a level of comfort for proficiency in online selling/purchasing platforms.

### **3.5.2 System Usability Scale (SUS) Testing Framework**

To determine whether the web application has achieved its objectives, the proponents utilized the System Usability Scale (SUS) framework to evaluate the usability of the web application through the responses of the participants in the web application testing. The SUS is a scale created by John Brooke in 1986 that serves as a “quick and dirty” tool for measuring the usability of a product (Department of Health and Human Services, n.d.). The scale comes in the form of a 10-item

questionnaire with 5 response options ranging from Strongly Agree to Strongly Disagree. For this test, the 10 questions in the questionnaire are as follows:

1. Overall, I find the APPCycle web application is easy to use.
2. The registration and login process is direct and user-friendly.
3. I find it easy to navigate between different sections of the APPCycle web application.
4. The design of the APPCycle web application is visually appealing.
5. Completing a sale or purchase transaction in the APPCycle web application is efficient.
6. The notification system for transactions on the APPCycle web application is timely and informative.
7. I feel confident about the security of my personal information on APPCycle.
8. The Google Teachable Machine accurately identifies scrap materials upon upload.
9. Integrating Google Teachable Machine enhances my experience identifying and selling scrap materials.
10. The performance of the Google Teachable Machine on the web application meets my expectations.

After the data has been gathered by the participants, the responses are converted into numbers with strongly disagree at 1 and strongly agree at 5 which will be used to determine the SUS score which represents the level of usability the application has. However, in the case in which all of the questions do not alternate between positive and negative statements, the scale is converted from 0 to 4 for strongly disagree and strongly

agree respectively, following the calculation for positive statements in which their scores are subtracted by 1 to get their response value (Lewis and Sauro, 2018). There are three formulas to be used which are the individual statement SUS score, participant SUS score (*System Usability Scale*, n.d.), and the mean SUS score which are as follows:

$$\text{SUS score of selected statement} = \left( \frac{\text{sum of all scores from selected statement}}{\text{sample size}} \right) * 25$$

$$\text{Participant SUS score} = \text{sum of all scores from statements} * 2.5$$

$$\text{Mean SUS score} = \frac{\text{sum of all SUS scores from respondents}}{\text{sample size}}$$

Once the data has been converted and computed, the score is then compared to the average usability score of 68 to determine whether the participants agree on the application's usability with the higher score signifying a good level of usability. On the other hand, scores below 68 signify that the application has a poor level of usability and should be revised with the given issues that were raised by the participants during testing (Bhat, 2023). Note that while the score may reach up to 100, the score does not represent the percentage but rather the percentile ranking of the sample (Department of Health and Human Services, n.d.).

### **3.5.3 System Usability Scale (SUS) Post-Study Testing Framework**

The SUS post-test functions similarly to the SUS pre-test in which it measures the usability of a product but instead is performed after the study which includes the improvements of the system from the SUS pre-test. The scale comes in the form of a 16-item questionnaire with 7 responses ranging from Strongly Agree to Strongly Disagree (*PSSUQ (Post-Study System Usability Questionnaire)*, 2021). The post-test has two questionnaires corresponding to the buyer and seller users.

For the seller, the questions are as follows:

1. Overall, I am satisfied with how easy it is to use APPCycle.
2. It was simple to use APPCycle.
3. As a seller user, I was able to complete the tasks and scenarios quickly using the seller interface in APPCycle.
4. I felt comfortable using APPCycle.
5. It was easy to learn to use APPCycle.
6. I believe I could become productive quickly using APPCycle.
7. As a seller user, the system gave error messages that clearly told me how to fix problems.
8. Whenever I made a mistake using the system, I could recover easily and quickly.
9. The information (such as online help, on-screen messages, and other documentation) provided for the seller interface in APPCycle was clear.
10. As a seller user, it was easy to find the information I needed.

11. As a seller user, the information, including Google Teachable Machine Image Validation, was effective in helping me complete the tasks and scenarios.
12. The organization of information on the system screens was clear.
13. The interface of APPCycle for sellers was pleasant.
14. I liked using the interface of APPCycle.
15. As a seller user, APPCycle has all the functions and capabilities I expect it to have.
16. Overall, I am satisfied with the seller interface in APPCycle.

For the buyer, the questions are as follows:

1. Overall, I am satisfied with how easy it is to use APPCycle.
2. It was simple to use APPCycle.
3. As a buyer user, I was able to complete the tasks and scenarios quickly using APPCycle.
4. I felt comfortable using APPCycle.
5. It was easy to learn to use APPCycle.
6. I believe I could become productive quickly using APPCycle.
7. As a buyer user, the system gave error messages that clearly told me how to fix problems.
8. Whenever I made a mistake using the system, I could recover easily and quickly.
9. The information (such as online help, on-screen messages, and other documentation) provided with APPCycle was clear for buyers.
10. As a buyer user, it was easy to find the information I needed.

11. As a buyer user, the information, including making transactions, was effective in helping me complete the tasks and scenarios.
12. The organization of information on the system screens was clear.
13. The interface of APPCycle for buyers was pleasant.
14. I liked using the interface of APPCycle.
15. As a buyer user, APPCycle has all the functions and capabilities I expect it to have.
16. Overall, I am satisfied with the buyer interface in APPCycle.

Once the data has been gathered from the participants, the responses are converted into numbers with strongly agree at 1 and strongly disagree at 7 which will be used to determine the SUS post score which represents the level of usability the application has. There are three formulas to be used which are the sub-scale SUS post score, participant SUS post score, and the mean SUS post score which are as follows:

$$SUS \text{ post score of sub - scale} = \left( \frac{\text{sum of all scores from range of statements}}{\text{number of statements}} \right)$$

$$SUS \text{ post score of participant} = \left( \frac{\text{sum of all scores from all statements}}{\text{number of statements}} \right)$$

$$Mean \text{ SUS post score} = \left( \frac{\text{sum of all SUS post scores from participants}}{\text{sample size}} \right)$$

The sub-scales refer to the three scales of the system in the SUS Post Study which are the system usefulness (questions 1 to 6), information quality (questions 7 to 12), and interface quality (13 to 15). The sub-scales provide a detailed breakdown of different factors affecting the product (*PSSUQ (Post-Study System Usability Questionnaire)*, 2021).

In the SUS post score, a lower score represents a better performance as opposed to the higher score rating of the SUS score. To determine whether the system is improved, Sauro and Lewis (2016) listed the following means to refer to when interpreting the scores:

System Usability: 2.80

Information Quality: 3.02

Interface Quality: 2.49

Overall: 2.82

The proponents conducted two tests using the System Usability Scale (SUS) Framework: a pre-test of the system which serves as a gathering of insights and improvements based on the critiques and scores of the participants regarding the system and a post test of the system which serves as the final test in which the suggestions and improvements of the participants in the pre-test were considered in improving the system and its functionalities.

The pre-test was performed once the main functionalities of the system were finished which included the registration, purchasing of products, listing of products, and the image verification through the integrated AI model. The pre-test used a 5-point SUS questionnaire to measure the responses of the participants which ranged from Strongly Agree at a value of 5 to Strongly Disagree at a value of 1. A total of 10 questions regarding the general functionality of the system were provided in the questionnaire for the participants to respond to. Additionally, a remark section was provided at the bottom of the questionnaire to fill up if the participants had any comments, suggestions, or critiques of the system which was used for further improvements of the system before the post test.

The Post-Study System Usability Testing was performed once the system was improved according to the remarks made by the participants and was presented to the same participants in the pre-test. The functionalities tested in the system were similar to the pre-test but with added improvements according to the suggestions and critiques to allow the functionality to be more usable. The post test used a 7-point SUS questionnaire to measure the responses of the participants which ranged from Strongly Agree at a value of 1 to Strongly Disagree at a value of 7. A total of 16 questions were provided and 2 types of questionnaires were provided, one for the buyer side and one for the seller side, for the participants to respond to.

### **3.6 Deployment and Maintenance**

Alshamrani & Bahattab (2015) describes this phase as the phase in which modifications, improvements, error corrections, and system refinement are to be established after system development and deployment. The deployment and maintenance phase aims to host the system within General Santos City, with the residents of General Santos City as the subject of the project and the developers as the project's administrators. The developers required both issues and administrators to at least have a personal computer or laptop as the primary device for accessing the system to be developed. To maintain the system, the researchers used different tools and technologies to build the software for the project. The tools and technologies that were used to make the software are the following:

#### **3.6.1 Programming Languages**

- **Laravel** – Laravel is a PHP web framework based on Symfony. It follows the MVC pattern and offers features like modular packaging, database access methods, and syntactic sugar. It's free and open-source and has security features like middleware, authentication control, CSRF security for blade, and encryption.
  - **Yajra** - Yajra Datatable is a package/library for Laravel, a PHP web framework. It's used specifically for displaying data in tables on web pages, with features that allow for customization based on conditions or specific requirements. It's particularly useful for managing and presenting large sets of data in a user-friendly and interactive way within web applications built using Laravel.
- **Blade** – Blade is a versatile programming language tailored for web, IoT, and secure applications. It is a C-based language that emphasizes simplicity and power and serves as a toolkit for creating specialized or general languages, complete with a grammar language and parser generator.
- **phpMyAdmin** – phpMyAdmin is a popular web-based application written in PHP designed to provide an intuitive and user-friendly interface for managing MySQL databases. It offers a wide range of features and tools that simplify database administration tasks, making it an essential tool for developers, database administrators, and website owners.
- **SQL** – SQL (Structured Query Language) is a programming language used to manipulate and manage data stored in a relational database management system. This includes creating entries, editing, updating, deleting entries from the database, and reading the data stored within the database.

- **HTML** – HTML (HyperText Markup Language) is a markup language used for creating web pages and designed to be displayed in a web browser. HTML is used as the underlying structure of a website as it defines where its elements are placed.
- **CSS** – CSS (Cascading Style Sheets) is a style sheet language used to describe an HTML element's presentation by defining attributes such as color, layout, and fonts.
  - **Bootstrap** – Bootstrap is a free and open-source CSS framework directed at responsive, mobile-first front-end web development. It contains HTML, CSS and JavaScript-based design templates for typography, forms, buttons, navigation, and other interface components.
  - **JavaScript** – JavaScript is a programming language for creating dynamic and interactive web content such as animated images, dynamically updating content, and other interactive functions.

### 3.6.2 Code Editor

- **Visual Studio Code** – Visual Studio Code (VS Code) is a source code editor developed by Microsoft which is used to provide a quick method in code editing, debugging, and version control but leaves out the more complex methods of IDEs such as Visual Studio and NetBeans.

### 3.6.3 Server and Database Tool

- **Laragon** – Laragon is a versatile and portable development environment for PHP, Node.js, Python, Java, Go, and Ruby. It integrates Apache, Nginx, MySQL, and NodeJS, making it lightweight and easy-to-use for Windows users.

#### **3.6.4 Machine Learning Tool**

- **Google Teachable Machine** – Google Teachable Machine is a web-based tool allowing users to efficiently train machine learning models without requiring coding knowledge. It enables users to create models for image classification, pose estimation, and sound classification using a simple and intuitive interface

#### **3.6.5 Web Hosting Provider**

- **cPanel** – cPanel is a web-based control panel that provides a graphical interface and automation tools designed to simplify website hosting. It offers features such as domain management, file management, email configuration, database management, and security settings, making it widely used by hosting providers and website owners alike.
- **InfinityFree** – InfinityFree offers a free hosting service, including unlimited disk space, unlimited bandwidth, and free domain hosting.

#### **3.6.6 Messaging and Email Capture**

- **Pusher API** – Pusher is a hosted API service that makes adding real-time data and functionality to web and mobile applications seamless. Pusher works as a real-time communication layer between the server and the client.
- **Mailtrap** – Mailtrap.io is a tool used by developers and teams for testing email notifications in a development or staging environment without sending emails to

real users. It provides a fake SMTP server that captures outgoing emails and displays them in a web interface, allowing developers to inspect the email content, headers, and attachments. This helps ensure that email functionality works as expected before deploying changes to a production environment, preventing accidental emails to real recipients during testing.

### **3.6.7 Payment Method**

- **PayPal** - PayPal is a digital payment platform that allows individuals and businesses to send and receive money online. It's widely used for various purposes, including online shopping, paying for services, sending money to friends or family, and accepting payments for goods or services as a merchant. By using PayPal's sandboxing, users can simulate transactions and functionalities without involving actual money. This is a great way to test the system's PayPal integration without affecting real financial transactions. Users can use sandboxing to test payment processing, refunds, and other functionalities related to PayPal in the system.

## **CHAPTER IV**

### **RESULTS AND DISCUSSION**

This chapter provides an overview of the system prototype developed for this project and an analysis of the methodology employed. It gives a summary of the methodology followed in creating the APPCycle web application, with a focus on features and functionality. The chapter also addresses user acceptability and usability testing, focusing on user assessment and feedback. The system prototype shows how the method was created and how it may be used in practice, and it is a concrete project result. The chapter then thoroughly examines the prototype's functioning, effectiveness, and user experience, offering insights into its advantages and shortcomings. In addition, the section on usability testing and user acceptability provides insight into how users interacted with the program, what comments they made, and how satisfied they were overall. This data is crucial for assessing the usefulness and usability of the program, which in turn guides upcoming improvements and adjustments meant to satisfy user demands.

#### **4.0 Results of Requirements Analysis and Gathering**

The requirements analysis findings underscored the study's importance in addressing the challenges and opportunities presented by the circular economy and waste reproduction. Currently, most circular economy activities are lone enterprises centered on tangible resources and commodities. However, to scale these solutions internationally and across industries, coherent digital foundations must be created to support circular business models.

According to Pareja (n.d.), in General Santos City in 2016, plastic waste comprised 51.25%, followed by paper at 28.53%, yard waste at 11.83%, and kitchen waste at 2.74%. The remaining 5.65% included various other wastes such as glass, metal, rubber, and hazardous waste. The data indicates the disposal of 41.065 tons of plastic waste, 22.85 tons of paper waste, 9.48 tons of yard waste, 2.19 tons of kitchen waste, and 4.52 tons of other waste during that year. In line with this, the proponents have concluded that a web-based application for the online sale and purchase of reusable and recyclable goods is an innovative approach to support the ideas of a circular economy and mitigate improper waste disposal. The application plays a critical part in building a circular economy by developing a system that enables the practical and convenient interchange of items that can be reused or recycled instead of being dumped as waste. Through this study, the researchers aim to motivate others to use similar approaches and show how technology may promote the circular economy.

To effectively manage the activities and tasks involved in developing the APPCycle web application, the proponents utilized GANTT Charts. These charts provided a visual representation of the project timeline and helped the team track and organize their progress. The development process commenced with requirements gathering. During this phase, the proponents discussed the goals and prerequisites of the web application and proceeded to develop it using an iterative waterfall methodology. This approach involved sequential phases of requirements analysis, design, implementation, testing, and deployment, with each phase building upon the previous one. It allowed for iterative development and refinement of the system's features, ensuring that they aligned with the identified requirements and met the intended objectives of the application. Following the completion of the project start phase's tasks, the proponents determined several possibilities and determined their research goals. During the initial research, they evaluated the

significance of the project from several angles through a pilot interview (refer to **Appendix C** for the individual user responses).

Pilot Interview Questions	Responses (Majority)
<b>What is your role in recycling scrap materials?</b>	Scrap Materials Buyer
<b>How frequently do you engage in selling/purchasing scrap materials?</b>	Occasionally
<b>What aspects of scrap materials' current sale and purchase process are challenging or inefficient?</b>	<ul style="list-style-type: none"> <li>• Electronic parts</li> <li>• Irredeemable goods</li> <li>• Disposal costs</li> <li>• Marketplace viability</li> </ul>
<b>Have you used digital platforms or applications for buying/selling scrap materials?</b>	No
<b>How satisfied are you with the efficiency of the current methods of buying/selling scrap materials?</b>	Neutral
<b>From an economic perspective, do you believe that adopting an AI-assisted web application for scrap material transactions would be cost-effective?</b>	Yes
<b>Would you like to use an AI-assisted web application like APPCycle to improve operational efficiency in selling/purchasing scrap materials?</b>	Yes
<b>What features would you like to see in an AI-assisted web application for buying/selling scrap materials?</b>	<ul style="list-style-type: none"> <li>• Sales report for sellers</li> <li>• User information security <ul style="list-style-type: none"> <li>• Messaging feature</li> </ul> </li> <li>• Accessibility for non-tech users <ul style="list-style-type: none"> <li>• Easy navigation</li> </ul> </li> <li>• Market value information</li> <li>• Engaging user interface</li> </ul>
<b>Are you concerned about using AI technology to sell/purchase scrap materials?</b>	No
<b>How likely are you to recommend APPCycle to others based on your needs?</b>	Very likely

**Table 3** Summary of Pilot Interview Responses for Needs Analysis

## **4.1 Prototype Development**

In developing the system of the web application, the proponents conducted two sets of prototyping phases before deploying the final version of the system to be used by the end-users. The results of the system prototyping are evaluated by the proponents and are guided by the diagrams developed to visualize the process flow of the system. The components involved in developing the prototype of the system include listing the web application features, outlining the process, and designing by user action based on the system. These components play a major role in the creation of the APPCycle prototype and in ensuring that the development of the system is systematic and follows the appropriate logic according to the created diagrams.

The first component, listing the application features, involves listing the features the web application that is expected to have at the end of the development phase. This component focuses on the essential functionalities of the system and serves as a guide on the expected features the web application should have at the end of its development.

The next component is the outlining of the processes happening in the web application. This includes the creation of diagrams such as the use case and activity diagrams to indicate the possible actions and process flow of the end-user respectively. The entity-relationship diagram is developed to serve as the blueprint for the database used by the web application in storing data such as the end-user's information, the items listed for sale, and the categories that is to be sold on the web application.

The last component is the designing by the user action in which the two previous components involved in the development of the prototype are used to guide in the development of the web application such as the webpages involved, the implementation of the possible user actions

in the system, and the process flow the user actions must follow in order to have a functional prototype for testing.

By following this approach and considering the key components in developing the prototypes of the system, the proponents ensure that the development of the prototypes of APPCycle is done in a structured manner which benefit the proponents in achieving a prototype that satisfies the requirements of the system to be developed.

## **Results of Prototyping Phase 1**

### **4.1.1 Listing the Application Features**

The proponents listed the necessary features of the web application which is a scrap material e-commerce web application with AI assistance in verifying whether the submitted images for posting the scrap material is scrap material or not. The features were then specified according to the following: a homepage that displays a list of available items for sale sorted by scrap material categories, a dashboard that manages the personal information of the user, listed items, and purchase or transaction history for the users, a messaging feature between the customer and the seller to communicate the purchase of the item, and a trained AI model that helps in the verification of the images as valid scrap material.

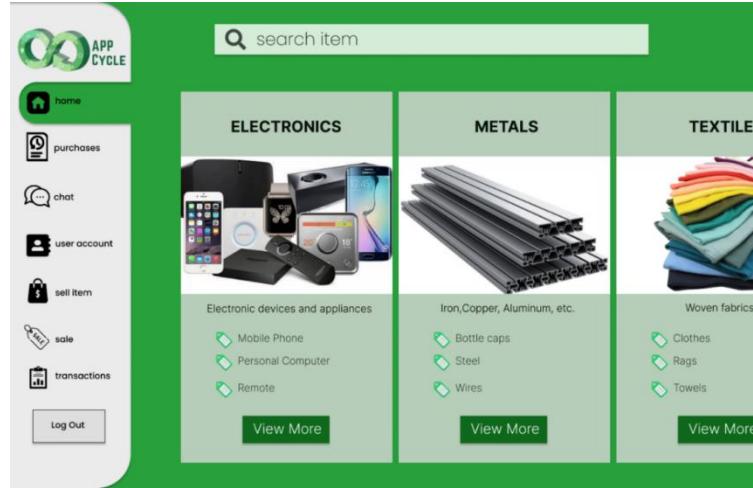
### **4.1.2 Outlining of Processes**

The proponents created various diagrams that depict the process flow that is to be expected by the system through the use case and activity diagrams with the entity-relationship diagram acting as a guide in the construction of the database which is used to

store, update, or remove the data when interacting with the web application. The diagrams help create a systematic flow which helps the proponents in getting a clearer direction as to how the web application should proceed if an end-user were to interact with the prototype.

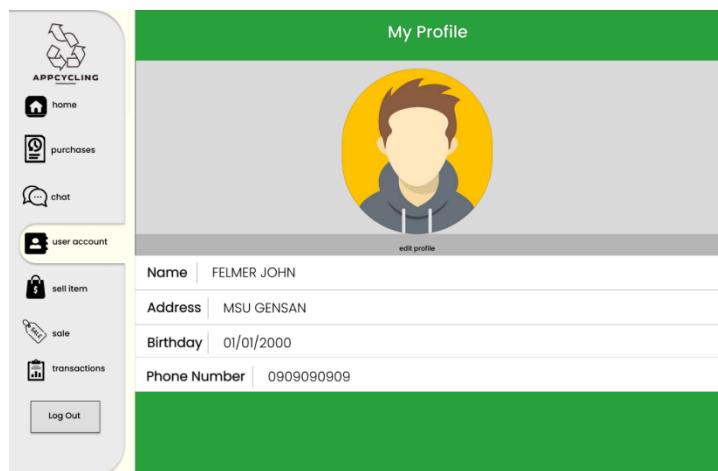
#### **4.1.3 Designing by User Action**

Using the created diagrams to direct the flow of the system, the proponents developed a mockup of the system using Figma which is an interface design tool for websites which act as a replacement for the actual web application that is to be developed later. In the mockup interface, the proponents can simulate the expected interaction of the system without requiring to develop an entire web application and were able to simulate some of the essential functionalities of the system such as a homepage, a user dashboard, and transaction history.



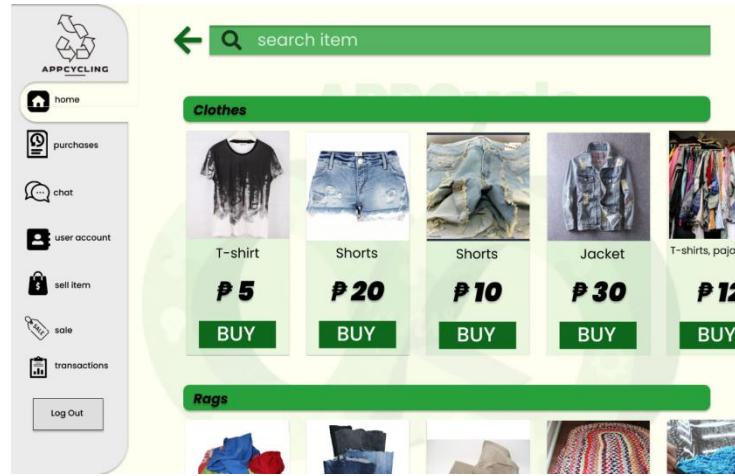
**Figure 3.** Homepage of the Application Prototype Version 1

Figure 3 depicts the homepage of the mockup web application developed in Figma, which shows the sidebar containing the possible features of the web application alongside the three scrap material categories but does not show the items alongside the categories they belong in. This version uses a sidebar for navigating through the web application with options such as chatting, viewing the user account, selling an item, and checking of transactions.



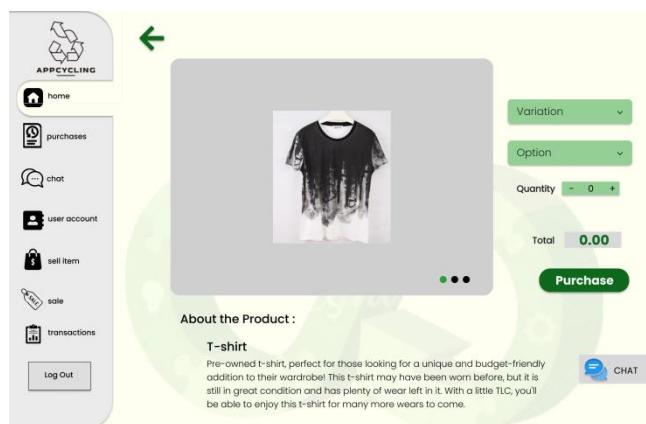
**Figure 4.** User Page for the Application Prototype Version 1

Figure 4 depicts the user profile page in which they are able to edit their personal information. In this version, the user page was limited to having the values for the name, address, birthday, and the phone number of the user alongside a profile image of the user.



**Figure 5.** Item Display Page for the Application Prototype Version 1

Figure 5 depicts the item display page for scrap items that are cloth which is one of the scrap material categories being sold in the web application and is separated into smaller classes such as clothes and rags as seen in the figure.



**Figure 6.** Item Detail Page for Application Prototype Version 1

Figure 6 depicts the item detail page, which provides the user with more information regarding the item they are interested in, such as the price, variation, text description, and image of the item. Because this is a mockup, the image verification through an AI model has not been implemented yet, and the image was manually added.

Sale ID	Item ID	Item	Qty	Customer name	Address
1	1	SHORT	1	CARL GIAN	LAGAO, GEN.SAN
2	2	T-SHIRT	3	STEPHANE	LAGAO, GEN.SAN

**Figure 7.** Transaction Sale History Page for Application Prototype Version 1

Figure 7 depict the user's sale transaction history page, which contains information about the items they have sold in the web application. The history is arranged in a table format and can be printed. The page can also show options for the sale transaction history.

Purchased ID	Item ID	Item purchased	Qty	Customer name	Address
1	1	T-SHIRT	1	FELMER JOHN	LAGAO, GEN.SAN
2	2	SHORT	1	FELMER JOHN	LAGAO, GEN.SAN

**Figure 8.** Transaction Purchase History for Application Prototype Version 1

Figure 8 depict the user's purchase transaction history page, which contains information about the items they have purchased in the web application. The history is arranged in a table format and can be printed. The page can also show options for the purchase transaction history.

After careful observation, the proponents agreed that while the mockup was able to provide a simple-to-understand process flow of the system, it is lacking some of its essentials such as the AI model for verifying images and a database that can be worked with to show the connection between the database server and the server for the web application. As a result, the developers began improving on the system based on the feedback from the prototype.

## **Results of Prototyping Phase 2**

### **4.1.2.1 Listing the Application Features**

Following the prototype version 1 testing phase, the proponents began listing the possible enhancements to the prototype such as a cleaner web page, products being directly shown on the home page, and forms needing more information compared to before. In this prototype version, the database connection to the web application was also included in listing the possible features of the web application alongside the development of the AI model which is to be used for the image verification when listing an item into the system.

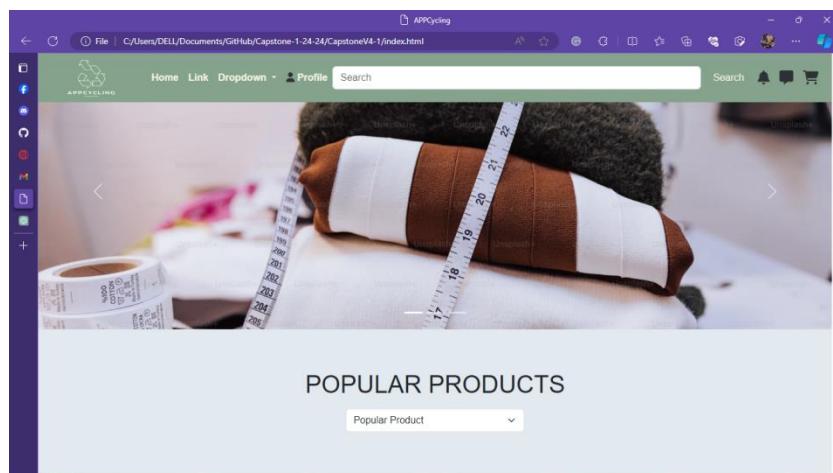
### **4.1.2.2 Outlining of Processes**

This component of prototype version 2 focuses more on the revisions of the diagrams after some corrections in regards to the connections created in the provided diagrams used for the web application. In this component, the proponents made minor changes to the diagrams such as appropriate naming conventions in regards to the activities

that can be done by the actors. A process flow was also developed to help provide a clearer process flow between the actions that can be performed in the web application although this was not included in the diagrams as the use case and activity diagrams provide a view of the process flow and instead serves as a simple guide in the possible actions a user can do in the system.

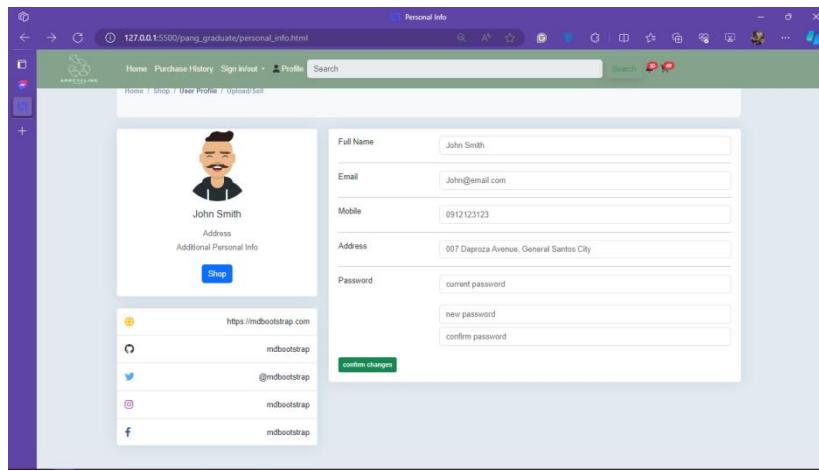
#### **4.1.2.3 Designing by User Action**

The proponents changed the UI of the prototype to a much cleaner and more open UI compared to the previous prototype with the sidebar being moved to the top portion of the web page. While the categories in the home page were the three selected scrap materials, a selection option was added in this prototype version to accommodate subcategories such as topwear and bottomwear for cloth. The main categories were then combined into one dropdown option instead of three separate elements to allow flexibility in the presentation of listed items such that the items loaded in the home page were now based on what category was selected. A database connection was also established such that the selected category option would list the entries found in the database which were the selected scrap material categories.



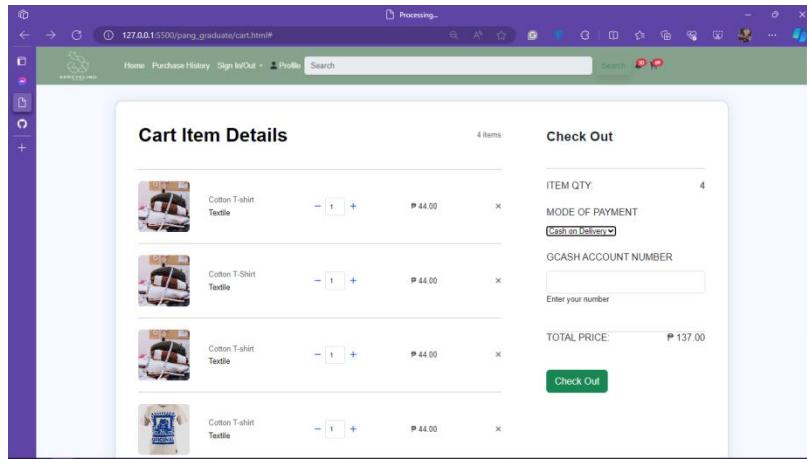
**Figure 9.** Homepage of the Application Prototype Version 2

Compared to the previous prototype, the homepage in Figure 9 uses a banner that moves to the next image showing a scrap material with the image currently focused on cloth. The search bar and sidebar are both combined in one section above the home page including a newer logo for the web application.



**Figure 10.** User Page for the Application Prototype Version 2

While Figure 10 did not receive too many changes, some data were added such as a password changing option, links to the user's social media, and the “Shop” option which leads to the item listing for the system. The page can be accessed via the Profile option located on the immediate left of the search bar at the web page's top.



**Figure 11.** Cart Item Details for the Application Prototype Version 2

Figure 11 is a new web page for the shopping cart found in the web application in which the user can see the items they are interested in purchasing from the sellers in the system. The page includes information about the item such as the quantity of the item and its price, the total item quantity found in the cart, the mode of payment with cash on delivery being the currently selected option, a GCash account number form if the customer wishes to purchase via GCash instead, and the total price of the items with a check out button at the bottom which leads to the transaction made by purchasing items from the system.

## 4.2 Project Design Results

This phase outlined the frameworks and strategies employed to achieve the proponents' project goals effectively. It delves into the detailed design aspects that form the foundation of other web applications. It encompasses the following key components:

#### **4.2.1 Technical Framework**

To effectively develop the system, the developers used the created charts, diagrams (refer to **Appendix C**), and conceptual framework of the Machine Learning Tool to guide the system, including both front-end and back-end functionalities.

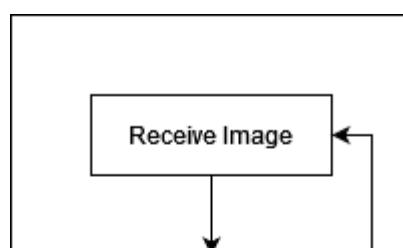
##### **4.2.1.1 Front-end Development**

The developers first began with the front-end part of the system, which involves the visuals of the web application and its functionality in switching between its web pages. Using the Figma application for the wireframe prototype, the developers are guided on how the web application UI should look and how the webpages connect, built using HTML and CSS as the web application's structure and design, respectively. This was done by gathering the attributes of the elements used in the framework, such as the color scheme used, the webpage elements used, and the connections between webpages through interacting with these elements. After gathering the attributes, these were used to create the code for both HTML and CSS using components similar to that of the framework to construct the front-end side of the web application.

##### **4.2.1.2 Back-end Development**

Once completed, the back-end part is then built using the UML diagrams showing the various activities the user can perform using the web application as its basis. The back-end of the program consists of PHP as the scripting language for passing SQL statements to the server, which is accessed via MySQL as the SQL dashboard for accessing the database that is used by the web application, and JavaScript which will host the AI model used to scan the submitted images as to whether or not the image is classified as recyclable waste via TensorFlow. The diagrams showing the process flow of a user action in the system will be replicated through the PHP requests and SQL commands for the user's input. In contrast, the trained AI model will be integrated into the webpage assigned to submit the item to be placed in the database as a verifier of whether the thing is a valid entry.

#### 4.2.1.3 AI Integration

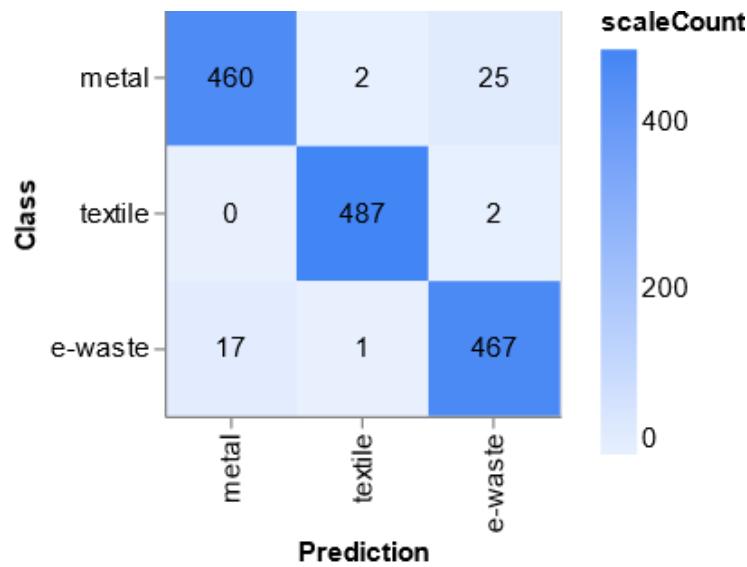


***Figure 12. Conceptual Diagram of the Machine Learning Tool***

The AI model used in the system is a machine learning model made using Teachable Machine, a web application made by Google that simplifies creating a TensorFlow model, which is used for AI-based projects such as machine learning. The model is integrated into the system via loading TensorFlow.js and the model file into the webpage containing the image submission, which serves as the AI functionality of the system in validating the images sent by the user as to whether the photo shows recyclable waste or not. The AI model used in this web application is fed images of 3 categories: metal scrap, textile/cloth, and electronics. A fourth category identifies the image as invalid if the model does not detect that the image fits in the first three categories.

Through the Teachable Machine website, the gathered dataset for the model can be trained and adjusted on its accuracy and how well it identifies the item depicted in the image as recyclable waste or not. The model functions as a verifier

of the user's image input when submitting an entry to the system to verify whether or not the item in the image is classified as one of the recyclable wastes trained in the model or not as a way to simplify the identification of recyclable waste by submitting an image of the item and allowing the trained model to identify and classify the item captured in the image. Because the system focuses on the AI model in organizing the images, the model is essential to the design and should be as accurate as possible when identifying and classifying items submitted by users to the system.



**Figure 13.** Confusion Matrix of the AI Model for Image Verification

Figure 13 depicts the confusion matrix of the AI model trained in Google Teachable Machine. The confusion matrix serves as a matrix visualization as to how accurate the model is in predicting a class given the provided classes the model was fed with. The number of samples is represented in a color scale with the darker color representing a large number of samples in a given matrix cell. The confusion matrix uses an X and Y axis in categorizing the samples according to the class of the sample and the model's prediction

of the sample's class respectively. The model uses three classes of scrap materials namely e-waste, metal, and textile. In the given matrix, 485 e-waste samples, 487 metal samples, and 489 textile samples were used in the matrix. Given the matrix above, the most accurate class is the textile class with 487 out of 489 samples correctly predicted as textile resulting in an accuracy of 99.59%. The second most accurate class is the e-waste class with 467 out of 485 samples correctly predicted as e-waste resulting in an accuracy of 96.29%. The least accurate class is the metal class with 460 out of 487 samples correctly predicted as metal resulting in an accuracy of 94.46%. The accuracy is calculated by dividing the total number of correct predictions by the total number of samples in a class and rounded up to the nearest hundredths.

#### **4.2.1.4 Database Server**

The database system is designed to have a centralized table containing the sales, which includes the information about the item being sold, the item's seller, the item's buyer, the price of the product, and the date on which the item was sold. The database also contains information regarding the registered users, the item description, the category, and the transactions made. Through PHP in the back-end functionality of the web application, the system allows the execution of SQL statements in entering, editing, displaying, and deleting entries in the method, most notably for items to be sold in the web application. While the system allows the submission of images, the SQL statements in the back end convert the image data into a Binary Large Object (BLOB) as the database typically does not have an inherent datatype to support image files. For other entries, such as text description and personal data, characters and integers will be used as the central datatype to

store the data in the database. When retrieving the image from the database, images stored in it are converted back to Base64 from Binary to properly show the image from its BLOB form. Other entries can generally be retrieved from the database as they do not undergo any conversion to store them in the database. They can be called to the webpage through the SQL commands in the PHP script.

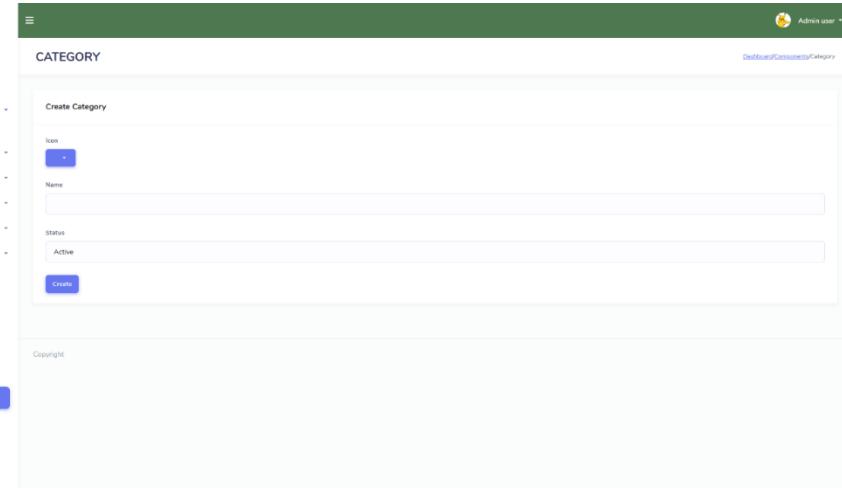
### 4.3 System Implementation

The primary objective in designing the user interface is to guarantee a user-friendly interaction with the web application upon implementation. This is achieved by adopting popular e-commerce design principles, which improve the overall user experience. Furthermore, the proponents utilized pre-existing e-commerce website designs to help developers build a web application that smoothly blends with established e-commerce design standards. By giving the users a visual depiction of the project's features, capabilities, and user interface, the screenshots from the prototype will improve their comprehension of the implemented solution:

The screenshot shows the 'Admin: Manage Categories' page. The left sidebar has a 'Manage Categories' section under 'E-Commerce'. The main area displays a table titled 'All Categories' with three entries: 'Toffle' (Id: 21, Status: On, Actions: edit, delete), 'Metal' (Id: 20, Status: On, Actions: edit, delete), and 'Electronics' (Id: 19, Status: On, Actions: edit, delete). The table includes columns for Id, Icon, Name, Status, and Actions. A search bar and pagination controls are also present.

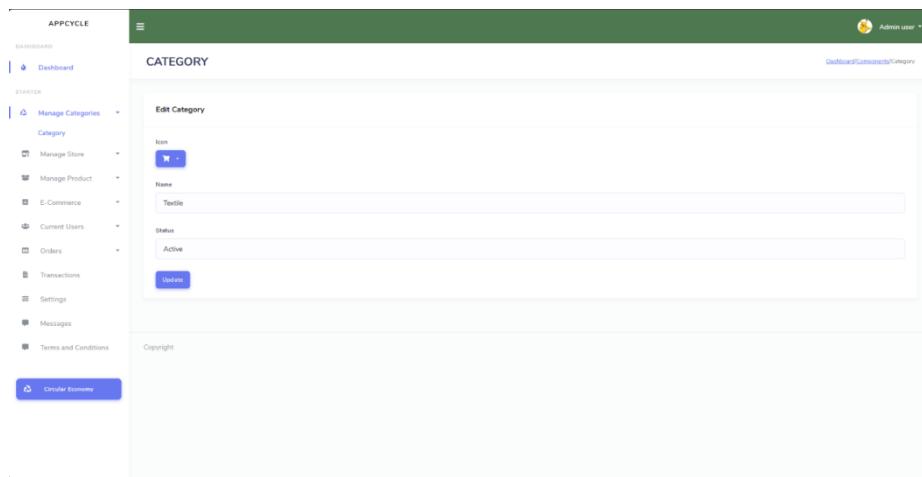
**Figure 14.** Admin: Manage Categories

Only the system administrator has the authority to manage categories, including the ability to add, edit, and delete them. Currently, we have three static categories integrated into our Google Teachable Machine. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account.



**Figure 15.** Admin: Add Categories

In this figure, only the system administrator can add a category. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account.



**Figure 16.** Admin: Edit Categories

In this figure, only the system administrator can edit a category. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account.

The screenshot shows the 'Slider Table' section of the APPCYCLE admin dashboard. The left sidebar includes 'Dashboard', 'Manage Categories', 'Manage Store' (with 'Slider' selected), 'Manage Product', 'E-Commerce', 'Current Users', 'Orders', 'Transactions', 'Settings', 'Messages', 'Terms and Conditions', and 'Circular Economy'. The main area has a green header 'Table' and a sub-header 'Slider Table'. It features a search bar and a dropdown for 'Show 10 entries'. A table lists four items:

ID	Banner	Title	Serial	Status	Action
3		Fabric Scraps	1	Active	<button>Edit</button> <button>Delete</button>
4		Cellular Phones	2	Active	<button>Edit</button> <button>Delete</button>
5		Soda Cans	3	Active	<button>Edit</button> <button>Delete</button>
6		Reusables rem et v	4	Deleted	<button>Edit</button> <button>Delete</button>

At the bottom, it says 'Showing 1 to 4 of 4 entries' with 'Previous' and 'Next' buttons.

**Figure 17. Admin: Slider**

Only the system administrator possesses the authority to manage the slider, including the ability to add, edit, and delete them. This slider will be shown on the dashboard. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account.

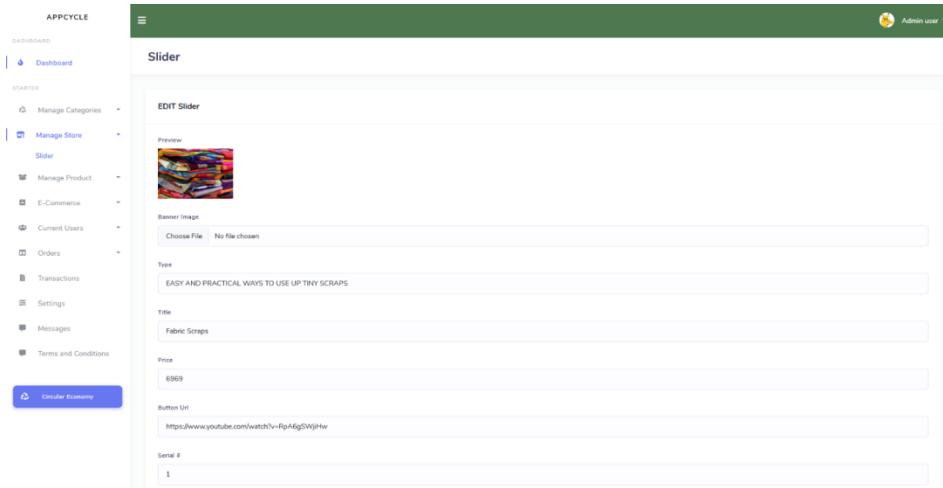
The screenshot shows the 'Create Slider' form in the APPCYCLE admin dashboard. The left sidebar is identical to Figure 17. The main area has a green header 'Slider' and a sub-header 'Create Slider'. It contains the following fields:

- Banner Image: A file input field with 'Choose File' and 'No file chosen' options.
- Type: A text input field.
- Title: A text input field.
- Price: A text input field.
- Button List: A text input field.
- Serial #:
- Status: A dropdown menu with 'Active' selected.

At the bottom is a blue 'Add' button.

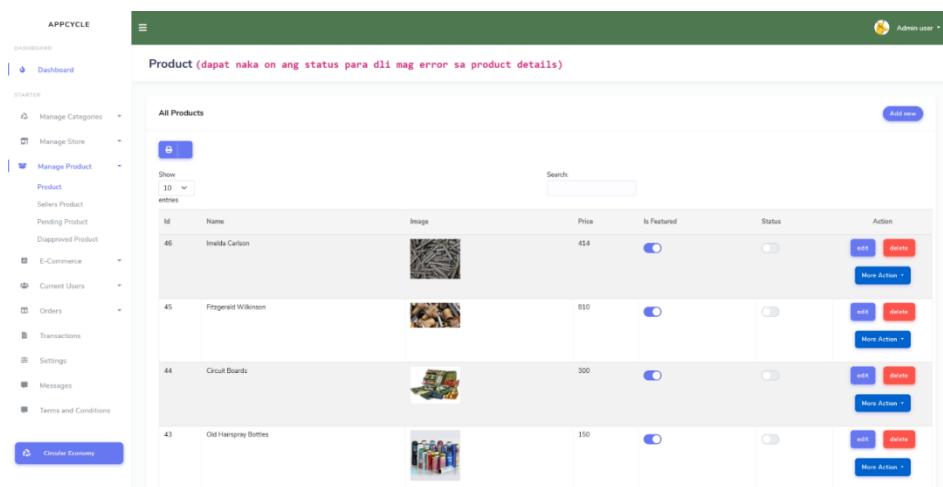
**Figure 18. Admin: Add Slider**

Only the system administrator can add a slider, which will be shown on the dashboard. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account.



**Figure 19.** Admin: Edit Slider

Only the system administrator can edit a slider, which will be shown on the dashboard. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account.



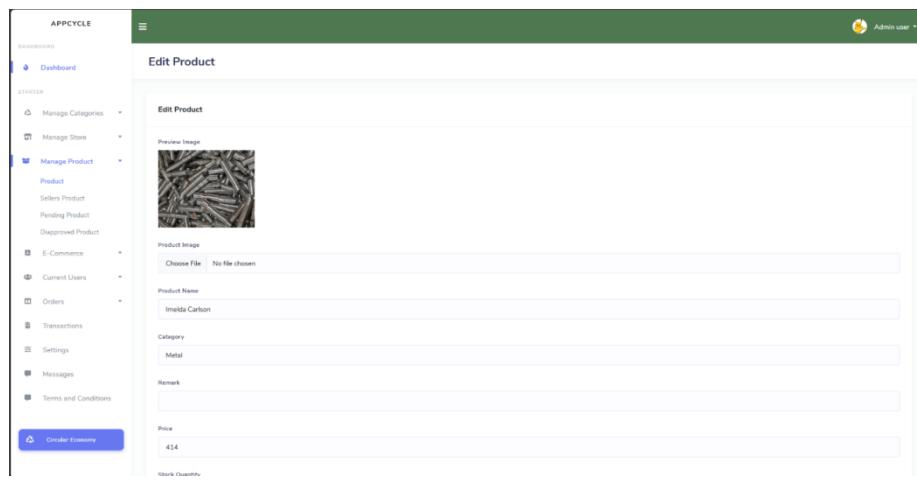
**Figure 20.** Admin: Manage Products

Only the system administrator possesses the authority to manage products, including the ability to add, edit, and delete them, and can change the product's status. Additionally, the system displays a data table showcasing different statuses of products, namely “Pending” and “Disapproved” products. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account.



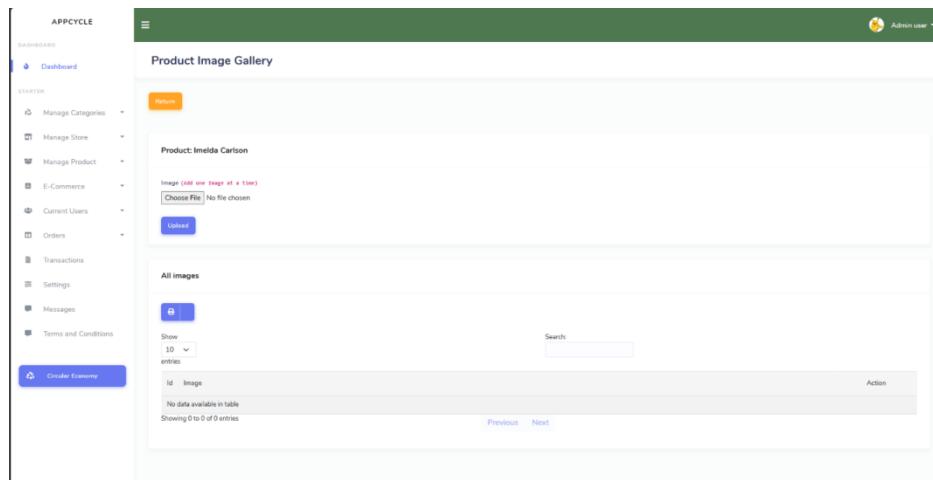
**Figure 21.** Admin: Add Product

The system administrator has the authority to add products to the shop, including the ability to add, edit, and delete them. This functionality is restricted to the admin account and is navigated under the manage product tab on the sidebar through the admin dashboard.



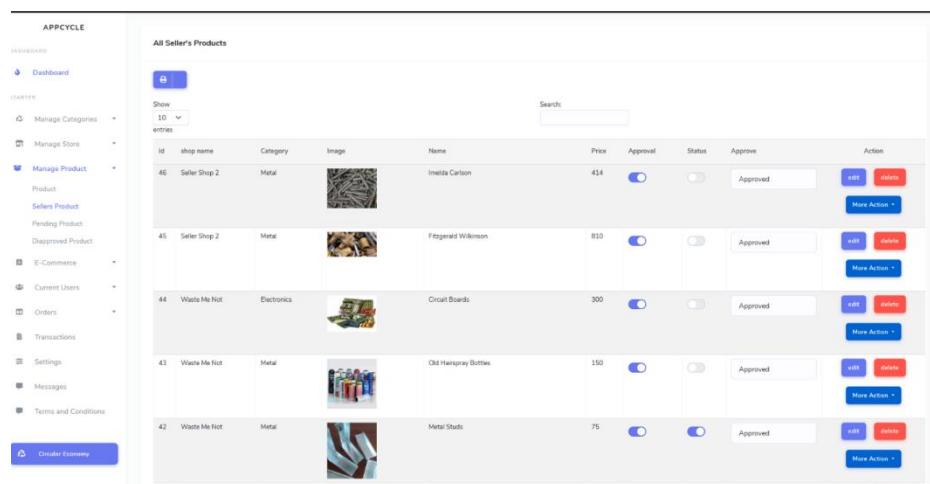
**Figure 22.** Admin: Edit Product

The system administrator is authorized to edit products in the shop, including adding, editing, and deleting them. This functionality is restricted to the admin account and is navigated under the manage product tab on the sidebar through the admin dashboard.



**Figure 23.** Admin: Product Image Gallery

The system administrator has the authority to add products to the image gallery. This functionality is navigated under the manage product tab on the sidebar. Click the product, then the More Action button, and then go to the image gallery



**Figure 24. Admin: Sellers Product**

The system administrator possesses the authority to view and manage the seller's product. Including the ability to add, edit, and delete them and change the product's status. This functionality is navigated under the manage product tab on the sidebar.

This screenshot shows the 'Seller's Pending Product' section of the APPCYCLE Admin interface. The left sidebar is filled with various management tabs like 'Manage Categories', 'Manage Store', 'Manage Product' (which is currently selected), and 'E-Commerce'. The main content area is titled 'Seller's Pending Product' and displays a table of 'All Pending Products'. The table has columns for 'Id', 'Shop name', 'Image', 'Name', 'Price', 'Approve' (with a dropdown menu showing 'Pending'), and 'Action' (with buttons for 'Edit', 'Delete', and 'Disapprove'). There is a search bar at the top of the table. Below the table, it says 'Showing 1 to 1 of 1 entries'.

**Figure 25. Admin: Pending Product**

The system administrator has the authority to view and approve all sellers' pending products. This functionality is accessible under the manage product tab on the sidebar.

This screenshot shows the 'Product Remark' page for a specific product. The left sidebar shows the 'Manage Product' tab is selected. The main content area is titled 'Product Remark' and shows details for a product named 'Imelda Carlson'. It lists the 'Seller' as 'Seller Shop 2' and the 'Category' as 'Bolt'. Below this, there is a large image of a pile of metal bolts. A text input field labeled 'Remark' is present, with a 'Save' button below it. At the bottom of the page, there is a link: 'https://www.appcycleinfluencerapp.com/admin/dashboard'.

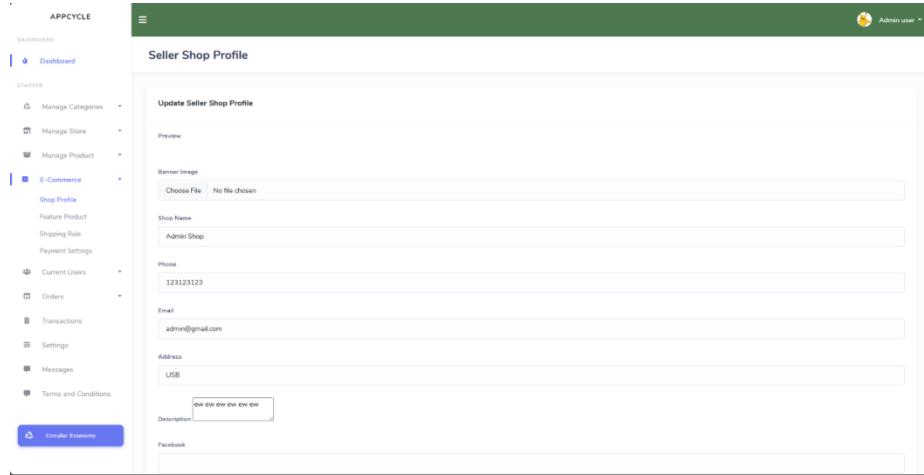
**Figure 26. Admin: Disapproved Product Remark**

The system administrator has the authority to disapprove pending products. This functionality is navigated under the manage product tab on the sidebar. When a buyer submits a product for sale through admin approval on the platform, the admin has the authority to review and approve or disapprove the product. If the admin finds that the submitted product is not scrap material or the user is engaging in trolling behavior, the product's status is set to "disapproved," and specific remarks are provided detailing the reasons for disapproval.

ID	shop name	Image	Name	Price	Agree	Remark	Action
40	Seller Shop 2		Imida Carbon	414	<span style="background-color: red; color: white; padding: 2px 5px;">Disapproved</span>	not a scrap	<span style="color: blue; border: 1px solid blue; padding: 2px 5px;">Edit</span> <span style="color: red; border: 1px solid red; padding: 2px 5px;">Delete</span> <span style="color: blue; border: 1px solid blue; padding: 2px 5px;">More Action</span>

**Figure 27. Admin: Disapproved Products**

The system administrator possesses the authority to view all disapproved products. This functionality is navigated under the manage product tab on the sidebar. If the user wishes to resubmit the item, it will be set as "pending," indicating that the admin needs to re-validate it before approving. This process ensures that only genuine scrap materials are listed on the platform, maintaining quality standards and preventing misuse or irrelevant listings. Administrators can access all disapproved products and manage them through the "Manage Products" tab on the sidebar, allowing for efficient monitoring and control over the platform's content.



**Figure 28.** Admin: Shop Profile

The figure shows the shop profile management, where users can add and update information. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account.

The screenshot shows the 'Add Product' form and the 'Featured Products' list within the APPCYCLE admin interface. The left sidebar contains navigation links for DASHBOARDS, STARTER, E-COMMERCE, and OTHERS. The main content area has two sections: 'Add Product' (with fields for 'Metal Studs', 'Show at Home?', and 'Status?') and 'Featured Products' (with a table listing products like 'Tool Steel', 'Film Camera Bundle', 'Guitar/Taricia', 'Gadget Bundle', 'Circuit Boards', and 'Nonfunctional/Alana Phone'). The table includes columns for 'Show At Home', 'Status', and 'Action' (Delete). The bottom of the page shows pagination with 'Showing 1 to 6 of 6 entries' and 'Previous' and 'Next' buttons.

M	Product Name	Show At Home	Status	Action
21	Tool Steel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
22	Film Camera Bundle	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
23	Guitar/Taricia	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
24	Gadget Bundle	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
25	Circuit Boards	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
26	Nonfunctional/Alana Phone	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>

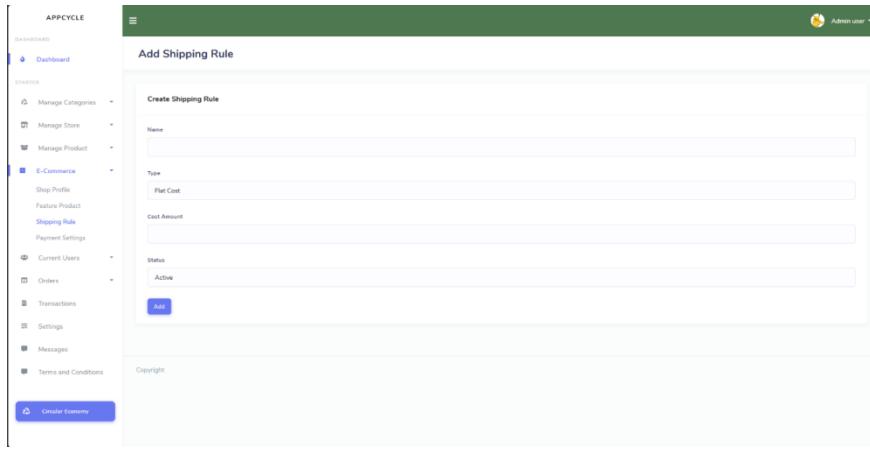
**Figure 29.** Admin: Featured Products

The figure displays the featured product section, allowing the admin to add and delete featured products in the shop. Featured products are prioritized and displayed on the dashboard before all other category products. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "E-Commerce" tab in the sidebar navigation.

The screenshot shows the Admin Dashboard for APPCYCLE. The left sidebar navigation includes sections like DASHBOARD, STARTER, E-Commerce (Shop Profile, Feature Product, Shipping Rule, Payment Settings), CURRENT USERS, ORDERS, TRANSACTIONS, SETTINGS, MESSAGES, and TERMS AND CONDITIONS. The main content area is titled 'Shipping Rule' and shows a table titled 'All Shipping Rules'. The table has columns: ID, Name, Type, Min Cost, Cost, Status, and Action. It lists four rules: 1. Christmas Shipping Fee (Min Cost: P5000, Cost: P0, Status: On), 2. February shipping deals (Min Cost: P1000, Cost: P50, Status: On), 3. New Year Deal (Min Cost: P4000, Cost: P10, Status: On), and 4. Normal (Min Cost: P0, Cost: P100, Status: On). There are buttons for 'Add new' and 'Edit' next to each rule. A search bar and a 'Show 10 entries' dropdown are also present.

**Figure 30.** Admin: Manage Shipping Method

The figure displays the shop's shipping method, allowing the admin to add, edit, and delete shipping rules. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "E-Commerce" tab in the sidebar navigation.



**Figure 31.** Admin: Shipping Method

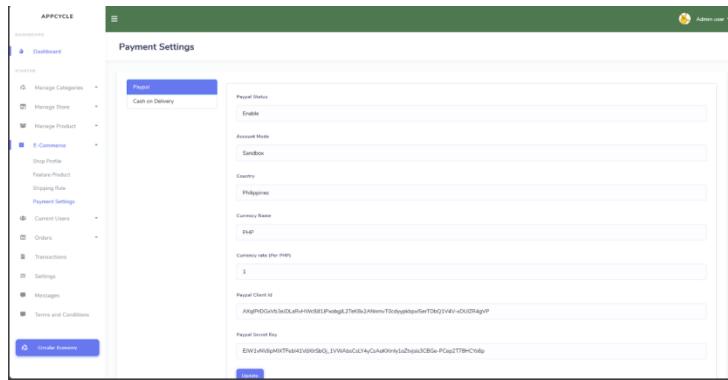
The figure displays the shop's shipping method, allowing the admin to add, edit, and delete shipping rules. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "E-Commerce" tab in the sidebar navigation.



**Figure 32.** Admin: Edit Shipping Method

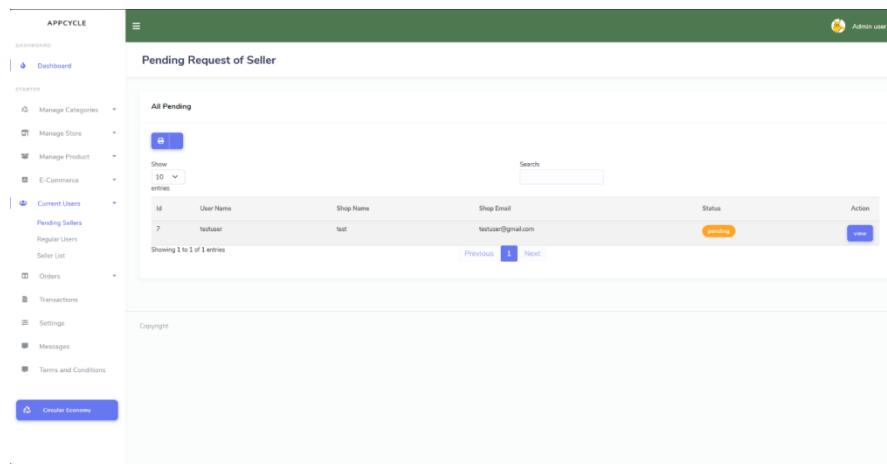
The figure displays the shop's shipping method, allowing the admin to edit shipping rules. This functionality is exclusively accessible through the admin dashboard and is restricted to the

admin account. Users can access this feature under the "E-Commerce" tab in the sidebar navigation.



**Figure 33. Admin: Payment Settings**

The figure displays the payment configuration, allowing the admin to configure the payment option. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "E-Commerce" tab in the sidebar navigation.



**Figure 34. Admin: Pending Request to be a Seller**

The figure displays the user's request to be a seller. Only the admin has the authority to accept this request. This functionality is exclusively accessible through the admin dashboard and

is restricted to the admin account. Users can access this feature under the "Current Users" tab in the sidebar navigation.

The screenshot shows the 'All Users' page in the APPCYCLE admin dashboard. The sidebar navigation includes 'Dashboard', 'Manage Categories', 'Manage Store', 'Manage Product', 'E-Commerce', 'Current Users' (which is selected), 'Pending Sellers', 'Regular Users', 'Seller List', 'Orders', 'Transactions', 'Settings', 'Messages', and 'Terms and Conditions'. The main content area is titled 'User List' and displays a table with columns: Id, Name, Email, Role, and Status. There are four entries: user2 (email: user@gmail.com), test10 (email: test10@gmail.com), testuser (email: testuser@gmail.com), and user 2 (email: user@gmail.com). The 'Status' column for user2, test10, and testuser has a toggle switch that is turned on (blue). A search bar is at the top right, and a 'Previous' and 'Next' button are at the bottom right. The status bar at the bottom left says 'Showing 1 to 4 of 4 entries'.

**Figure 35. Admin: Regular User**

The figure displays all the user accounts, allowing the admin to block an account by turning off its status. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "E-Commerce" tab in the sidebar navigation.

The screenshot shows the 'All Users' page in the APPCYCLE admin dashboard. The sidebar navigation includes 'Dashboard', 'Manage Categories', 'Manage Store', 'Manage Product', 'E-Commerce' (which is selected), 'Current Users', 'Pending Sellers', 'Regular Users', 'Seller List', 'Orders', 'Transactions', 'Settings', 'Messages', and 'Terms and Conditions'. The main content area is titled 'User List' and displays a table with columns: Id, Name, Email, Shop Name, Role, and Status. There are three entries: Kate (email: sidearms27@gmail.com, shop name: Waste Me Not), testseller (email: testseller@gmail.com, shop name: test request seller), and Seller user (email: seller@gmail.com, shop name: Seller Shop Z). The 'Status' column for all three entries has a toggle switch that is turned on (blue). A search bar is at the top right, and a 'Previous' and 'Next' button are at the bottom right. The status bar at the bottom left says 'Showing 1 to 3 of 3 entries'.

**Figure 36. Admin: Seller List**

The figure displays all the sellers in the shop, allowing the admin to block their accounts by turning off their status. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "E-Commerce" tab in the sidebar navigation.

This screenshot shows the 'Orders' section of the admin dashboard. The left sidebar has 'E-Commerce' selected under 'Current Users'. The main area is titled 'All Order' and lists six orders. Each order row includes columns for Order ID, Customer, Date, Product Types, Amount, Order Status, Payment Status, Payment Method, and Action (Edit and Delete buttons). The orders are:

Order ID	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
9 36346460125	user 2	16-Apr-2024	1	₱223	Pending	Pending	paypal	<button>Edit</button> <button>Delete</button>
8 45114340470	user 2	11-Apr-2024	1	₱1856	Pending	Pending	COD	<button>Edit</button> <button>Delete</button>
7 40205232205	user 2	05-Apr-2024	1	₱708	Pending	Pending	paypal	<button>Edit</button> <button>Delete</button>
6 17032706193	Admin user	05-Apr-2024	1	₱106	Pending	Pending	paypal	<button>Edit</button> <button>Delete</button>
5 780320080361	Admin user	05-Apr-2024	1	₱1003	Pending	Pending	paypal	<button>Edit</button> <button>Delete</button>
4 42251145230	Admin user	05-Apr-2024	1	₱708	Pending	Pending	paypal	<button>Edit</button> <button>Delete</button>

Showing 1 to 6 of 6 entries

**Figure 37. Admin: All Orders**

The figure displays all the orders, allowing the admin to view and delete an order. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "Order" tab in the sidebar navigation.

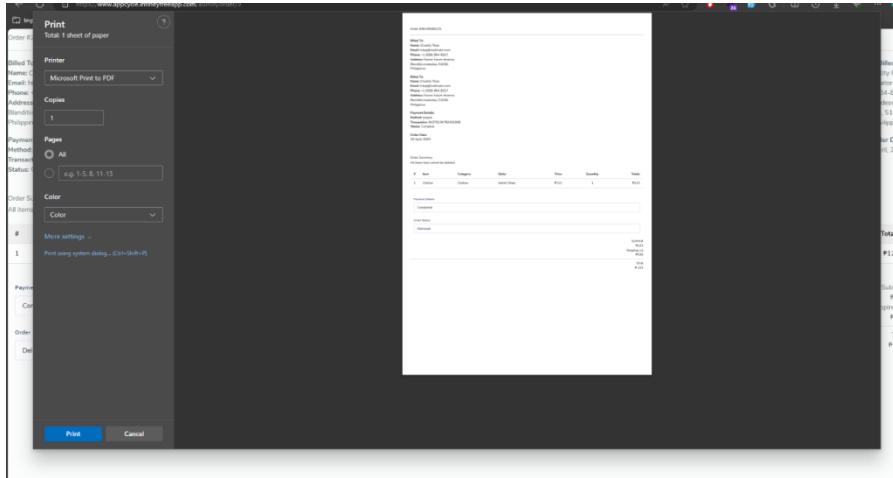
This screenshot shows the 'View Order' page for order number 4. The left sidebar has 'Orders' selected under 'Current Users'. The top half shows the 'Billed To' and 'Shipped To' details. The bottom half shows the 'Order Summary' with one item: Clothes from Admin Shop for ₱123. The total amount is ₱223.

#	Item	Category	Seller	Price	Quantity	Totals
1	Clothes	Clothes	Admin Shop	₱123	1	₱123

Payment Status: Completed  
Order Status: Delivered

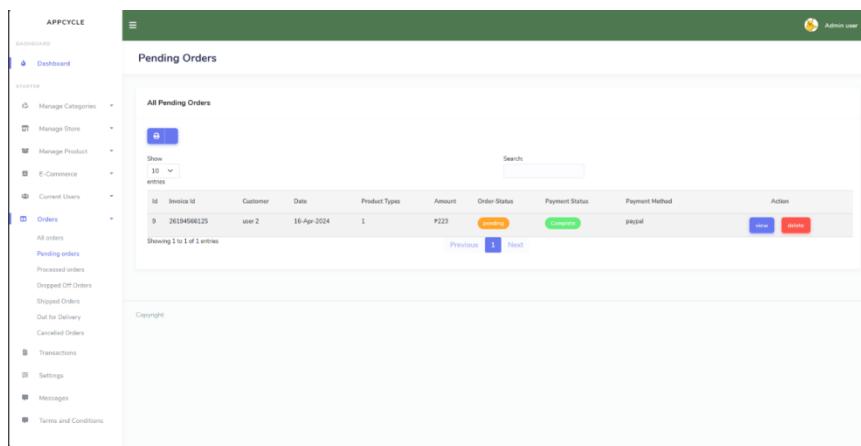
**Figure 38. Admin: View Order**

The figure displays all the order information, allowing the admin to change the product's payment and order status. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Admin can access this feature under the "Order" tab, then the view button, in the sidebar navigation.



**Figure 39. Admin: Print Order**

The figure displays the printable order information, allowing the admin to print the order information. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. The admin can access this feature under the "Order" tab, then the view button, and then print it in the sidebar navigation.



**Figure 40.** Admin: Pending Orders

The figure displays all the pending orders, allowing the admin to view and delete a pending order. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "Order" tab in the sidebar navigation.

ID	Invoice ID	Customer	Date	Product Type	Amount	Order Status	Payment Status	Payment Method	Action
10	750000003301	User 2	18-Apr-2024	1	Rs10	Pending	Unpaid	Unpaid	<button>View</button> <button>Delete</button>

**Figure 41.** Admin: Processed Orders

The figure displays all the processed orders, allowing the admin to view and delete a processed order. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "Order" tab in the sidebar navigation.

ID	Invoice ID	Customer	Date	Product Type	Amount	Order Status	Payment Status	Payment Method	Action
No data available in table									Previous Next

**Figure 42.** Admin: Dropped off Orders

The figure displays all the dropped-off orders, allowing the admin to view and delete a dropped-off order. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "Order" tab in the sidebar navigation.

This screenshot shows the 'Shipped Orders' section of the admin dashboard. The left sidebar has 'Orders' selected, with 'Dropped Off Orders' highlighted. The main area title is 'All Shipped Orders'. A table lists one order: ID 45701430470, Invoice ID user 2, Date 11-Aug-2024, Product Type 1, Amount ₹1856, Order Status Out for delivery, Payment Status Complete, and Payment Method COD. Action buttons for 'View' and 'Delete' are shown.

ID	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
B	45701430470	user 2	11-Aug-2024	1	₹1856	Out for delivery	Complete	COD	<a href="#">View</a> <a href="#">Delete</a>

**Figure 43.** Admin: Shipped Orders

The figure displays all the dropped-off orders, allowing the admin to view and delete a dropped-off order. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "Order" tab in the sidebar navigation.

This screenshot shows the 'Out for Delivery Orders' section of the admin dashboard. The left sidebar has 'Orders' selected, with 'Out for Delivery' highlighted. The main area title is 'All Out for Delivery Orders'. A table lists one order: ID 45701430470, Invoice ID user 2, Date 11-Aug-2024, Product Type 1, Amount ₹1856, Order Status Out for delivery, Payment Status Complete, and Payment Method COD. Action buttons for 'View' and 'Delete' are shown.

ID	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
B	45701430470	user 2	11-Aug-2024	1	₹1856	Out for delivery	Complete	COD	<a href="#">View</a> <a href="#">Delete</a>

**Figure 44.** Admin: Out for Delivery Orders

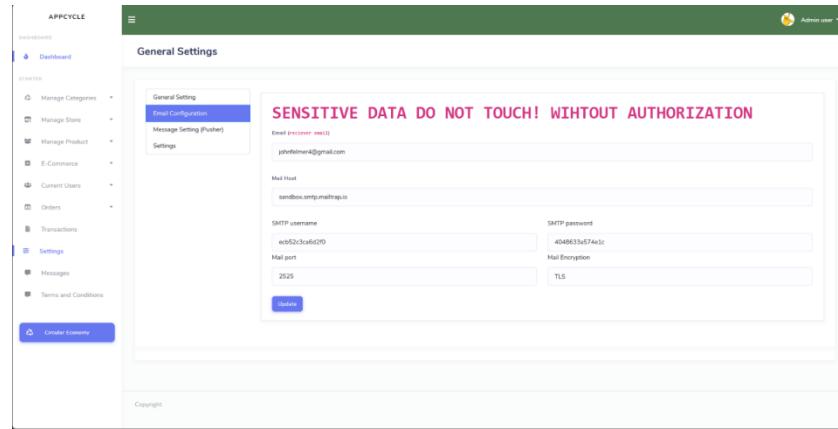
The figure displays all the out-for-delivery orders, allowing the admin to view and delete an out-for-delivery order. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Users can access this feature under the "Order" tab in the sidebar navigation.

**Figure 45.** Admin: Transactions

The figure displays all transactions made in the store, allowing the admin to view and print them. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Admins can access this feature in the "Transaction" tab in the sidebar navigation.

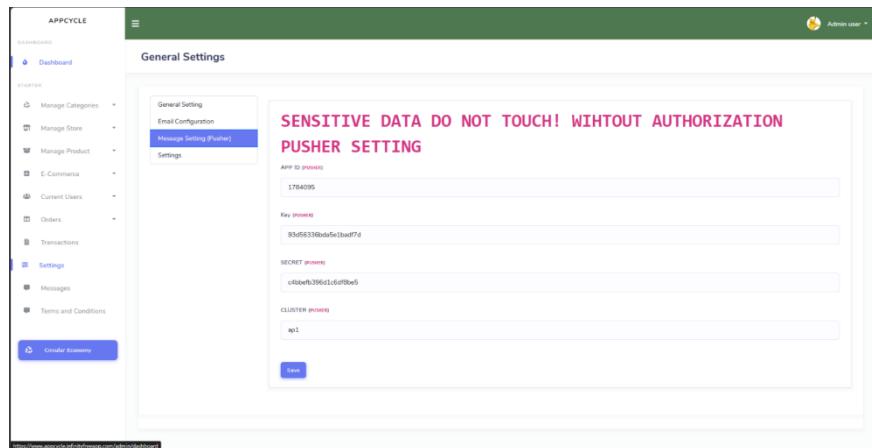
**Figure 46.** Admin: General Settings

The figure shows the general settings configuration, allowing the admin to edit the site name, currency, currency icon, contact email, and address. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Admin can access this feature in the "Settings" tab in the sidebar navigation.



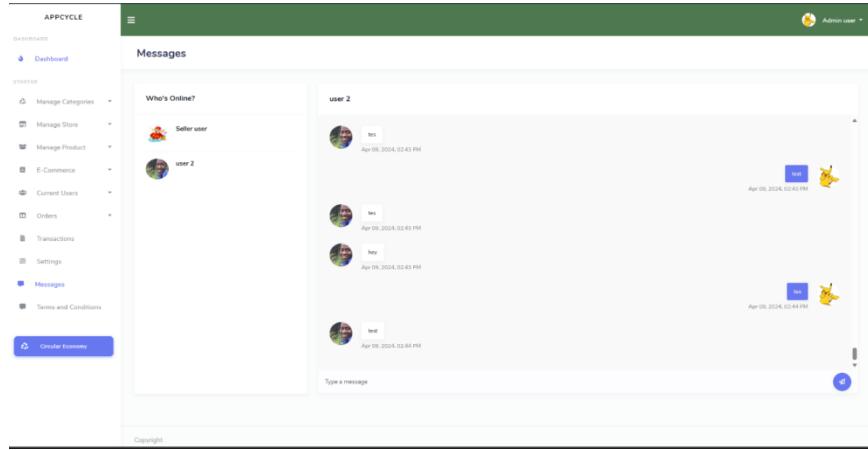
**Figure 47.** Admin: Email Configuration

The figure shows the email configuration, allowing the admin to edit the email configurations. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Admin can access this feature in the "Settings" tab in the sidebar navigation.



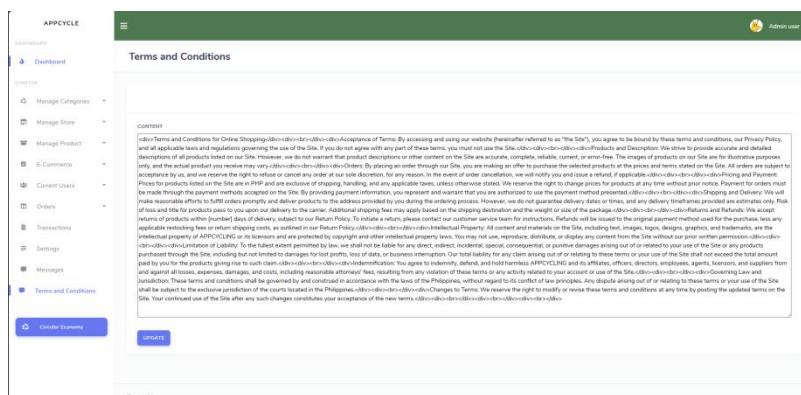
**Figure 48.** Admin: Message Configuration

The figure shows the message configuration, allowing the admin to edit the message configurations. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Admin can access this feature in the "Settings" tab in the sidebar navigation.



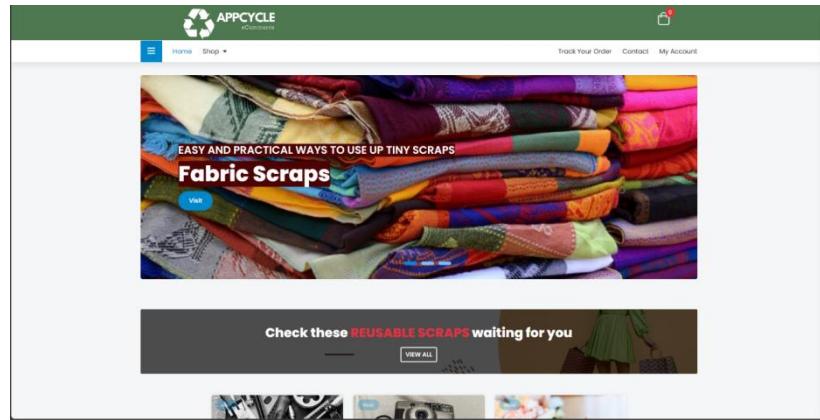
**Figure 49. Admin: Messages**

The figure shows how the admin can communicate in the web application, allowing the admin to reply to messages. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. The admin can access this feature in the "Messages" tab in the sidebar navigation.



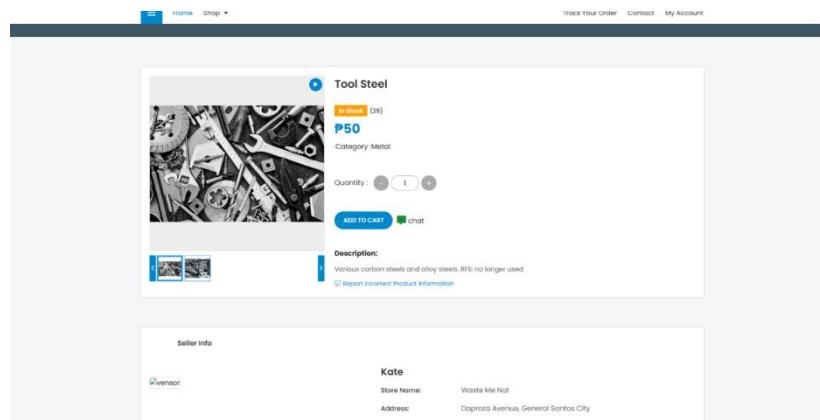
**Figure 50. Admin: Terms and Conditions**

The figure shows the content of the Terms and Conditions of the web application, allowing the admin to edit the Terms and Conditions of the web application. This functionality is exclusively accessible through the admin dashboard and is restricted to the admin account. Admin can access this feature in the "Terms and Conditions" tab in the sidebar navigation.



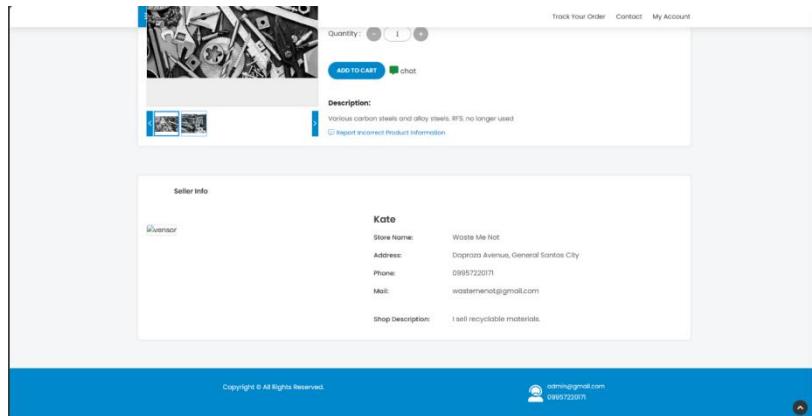
**Figure 51.** Customer: Home Page

The figure shows the web application's home page, accessible to all visitors. On this page, they can view different types of available products.



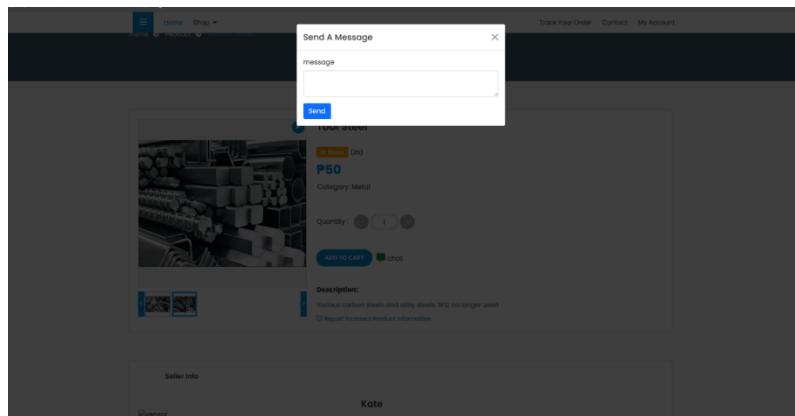
**Figure 52.** Customer: Product Details

The figure shows the product details, allowing all visitors to view the details of the posted product in the web application. This functionality is accessible to all and can be navigated by clicking a product on the home page.



**Figure 53. Customer: Seller Information**

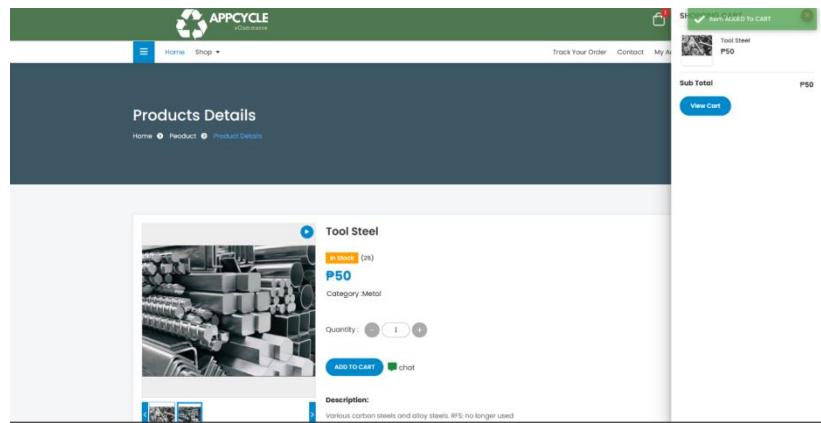
The figure shows the seller information for the product, allowing all visitors to view the seller information for the posted products in the web application. This functionality is accessible to all. You can navigate by clicking a product from the home page and scrolling to the bottom.



**Figure 54. Customer: Message Seller**

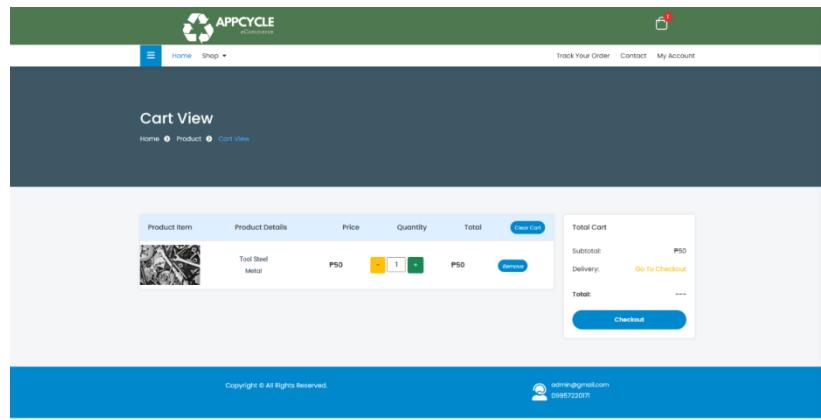
The figure shows the application's messaging features, allowing all logged-in users to message the product seller. This functionality is accessible to all logged-in users. It can be

navigated by clicking a product from the home page and clicking the message icon beside the add-to-cart button.



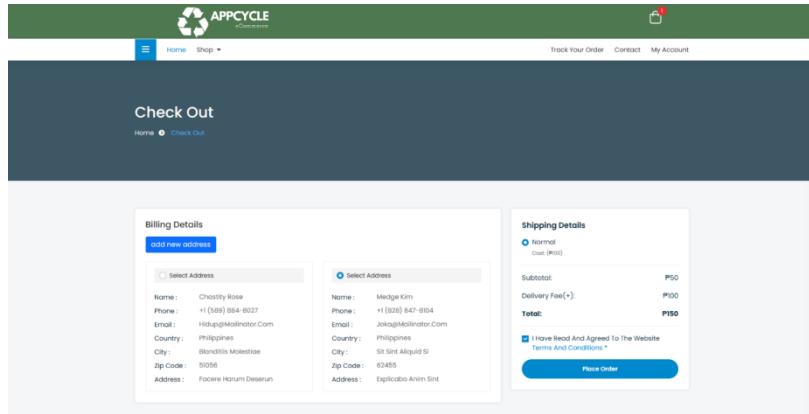
**Figure 55. Customer: Add to Cart**

The figure shows the application's add-to-cart feature, which allows all logged-in users to add a product to their cart. This functionality is accessible to all logged-in users. It can be navigated by clicking a product from the home page and the add to cart button.



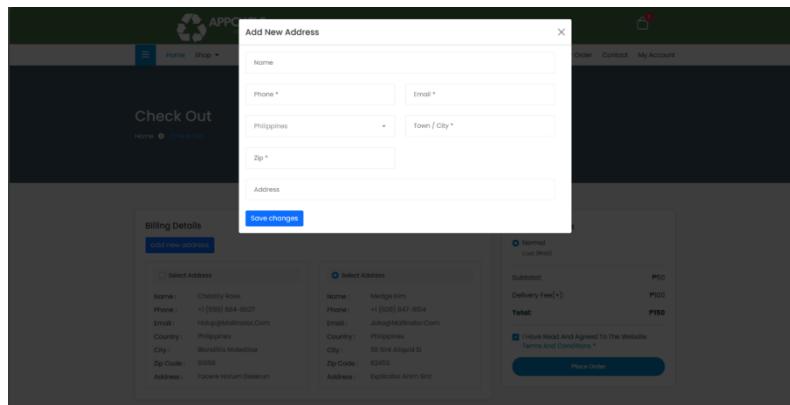
**Figure 56. Customer: View Cart**

The figure shows the content and details of the cart, allowing all logged-in users to view its details. This functionality is accessible to all logged-in users. It can be navigated by clicking a product from the home page, clicking the add to cart button, and viewing the cart.



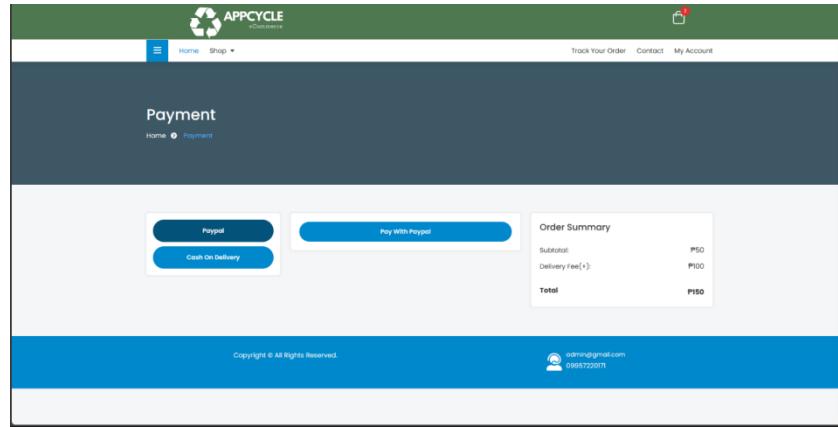
**Figure 57. Customer: Checkout**

The figure shows the checkout page, which allows all logged-in users to check out their carts. This functionality is accessible to all logged-in users. It can be navigated by clicking a product from the home page, clicking the add to cart button, viewing the cart, and checking out.



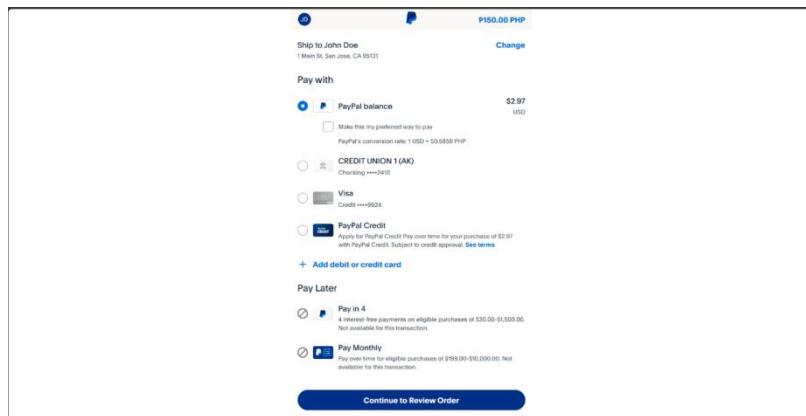
**Figure 58. Customer: Add New Address**

The figure shows the creation of a new address, allowing all logged-in users to add a new billing address. This functionality is accessible to all logged-in users. You can navigate it by performing the checkout process and clicking the add new address button.



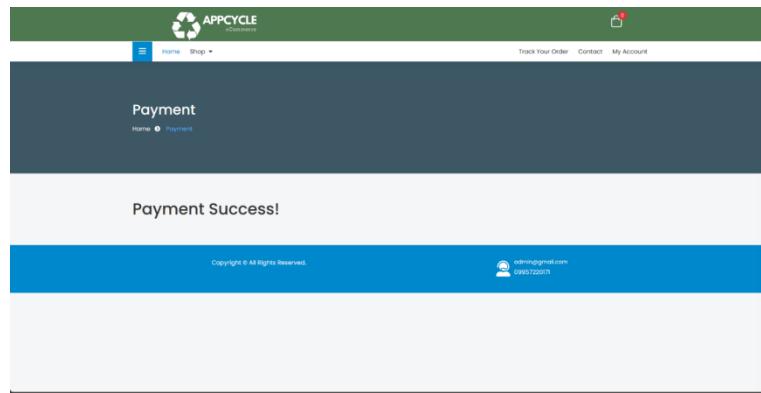
**Figure 59.** Customer: Payment Option

The figure shows the payment option, allowing all logged-in users to choose one. This functionality is accessible to all logged-in users. You can navigate it by checking out and clicking the place order button after completing the required field.



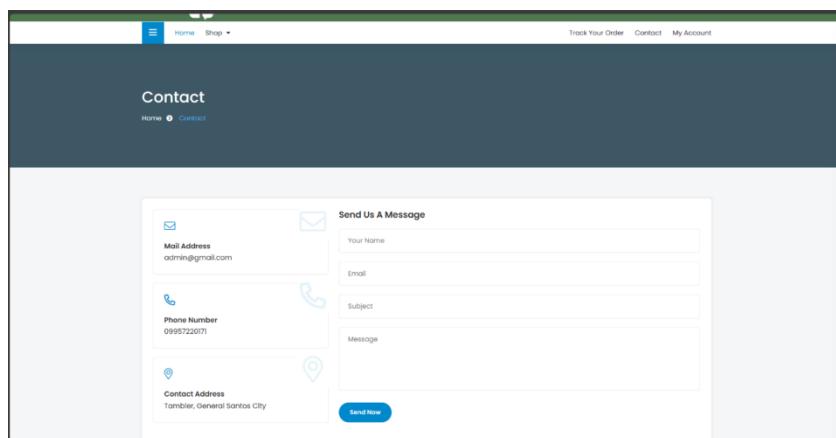
**Figure 60.** Customer: PayPal Payment Method

The figure shows the PayPal payment method, which allows all logged-in users to pay their cart bills. This functionality is accessible to all logged-in users. It can be navigated by performing the checkout process, clicking the place order button after completing the required field, and choosing PayPal as payment.



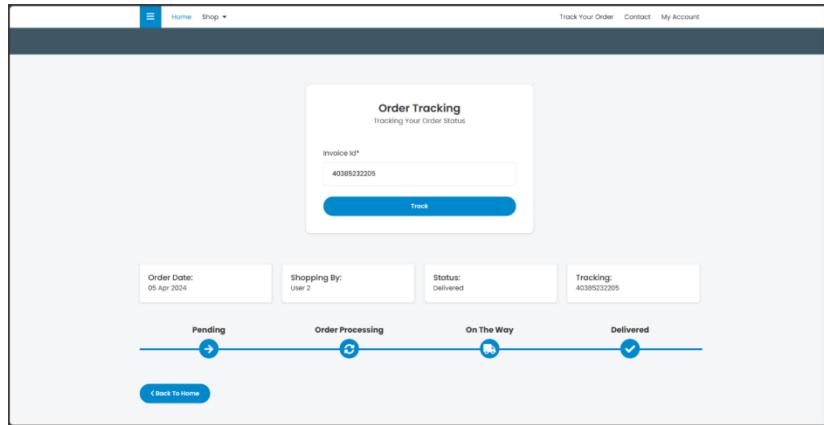
**Figure 61.** Customer: Payment Success

The figure shows the Payment Success Page; this will be displayed once the payment is successful.



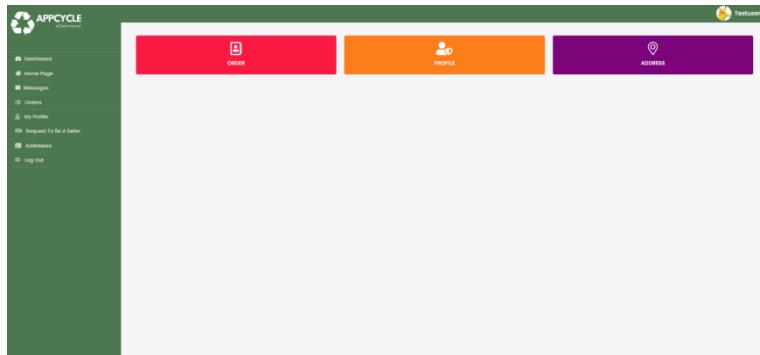
**Figure 62.** Customer: Contact

The figure shows the contact page, allowing all logged-in users to submit their concerns through the contact page. This functionality is accessible to all logged-in users. This can be found in the navbar menu tab named “Contact.”



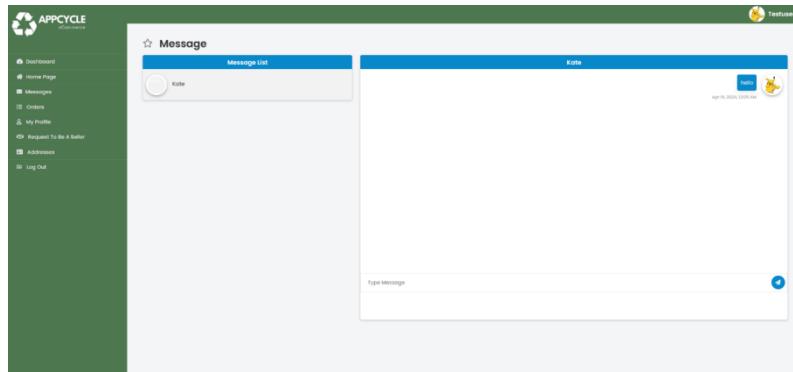
**Figure 63.** Customer: Order Tracking

The figure shows the order tracking page, allowing all logged-in users to track their orders. This functionality is accessible to all logged-in users. This can be navigated at the navbar menu tab named “Track Your Order” and then submitting an invoice ID of the ordered product.



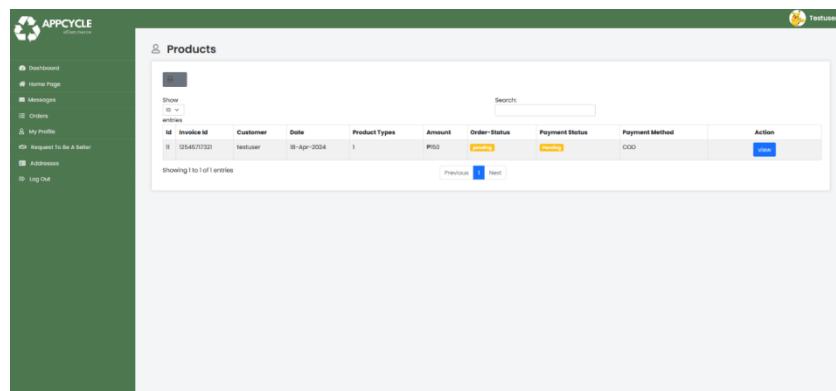
**Figure 64.** Customer: View Dashboard

The figure above shows the user dashboard when logging into the web application. This page is where users can find their messages with other users, orders, profiles, addresses, and a request form to become sellers in the system. Additionally, the Home Page and Log Out option allows users to visit the web page and log out of their system.



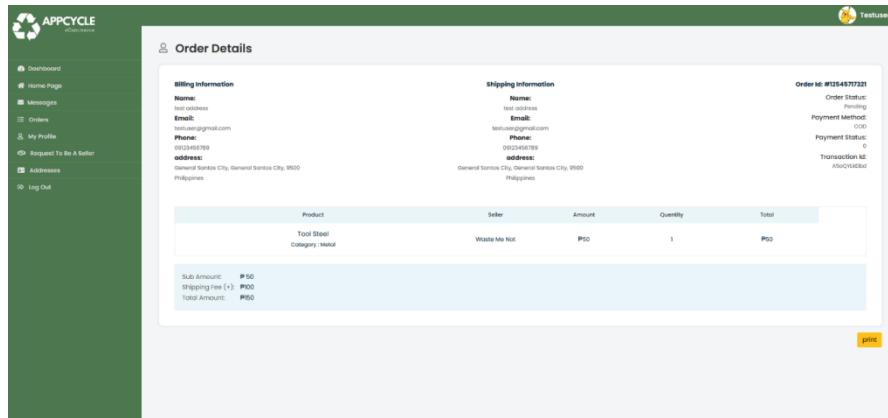
**Figure 65. Customer: View Messages**

The figure above shows a webpage containing the user's conversations with other system users. On this webpage, the user can find a list of users they have contacted via the chat option on the product detail page and a chatbox containing the messages they had with another selected user from the list.



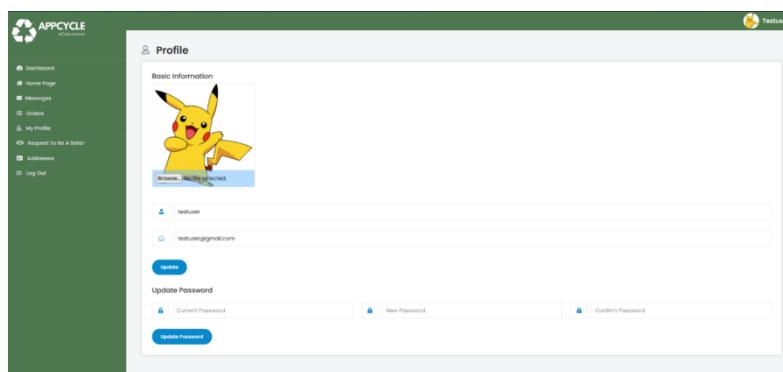
**Figure 66. Customer: View Orders**

The figure above shows a webpage containing the user's orders in the system. The page contains the date of purchase, the type of product, the amount, the order and payment status, and the payment method. A view button is located on the right side to show a printed report of the purchase on another webpage.



**Figure 67. Customer: View Order Details**

The figure above shows a webpage containing the order details of the customer's purchase from their orders list. The printed report contains more information, such as the customer's billing and shipping information, the breakdown of the cost of the purchase found below, the name of the product and its seller, and a print option on the bottom right if the customer wants to have a printed copy of their purchase.



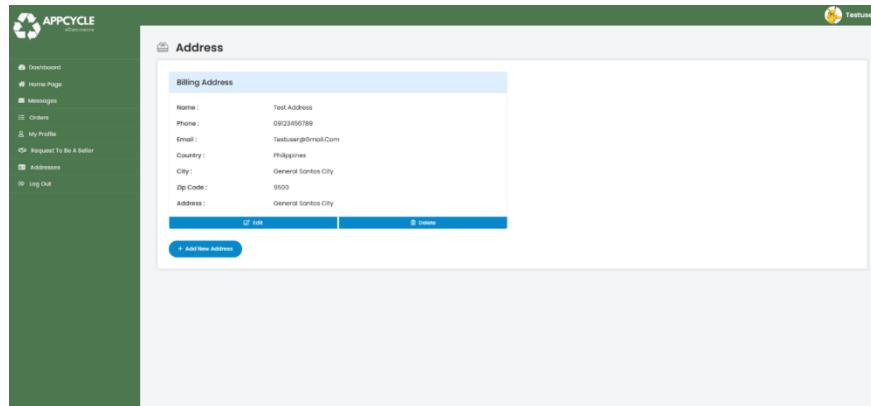
**Figure 68. Customer: View Profile**

The figure above shows a webpage containing the customer's profile details. On this webpage, the customer can change their profile image, username, email, and password by using the form to update it.

The screenshot shows a dark-themed user interface for the APPCYCLE platform. On the left, there is a vertical sidebar with a green background containing navigation links: Dashboard, Home Page, Messages, Orders, My Profile, Request To Be A Seller, Address, and Log Out. The main content area has a white background and features a title 'Request To Be A Seller'. Below the title, there is a 'Terms and Condition' section with placeholder text. The form consists of several input fields: 'Shop Image' (with a 'Browse' button), 'Shop Name' (text input), 'Shop Email' (text input), 'Shop Phone' (text input), 'Shop Address' (text input), and 'Shop About' (text input). At the bottom left of the form is a blue 'Submit' button.

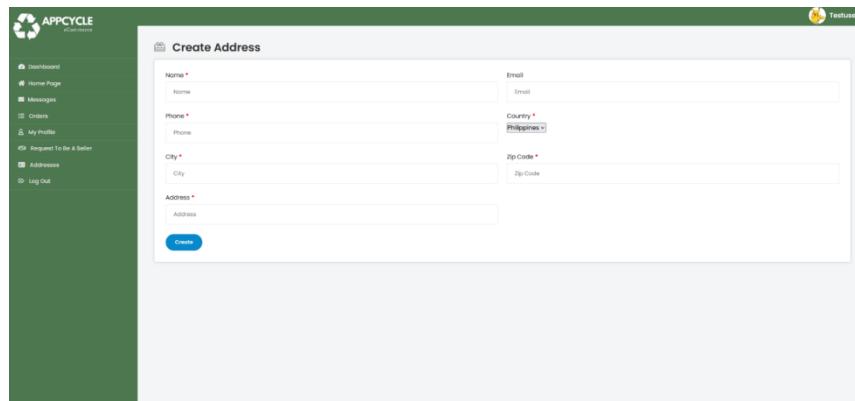
**Figure 69. Customer: Request to be a Seller**

The figure above shows a webpage containing a form for the customer to fill in to become a seller on the platform. Through this webpage, the customer can request to become a seller by filling up the form found in the webpage, which contains the shop image they want to be associated with, the shop name, the shop email and phone number for contact, the shop address, and an explanation of their shop. Once complete, they can click the bottom left button to submit their request for the admins to process.



**Figure 70.** Customer: Manage Addresses

The figure above shows a webpage containing a collection of addresses the customer may use for the system. This webpage allows the customer to see the list of addresses they have added to the system alongside the option to add a new address, update an existing one, or delete one entirely.



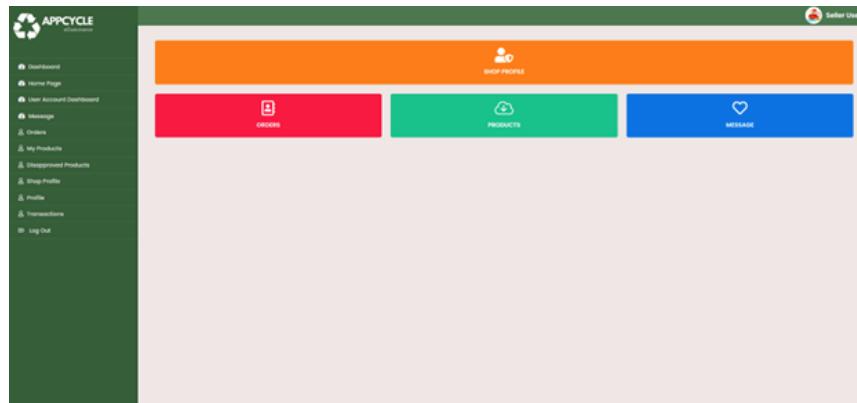
**Figure 71.** Customer: Create Address

The figure above shows a webpage containing a form for the customer to fill in if they haven't added one or want to use multiple addresses. The customer can create a new address through this webpage by filling in the necessary info, such as the name, phone number, email, country, city, ZIP code, and home address.

The screenshot shows a web-based application interface for managing addresses. On the left is a dark green sidebar menu with various options like Dashboard, Home Page, Messages, Orders, My Profile, Request To Be A Seller, Addresses, and Log Out. The main content area has a title 'EDIT Address'. It contains several input fields: 'Name' (with placeholder 'Net address'), 'Email' (with placeholder 'netuser@gmail.com'), 'Phone' (with placeholder '09123456789'), 'Country' (set to 'Philippines'), 'City' (set to 'general bonito City'), 'Zip Code' (set to '9999'), and 'Address' (set to 'general bonito City'). There is also a 'Submit' button at the bottom.

**Figure 72. Customer: Edit Address**

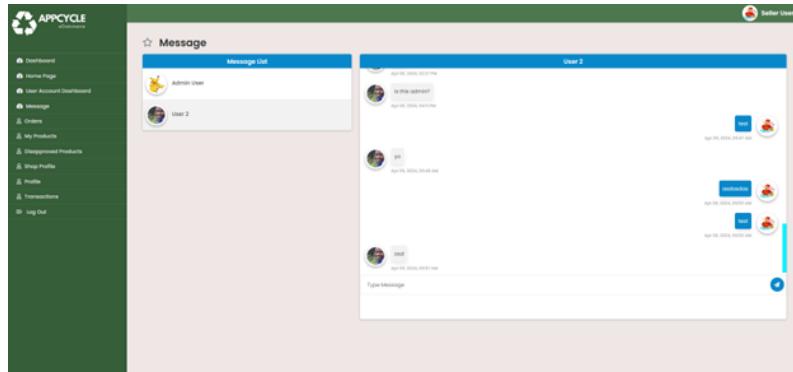
The figure above shows a webpage containing a form for the customer to fill in if they want to update an existing address. Similar to the create address page, this webpage allows the customer to update an existing address by filling in the necessary info such as the name, phone number, email, country, city, ZIP code, and the address of their home.



**Figure 73. Seller: View Dashboard**

The figure above shows a webpage containing a dashboard for the seller's side. Through this webpage, the seller can do the same capabilities as the customer but with added features such as viewing and listing their products, a list of disapproved products with remarks from the admin, viewing and editing their shop profile, and the transactions made from their listed products. The

seller can return to the customer dashboard through this webpage by selecting the User Account Dashboard option.



**Figure 74. Seller: View Messages**

The figure above shows a webpage containing a list of users they have interacted with and the seller's messages with them. This webpage functions similarly to the chat function on the customer's side and shares the same characteristics, such as listing the users they have communicated with and their message history.

M	Invoice ID	Customer	Date	Product Type	Amount	Order Status	Payment Status	Payment Method	Action
1	45104040470	user 2	05-Apr-2024	1	\$100	Open	Pending	COD	<button>View</button>
2	45104032200	user 2	05-Apr-2024	1	\$100	Open	Pending	Paytm	<button>View</button>
3	17632268993	Admin user	05-Apr-2024	1	\$100	Open	Pending	Paytm	<button>View</button>
4	76952805000	Admin user	05-Apr-2024	1	\$100	Open	Pending	Paytm	<button>View</button>
5	42204403000	Admin user	05-Apr-2024	1	\$100	Open	Pending	Paytm	<button>View</button>

**Figure 75. Seller: View Sold Products**

The figure above shows a webpage containing a list of transactions in which the seller could sell their scrap material. This webpage functions almost similarly to the View Orders page on the customer side but with entries focusing on the users who have purchased your scrap

material, such as a table containing their purchases and the View option to provide a more detailed view of the situation.

The screenshot shows the 'Order Details' page for a seller. At the top right, it says 'Seller User'. On the left, there's a sidebar with links like Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main content area has tabs for 'Order Details' and 'Seller User'. Under 'Order Details', there are sections for 'Billing Information' (Name: Chevally Rose, Email: chevallyrose@host.com, Phone: +1 (888) 884-8027, address: 123 Main Street, Anytown, USA), 'Shipping Information' (Name: Chevally Rose, Email: host@host.com, Phone: +1 (888) 884-8027, address: 123 Main Street, Anytown, USA), and an 'Order ID' section (Order ID: #43794393470, Order Status: Out For Delivery, Payment Method: COD, Payment Status: 1, Transaction ID: QKJGJGJGJG). Below these are tables for 'Product' (Can, Category: Metal) and 'Order Status' (Pending, Show). A 'print' button is at the bottom right.

**Figure 76.** Seller: View Order Details of Sold Product

The figure above shows a webpage containing a detailed view of the customer's purchase in which the seller could sell their scrap material. This webpage functions almost similarly to the View Order Details page of the customer side but with entries focusing on the users who have purchased your scrap material, such as a table containing their purchases and the View option to provide a more detailed view of the situation.

The screenshot shows the 'Products' page for a seller. The left sidebar is identical to Figure 76. The main content area has a 'Products' tab and a 'Seller User' link. It includes buttons for 'Submit for Admin Approval' and 'Upload Product', and links for 'Product Authentication through Google Teachable Machine' and 'Upload Product'. Below is a table with columns: Id, Image, Name, Price, Is approved?, Status, and Action (with edit, delete, and image gallery buttons). The table contains five rows of product data:

ID	Image	Name	Price	Is approved?	Status	Action
49		Imendo Corazon	414	Approved	<input checked="" type="checkbox"/>	<a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Image Gallery</a>
49		Fitzgerald Williamson	810	Approved	<input checked="" type="checkbox"/>	<a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Image Gallery</a>
38		Film Camera Bundle	3000	Approved	<input checked="" type="checkbox"/>	<a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Image Gallery</a>
31		Nonfunctional Alcohol Phone	590	Approved	<input checked="" type="checkbox"/>	<a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Image Gallery</a>
30		Dakota Hinton	785	Approved	<input checked="" type="checkbox"/>	<a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Image Gallery</a>

**Figure 77.** Seller: View Listed Products

The figure above shows a webpage containing a view of the seller's listed items in which the seller could sell their scrap material. The webpage includes several options, such as uploading a product with Google Teachable Machine or having to verify via the admin manually, viewing the image gallery of the product, an edit and delete option for the listed product, and an image gallery if the customer is curious for more images regarding the product.

The screenshot shows a dark-themed web application for APPCYCLE. On the left is a sidebar with navigation links: Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main content area has a title 'Upload Product Through Google Teachable Machine Authentication'. It contains a note '(SELECT A CATEGORY FIRST BEFORE UPLOADING IMAGE!!!)' and fields for Category (a dropdown menu), Image (a file input field with placeholder 'Browse... No file selected.'), Product Name, Price, Stock Quantity, Description, and Status (Active). A 'Seller User' icon is in the top right corner.

**Figure 78. Seller: Upload Product via Google Teachable Machine**

The figure above shows a webpage containing a form for the seller to complete if they want to list a product in the system. The AI model decides whether the image agrees with the captured image as recyclable or not. The webpage contains a category to select, an image to add, the name, price, quantity, and description of the product to be listed, and its status.

This screenshot shows the same dark-themed APPCYCLE interface as the previous one. The sidebar and title are identical. The main content area has a title 'Create Product'. It contains fields for Product Image (a file input field with placeholder 'Browse... No file selected.'), Product Name, Category (set to Electronics), Price, Stock Quantity, Description, and Status (set to Active). A blue 'Add' button is at the bottom right of the form. A 'Seller User' icon is in the top right corner.

**Figure 79.** Seller: Upload Product via Manual Approval from the Admin

The figure above shows a webpage containing a form for the seller to complete if they want to list a product in the system, similar to the previous website. Unlike the page that uses the AI model, this page relies on the admin to accept or deny their request via the admins viewing the pending request in listing the product.

This screenshot shows the 'Edit Product' form within the APPCYCLE Seller User interface. The left sidebar contains navigation links such as Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main content area has a title 'Edit Product'. It includes fields for 'Product Image' (with a preview image of metal screws), 'Product Name' (Imelda Carlson), 'Category' (Metal), 'Price' (\$14), 'Stock Quantity' (572), 'Description' (Eorum nostrud animi), and status indicators for 'Approved' (No), 'Disapproved' (No), and 'Status' (Active). A large text area for the product description is also present.

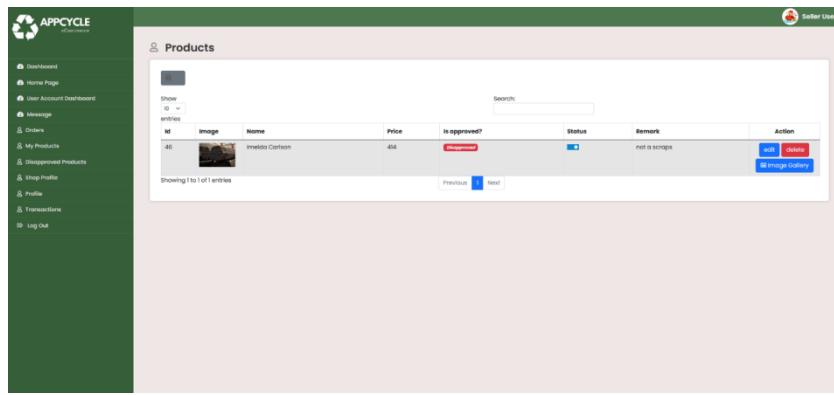
**Figure 80.** Seller: Edit Product Details

The figure above shows a webpage containing a form for the seller to complete if they want to edit the details of their listed product. This page's form is structured almost identically to the forms when listing a product but does not need confirmation from either admin or AI to accept the changes made to the listed product.

This screenshot shows the 'Product Images' section within the APPCYCLE Seller User interface. The left sidebar is identical to Figure 80. The main content area displays a table titled 'Product Images' with columns for 'Image' and 'Action'. A message at the bottom states 'No data available in table showing 0 to 0 of 0 entries'. There is also a search bar and navigation buttons for 'Previous' and 'Next'.

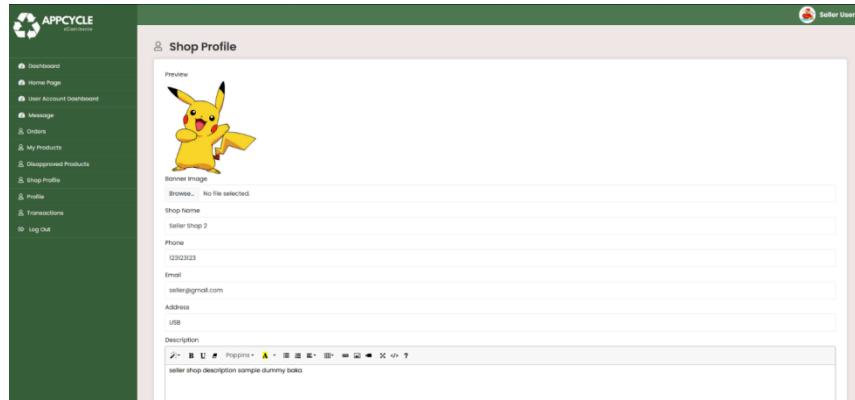
**Figure 81.** Seller: Product Image Gallery

The figure above shows a webpage containing a form for the seller to complete if they wish to add additional images regarding their listed product. On this page, the form requests an image input, which uses the same AI model as the one used to upload a product. It checks the image to see if it matches the product type. Once it matches, it can be added to the gallery, where the seller can see the associated images at the bottom of the webpage.



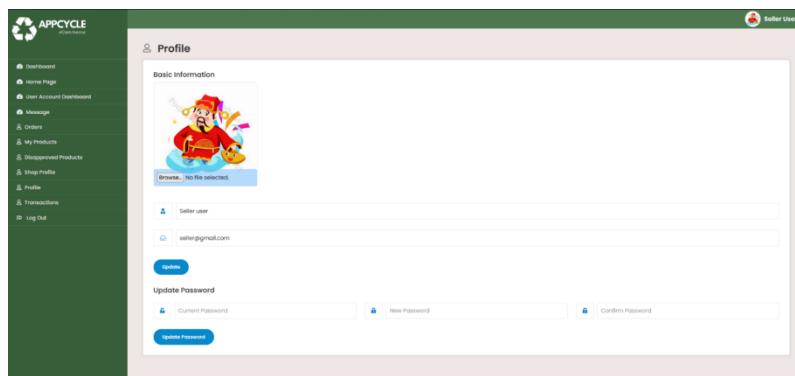
**Figure 82.** Seller: Disapproved Products

The figure above shows a webpage containing a list of disapproved product listings from the seller by the admin. On this page, the table contains basic info about the disapproved product, such as the seller's name, price, approval status (Disapproved), and a remark explaining why the product listing was disapproved.



**Figure 83.** Seller: Shop Profile

The figure above shows a webpage containing a form for the seller to fill in to edit the details of their shop profile. On this page, a form is provided in which the seller may enter the updated information of their shop, such as the banner image, shop name, contact number and email, address, and shop description, alongside a link for Facebook and Twitter if the seller has any.



**Figure 84.** Seller: View Profile

The figure above shows a webpage containing the seller's profile details. This webpage shares the same functionality as the customer's Profile page, where both can change their profile image, username, email, and password.

ID	Invoice ID	Transaction ID	Payment Method	Amount in Base Currency	Amount in Real Currency
8	#40305435470	QKJ0000178	COD	1000 PHP	1000 PHP
7	#40306433205	SLJ0004490985705	paypal	700 PHP	700 PHP
6	#40305435454	SPY88718000022C	paypal	100 PHP	100 PHP
5	#70003090000	GP9805917852418	paypal	1000 PHP	1000 PHP
4	#4225140226	4J79584XH944220Y	paypal	700 PHP	700 PHP

**Figure 85. Seller: View Transaction Reports**

The figure above shows a webpage containing the transaction report of the seller's shop. Although the webpage appears almost similar to the orders webpage, the transactions report webpage focuses on the monetization report instead of the order tracking as the table in this webpage contains the transaction ID of the products as well as the payment method and the amount in the currency which is set to Philippine Pesos or PHP. A filter can be found on the top left of the report, which the seller can use to determine the sales report of their shop based on a given timeframe. A print option can provide the seller with a cleaner version of the report, showing the transactions made with the shop and nothing else.

#### 4.4 System Testing/Verification

To determine whether the web application has achieved its objectives, the proponents utilized the System Usability Scale (SUS) framework to evaluate the usability of the web application through the responses of the thirty (30) participants in the web application testing.

The proponents decided to use the SUS framework to evaluate user satisfaction of the web application as it falls in line with the main objective of the application which is to develop a web application that allows the users to buy and sell reusable goods. Another reason for utilizing the SUS framework for usability testing is due to having the capability of pinpointing the issues of the system in which it has not achieved the satisfaction of the users which will help the proponents in understanding and resolving the issue despite the framework not having a diagnostic nature. Lastly, the framework is quick in processing and simple to calculate. It is inexpensive to execute compared to other methods regarding the application tested for usability as the framework uses a simple questionnaire in gathering data. The calculation and interpretation of the SUS score are simple and straightforward to understand all while being a valid tool in usability testing (Bhat, 2023).

#### **4.4.1 Usability Testing Version 1 Results and Evaluation**

During the testing of the Version 1 of the system, the proponents studied and evaluated the system prototypes version 1 and 2 in regards to the expected functionality of the system and its process flow. After reviewing the following prototypes, the proponents have concluded the following points from the system which are to be considered when creating the system that is to be used for usability testing:

- Add a dashboard for the customer, seller, and admin each having their own capabilities such as the seller's capability to sell their products, admin to manage

the users and products in the system, and for the customer to request to be a seller in the system.

- Add an address system in which users are able to create shipping addresses instead of having one singular address.
- Use PayPal as another form of payment in regards to the products to have either payment be done via PayPal or Cash on Delivery.
- Have an order tracking system to show the progress of the order delivery after purchasing the product.
- Allow the user to request to be a seller instead of having a separate seller account as a form of extended privileges in the system.
- Add a security system in regards to accounts such as an option to send an email to the email address of the account if the password is forgotten.
- Implement the Google Teachable Machine as an image validation instead of a category selector based on its image predictions to allow the freedom of the user to select the intended option and have the AI model verify that their entered information is valid and correct.
- A contact system to the admin of the system for inquiries and communication in regards to the system.
- Utilize email addresses for password reset procedures. If a user forgets their password or needs to reset it for security reasons, the system sends a password reset link or provides instructions to the user's registered email address. This process contributes to maintaining account security and ensuring that only authorized users can access their accounts.

#### 4.4.2 Usability Testing Version 2 Results and Evaluation

Grade	SUS	Percentile	Adjective
A+	84.1-100	96-100	Best Imaginable
A	80.8-84.0	90-95	Excellent
A-	78.9-80.7	85-89	
B+	77.2-78.8	80-84	
B	74.1 – 77.1	70 – 79	
B-	72.6 – 74.0	65 – 69	
C+	71.1 – 72.5	60 – 64	Good
C	65.0 – 71.0	41 – 59	
C-	62.7 – 64.9	35 – 40	
D	51.7 – 62.6	15 – 34	OK
F	25.1 – 51.6	2 – 14	Poor
F	0-25	0-1.9	Worst Imaginable

**Table 4** Percentiles, Grades, and Adjectives to Describe SUS Scores

Table 4 shows the table used to describe the calculated SUS scores and is used as a basis to determine whether the product has reached the minimum performance for usability (*System Usability Scale*, n.d.). To determine whether the system is usable, a minimum SUS score of 68 is used as a baseline as it represents the average SUS score where scores higher than 68 are considered above average and scores below 68 are considered below average (Bhat, 2023).

Respondent	Q1
1	3
2	2
3	3
4	3
5	2
6	3
7	4
8	2
9	1
10	3
11	2
12	3
13	2
14	4
15	3
16	4
17	2
18	3
19	3
20	2
21	4
22	2
23	3
24	3
25	3
26	4
27	2
28	2
29	2
30	2
Mean:	67.5
Required:	68
Strongly Disagree	0
Disagree	1
Neutral	12
Agree	12
Strongly Agree	5

**Table 5 Statement One (1) Result**

Table 5 shows the average (mean) SUS score of the stat, “Overall, I find the APPCycle web application is easy to use.” It can be observed that the SUS score is slightly below the minimum requirement for usability and with the majority of the votes between agree and neutral, it can be determined that while the web application is useful to an extent, there is some room for improving the user experience in terms of ease of use.

Respondent	Q2
1	4
2	3
3	4
4	3
5	3
6	3
7	4
8	4
9	4
10	4
11	3
12	3
13	3
14	3
15	3
16	3
17	3
18	3
19	4
20	3
21	4
22	4
23	3
24	3
25	4
26	4
27	3
28	1
29	3
30	4
Mean:	83.5
Required:	68
Strongly Disagree	0
Disagree	1
Neutral	0
Agree	17
Strongly Agree	12

**Table 6 Statement Two (2) Result**

Table 6 shows the average SUS score of the statement “The registration and login process is direct and user-friendly.” It can be observed that the SUS score is higher than the minimum requirement for usability and with the majority of the votes in agree, it can be determined that the respondents agree with the statement and the registration and login functionality is great in terms of usability.

Respondent	Q3
1	3
2	1
3	3
4	3
5	1
6	3
7	3
8	3
9	2
10	3
11	1
12	3
13	3
14	3
15	3
16	2
17	2
18	3
19	3
20	1
21	4
22	4
23	3
24	2
25	2
26	2
27	1
28	1
29	3
30	2
Mean:	61
Required:	68
Strongly Disagree	0
Disagree	6
Neutral	7
Agree	15
Strongly Agree	2

**Table 7 Statement Three (3) Result**

Table 7 shows the average SUS score of the statement “I find it easy to navigate between different sections of the APPCycle web application.” It can be observed that the SUS score is lower than the minimum requirement for usability and while the majority of the votes agree with the statement, the average score was unable to meet the minimum requirement and as a result, the navigation should be looked into and improved upon to meet the given standards.

Respondent	Q4
1	3
2	1
3	3
4	3
5	4
6	2
7	3
8	3
9	1
10	4
11	2
12	2
13	3
14	3
15	3
16	4
17	3
18	3
19	4
20	2
21	4
22	4
23	2
24	3
25	1
26	3
27	2
28	3
29	4
30	2
Mean:	70
Required:	68
Strongly Disagree	0
Disagree	3
Neutral	7
Agree	13
Strongly Agree	7

**Table 8 Statement Four (4) Result**

Table 8 shows the average SUS score of the statement “The design of the APPCycle web application is visually appealing.” It can be observed that the SUS score is slightly above the minimum requirement for usability and with the majority of the votes in agree, it can be determined that the respondents agree that the web application’s design is visually appealing to look at.

Respondent	Q5
1	4
2	2
3	4
4	2
5	3
6	2
7	4
8	4
9	2
10	3
11	0
12	2
13	2
14	2
15	2
16	2
17	4
18	3
19	4
20	3
21	3
22	4
23	4
24	3
25	2
26	3
27	2
28	3
29	4
30	3
Mean:	71
Required:	68
Strongly Disagree	1
Disagree	0
Neutral	11
Agree	9
Strongly Agree	9

**Table 9 Statement Five (5) Result**

Table 9 shows the average SUS score of the statement “Completing a sale or purchase transaction in the APPCycle web application is efficient.” It can be observed that the SUS score is slightly above the minimum requirement for usability and with the majority of votes in neutral, the respondents do not share a strong reaction of either agreement nor disagreement in regards to the completion of sales and/or purchase transactions and should likely be reviewed to improve on the experience regarding the statement.

Respondent	Q6
1	4
2	2
3	3
4	2
5	1
6	3
7	2
8	2
9	2
10	3
11	3
12	1
13	3
14	2
15	3
16	3
17	1
18	4
19	4
20	3
21	3
22	4
23	3
24	2
25	1
26	4
27	2
28	4
29	2
30	2
Mean:	65
Required:	68
Strongly Disagree	0
Disagree	4
Neutral	10
Agree	10
Strongly Agree	6

**Table 10 Statement Six (6) Result**

Table 10 shows the average SUS score of the statement “The notification system for transactions on the APPCycle web application is timely and informative.” It can be observed that the SUS score is below the minimum requirement for usability and with the majority being split between neutral and agree, it can be said that while some respondents agree with the statement, some do not share the same positive response and may consider that the notification system should be improved upon in order to agree with the statement.

Respondent	Q7
1	4
2	3
3	2
4	2
5	2
6	2
7	3
8	3
9	2
10	2
11	2
12	1
13	2
14	2
15	2
16	2
17	2
18	3
19	3
20	3
21	3
22	2
23	2
24	1
25	2
26	4
27	3
28	3
29	3
30	2
Mean:	60
Required:	68
Strongly Disagree	0
Disagree	2
Neutral	16
Agree	10
Strongly Agree	2

**Table 11 Statement Seven (7) Result**

Table 11 shows the average SUS score of the statement “I feel confident about the security of my personal information on APPCycle.” It can be observed that the SUS score does not meet the minimum requirement for usability and a majority of the votes have voted for neutral. Given the info, it can be determined that the respondents do not agree nor disagree with the statement and based on the SUS score, the security of the personal info of the users should be improved upon which may convince those who voted neutral if it reaches their expectations

Respondent	Q8
1	4
2	2
3	3
4	3
5	4
6	3
7	4
8	4
9	2
10	4
11	2
12	2
13	2
14	2
15	2
16	2
17	3
18	3
19	4
20	3
21	3
22	2
23	3
24	2
25	3
26	3
27	2
28	3
29	4
30	3
Mean:	71.75
Required:	68
Strongly Disagree	0
Disagree	0
Neutral	11
Agree	12
Strongly Agree	7

**Table 12 Statement Eight (8) Result**

Table 12 shows the average SUS score of the statement “The Google Teachable Machine accurately identifies scrap materials upon upload.” It can be observed that the SUS score is slightly above the minimum requirement for usability and with a majority of the votes in agreement with the statement, it can be said that the system’s integration with Google Teachable Machine is fairly accurate to determine what scrap material is being submitted through the product listing form where the model is being implemented and the respondents agree with the statement in that the model made by Google Teachable Machine is accurate in its image identification.

Respondent	Q9
1	4
2	2
3	3
4	3
5	4
6	3
7	4
8	4
9	3
10	4
11	2
12	3
13	2
14	2
15	2
16	1
17	3
18	3
19	4
20	3
21	3
22	3
23	3
24	2
25	2
26	4
27	3
28	3
29	4
30	3
Mean:	74.25
Required:	68
Strongly Disagree	0
Disagree	1
Neutral	7
Agree	14
Strongly Agree	8

**Table 13 Statement Nine (9) Result**

Table 13 shows the average SUS score of the statement “Integrating Google Teachable Machine enhances my experience identifying and selling scrap materials.” It can be observed that the SUS score is above the minimum requirement for usability and with a majority of the votes in agreement with the statement, it can be said that the respondents agree with the statement that by integrating the GTM model, it has enhanced the experience of the respondents in regards to the identification and sale of scrap materials.

Respondent	Q10
1	3
2	1
3	3
4	3
5	3
6	3
7	4
8	4
9	2
10	4
11	1
12	2
13	2
14	2
15	2
16	2
17	3
18	3
19	4
20	3
21	3
22	1
23	3
24	2
25	3
26	3
27	2
28	2
29	4
30	3
Mean:	66.75
Required:	68
Strongly Disagree	0
Disagree	3
Neutral	9
Agree	13
Strongly Agree	5

**Table 14 Statement Ten (10) Result**

Table 14 shows the average SUS score of the statement “The performance of Google Teachable Machine on the web application meets my expectations.” It can be observed that the SUS score is slightly below the minimum requirement for usability and with a majority of respondents in agreement with the statement, it can be stated that the respondents agree that the performance of the GTM model has met their expectations but since the score is below the minimum requirement, improvements to the model’s prediction should be implemented such that it is able to meet the requirement of usability.

Respondent	SUS Score
1	90
2	47.5
3	77.5
4	67.5
5	67.5
6	67.5
7	87.5
8	82.5
9	52.5
10	85
11	45
12	55
13	60
14	62.5
15	62.5
16	62.5
17	65
18	77.5
19	92.5
20	65
21	85
22	75
23	72.5
24	57.5
25	57.5
26	85
27	55
28	62.5
29	82.5
30	65
Mean:	69
Required:	68

**Table 15 System Usability Scale (SUS) Score of Respondents**

Table 15 shows the calculated SUS scores of the respondents based on their responses to the questionnaire and the average SUS score of the system in comparison to the minimum usability requirement. Based on the calculated mean, it can be determined that the web application can meet the minimum usability standards in terms of its performance, efficiency, and ease of use.

### Usability Testing Version 2 Overall Interpretation of Results

Overall, the results from the survey indicate an average level of satisfaction from the respondents regarding the system's general usability and meeting the minimum required level of its usability. While the system is unable to meet the minimal requirements of some of its functionality such as the navigation and security implementation in the system, both of which have an average SUS score of 61 and 60 respectively, some of its functionalities such as the transaction and the enhancement of the scrap material identification via the GTM model integration, having scores of 71 and 74.25 respectively, were able to meet the minimum requirements with the registration and login function having the best usability score of 83.5. Although the system has met the minimum requirements for a usable system, there is more room for improvement in some of its functionalities to improve its usability, particularly system navigation, notification system, data security, and the performance of the GTM model in the system.

#### **4.4.3 System Usability Scale (SUS) Post-Study Testing Results**

The SUS post-test functions similarly to the SUS pre-test in which it measures the usability of a product but instead is performed after the study which includes the improvements of the system from the SUS Pre-test. The scale comes in the form of a 16-item questionnaire with 7 responses ranging from Strongly Agree to Strongly Disagree (*PSSUQ (Post-Study System Usability Questionnaire)*, 2021). The post-test has two questionnaires corresponding to the buyer and seller users.

Respondent	System Usefulness
1	1.33
2	1.83
3	1.5
4	1.17
5	1.17
6	1.5
7	1.33
8	1.17
9	1
10	1.5
11	1.5
12	2.17
13	2
14	1.5
15	1
16	1.17
17	1.33
18	1.33
19	1.33
20	1.5
Mean	1.42
Required	2.8

**Table 16 Buyer System Usefulness Result**

Table 16 shows the average respondent Post-Study System Usability Questionnaire (PSSUQ) score of the system usefulness in the buyer side of the system. It can be observed that the mean score is lower than the average score of 2.8, signifying that the respondents are satisfied with the performance of the web application in terms of its system usefulness as a platform for scrap materials in the form of a digital marketplace when operating the web application as a buyer.

Respondent	Information Quality
1	1.67
2	1.5
3	1.5
4	1.17
5	1.33
6	2.17
7	1.17
8	1.17
9	1
10	1.83
11	1.5
12	3.17
13	1.5
14	1.5
15	1
16	1.83
17	1.33
18	1.33
19	1.17
20	2
Mean	1.54
Required	3.02

**Table 17 Buyer Information Quality Result**

Table 17 shows the average respondent PSSUQ score of the system in terms of the information quality in the buyer side of the system. It can be observed that the mean score is lower than the average score of 3.02, signifying that the respondents are satisfied with how the information is being presented in the web application when operating the web application as a buyer.

Respondent	Interface Quality
1	1.67
2	2
3	1.67
4	1.33
5	1.67
6	1.33
7	1
8	1
9	1
10	1.67
11	1.33
12	1
13	1.67
14	1.67
15	1
16	1
17	1.33
18	1.33
19	1
20	1.33
Mean	1.35
Required	2.49

**Table 18** Buyer Interface Quality Result

Table 18 shows the average respondent PSSUQ score of the system in terms of the interface quality in the buyer side of the system. It can be observed that the mean score is lower than the average score of 2.49, signifying that the respondents are satisfied with the interface of the system such as the product browsing, navigation, and the UI when operating the web application as a buyer.

Respondent	Overall
1	1.5
2	1.75
3	1.5
4	1.19
5	1.31
6	1.69
7	1.19
8	1.13
9	1
10	1.69
11	1.44
12	2.31
13	1.69
14	1.56
15	1
16	1.38
17	1.31
18	1.38
19	1.19
20	1.63
Mean	1.44
Required	2.82

**Table 19 Buyer Overall Result**

Table 19 shows the average respondent PSSUQ score of the system as a whole, combining the system usefulness, information quality, and interface quality of the system alongside the overall satisfaction of using the system in the buyer side. It can be observed that the mean score is lower than the average score of 2.82, signifying that the respondents are satisfied with the overall web application after its improvements from the previous testing according to its usefulness, information dissemination, and interface design of the web application.

Respondent	System Usefulness
1	1.5
2	1.83
3	1.5
4	1.33
5	1.17
6	1
7	1.33
8	1
9	2.5
10	1.83
11	1.5
12	2.33
13	1.67
14	1.5
15	1
16	1
17	1.33
18	1.33
19	1.17
20	1
Mean	1.44
Required	2.8

**Table 20 Seller System Usefulness Result**

Table 20 shows the average respondent PSSUQ score of the system usefulness in the seller side of the system. It can be observed that the mean score is lower than the average score of 2.8, signifying that the respondents are satisfied with the performance of the web application in terms of its system usefulness as a platform for listing scrap material in the form of a digital marketplace when operating the web application as a seller.

Respondent	Information Quality
1	1.67
2	1.5
3	2
4	1
5	1.33
6	1.17
7	1.17
8	1
9	2.33
10	1.83
11	1.17
12	2.67
13	1.5
14	1.17
15	1
16	2
17	1.5
18	1.17
19	1
20	1
Mean	1.46
Required	3.02

**Table 21 Seller Information Quality Result**

Table 21 shows the average respondent PSSUQ score of the system in terms of the information quality in the seller side of the system. It can be observed that the mean score is lower than the average score of 3.02, signifying that the respondents are satisfied with how the information is being presented in the web application when operating the web application as a seller.

Respondent	Interface Quality
1	1.67
2	2
3	1
4	1.67
5	1
6	1
7	1
8	1
9	2
10	2
11	1.67
12	2
13	1.67
14	1.17
15	1
16	1.33
17	1.67
18	1.33
19	1
20	1
Mean	1.41
Required	2.49

**Table 22 Seller Interface Quality Result**

Table 22 shows the average respondent PSSUQ score of the system in terms of the interface quality in the seller side of the system. It can be observed that the mean score is lower than the average score of 2.49, signifying that respondents are satisfied with the interface of the system such as the product listing form, view orders, and the UI when operating the web application as a seller.

Respondent	Overall
1	1.56
2	1.75
3	1.56
4	1.25
5	1.19
6	1.06
7	1.19
8	1
9	2.31
10	1.88
11	1.44
12	2.38
13	1.56
14	1.37
15	1
16	1.44
17	1.44
18	1.25
19	1.06
20	1
Mean	1.43
Required	2.82

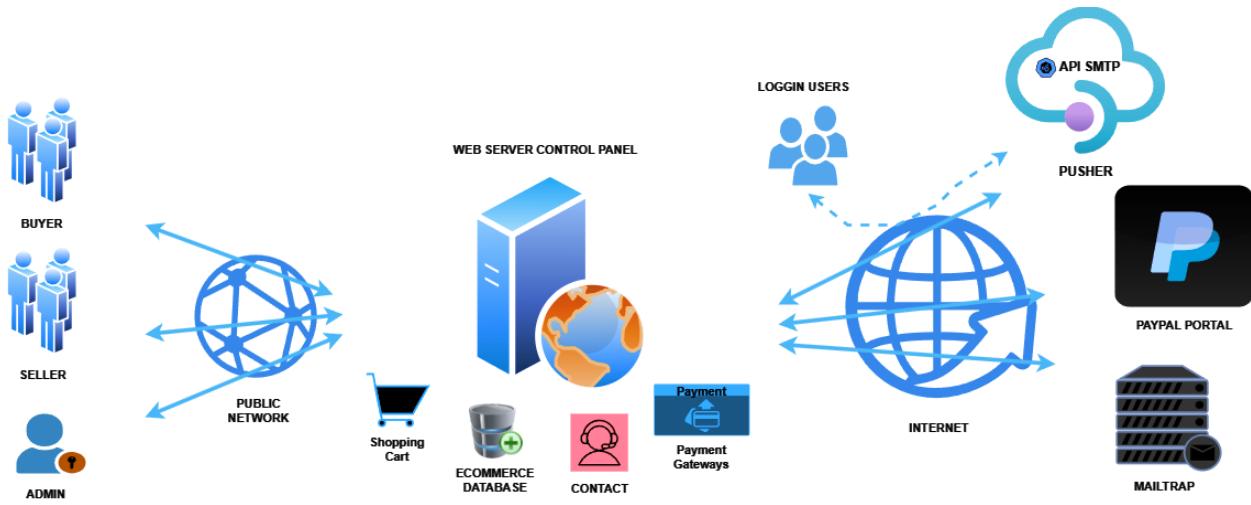
**Table 23 Seller Overall Result**

Table 23 shows the average respondent PSSUQ score of the system as a whole, combining the system usefulness, information quality, and interface quality of the system alongside the overall satisfaction of using the system in the seller side. It can be observed that the mean score is lower than the average score of 2.82, signifying that the respondents are satisfied with the overall web application after its improvements from the previous testing according to its usefulness, information dissemination, and interface design of the web application.

### **System Usability Scale (SUS) Post-Study Testing Overall Interpretation of Results**

Overall, the results from the provided questionnaire indicate a high level of satisfaction in all aspects of the PSSUQ which include the system usefulness, information quality, interface quality, and the overall experience of the user with the web application. It can be observed that the improved web application after taking some of the suggestions from the first test consideration for improvement that the respondents are greatly satisfied in using the system with the interface quality of both users showing the best performance at a mean PSSUQ score of 1.35 and 1.41 for the buyer and seller respectively. By considering the critiques, comments, and suggestions from the first test in order to improve the system according to the respondents' input, the system was able to successfully meet the expectations of the respondents from the first test who took the post-test.

#### 4.4 System Deployment



**Figure 86.** Deployment Diagram of APPCycle

The web application “APPCycle” and its database are managed mostly through a web-based control panel. Important services like PayPal, Pusher API, and Mailtrap.io support this architecture, enhancing the capabilities and user experience of the web app while also simplifying and lowering the cost of deployment.

During development, Mailtrap.io is useful for testing and debugging emails. Emails can be checked without forwarding them to actual users because it emulates an email server. This guarantees that, before going live, emails have the right content and appearance.

APPCycle also offers secure payment processing with the help of PayPal integration. PayPal accounts and cards are accepted as forms of payment, facilitating easy and reliable transactions. Using the web app to handle payments is a dependable method. Additionally, users can communicate in real time via the Pusher API. It enables them to notify others via email of

significant changes or activities instantly. This increases the amount of time users spend interacting with the software.

Each component, including the control panel, web application, database, Mailtrap.io, PayPal, and Pusher, is connected in to the deployment diagram to demonstrate how well they all function together. APPCycle operates easily, scales well, and maintains user satisfaction inside the application ecosystem with the help of this configuration.

## CHAPTER V

### SUMMARY, CONCLUSIONS, AND RECOMMENDATION

#### 5.0 Summary

People's interactions with the real world are increasingly influenced by digital spaces. They integrate user social interactions, business-related exchanges, and data streams. A more circular and sustainable economy is made possible by a digital marketplace. They could help individuals and groups to market, administer, and jointly develop resources. The hiring opportunities that have been identified offer a trial ground for companies to explore the internet to progress their digital transformation towards a circular economy.

In line with this, the proponents of the circular economy initiative designed a web-based platform "APPCycle" for buying and selling scrap materials to combat waste and pollution. Their goals include regenerating natural systems, recovering valuable materials from old products, and extending the useful life of resources. The system they've created makes it easier and more efficient to exchange recyclable and reusable materials, encouraging the use of eco-friendly products, and closing the loop by reducing waste. Closing the loop involves developing a mechanism for the quick and easy exchange of recyclable or reusable resources instead of discarding them as waste. Unlike the traditional linear economy model of "take, manufacture, use, dispose," the circular economy aims to use resources more efficiently.

APPCycle is a user-friendly web-based application facilitating the sale and purchase of scrap materials to promote the circular economy. It employs machine learning for accurate item validation within categories like metal, textile, and electronics, ensuring uploaded items are indeed

scraps. For the AI Integration, the analysis of the confusion matrix from Google's Teachable Machine AI model showed the prediction accuracy for three scrap material classes: textile garnered the highest accuracy (99.59%), followed by e-waste (96.29%), and metal (94.46%). Textile had the fewest incorrect predictions, while metal had the most. The web application is accessible online and is optimized for mobile browsing, enhancing its reach and usability for sellers and buyers of recyclable materials alike.

The significance of this research holds relevance as it has the potential to benefit the growing middle class in emerging economies by providing them with more disposable income, hence contributing to an enormous increase in global purchasing power. By encouraging the idea of upcycling, APPCycle may help the environment avoid a previously undiscovered need for consumption and a new peak in trash generation.

This research adopted the "Iterative Waterfall Model" technique. It's a method of developing software that combines the flexibility of iterative design with the sequential processes of the classic Waterfall Model. Instead of waiting until the project is finished, it enables adjustments and enhancements to be made at every stage of the development process. The primary distinction between the iterative waterfall model and the traditional waterfall model is the provision of feedback channels from each step to its antecedent phases. These feedback pathways enable for the correction of faults made by programmers at a later stage when they are discovered. The phase where mistakes are made can be changed thanks to the feedback channels, and these modifications are reflected in the subsequent phases.

System Usability Scale (SUS) Survey Testing was conducted to obtain feedback on the APPCycle web application's usability, efficacy, and general satisfaction from enthusiasts for scrap materials and those with experience in online marketplaces. The survey revealed that users were

moderately satisfied with the system's general usability (average SUS score of 71) and meeting minimum requirements (average SUS score of 69). However, specific areas like navigation and security fell short, with scores of 61 and 60, respectively. The transaction function scored 71, scrap material identification with GTM integration scored 74.25, and the registration/login function had the highest usability score of 83.5.

Additionally, the questionnaire results indicate high satisfaction across all aspects of the post-study system usability testing, including system usefulness, information and interface quality, and overall user experience. The improved web application, incorporating feedback from the initial test, led to significantly higher satisfaction levels, particularly in interface quality (mean PSSUQ score of 1.35 for buyers and 1.41 for sellers). By addressing critiques and suggestions from the initial test, the system successfully met users' expectations in the post-test phase.

## **5.1 Conclusion**

With the deployment of APPCycle, the goals of creating and building a homepage with comprehensive item listings, handling user data and transactions, and offering chat features have all been met. The implementation phase provided insights into how the Iterative Waterfall methodology was applied to ensure continuous improvement and refinement of the web application. It discussed the development stages, testing procedures, and iterations made to enhance the functionality and user experience of APPCycle. The site effectively shows the products that are for sale or purchase, giving consumers access to comprehensive details such as the item's category, description, price, quantity, and as well as the seller's information. Users were also able to send a message to the seller regarding the item for further inquiries. To provide

a flawless experience, the platform allowed users to manage their personal information as well as their shop profile, track item status, add new products, and view and print their transaction history. For the admin side, the management of activities in the web application especially the configuration settings for PayPal and API SMS are utilized, as well as the provision of remarks for disapproved products. Moreover, the messaging feature helped users and sellers communicate directly, which improved the web application's overall functionality.

Furthermore, the Google Teachable Machine AI model has performed well, recognizing scrap materials upon upload. The TensorFlow model generation process for AI-based projects is made simpler by integrating the AI model, which was made with Google's Teachable Machine. This model is included in the system using TensorFlow.js to validate user-submitted photos and determine whether or not they show recyclable garbage. Photos of electronics, textiles, metal scrap, and a fourth category for invalid images are used to train the AI model. The system's design relies heavily on its accuracy and usefulness, which guarantee the effective identification and classification of recyclable materials that users provide.

The analysis of the confusion matrix for the AI model trained in Google's Teachable Machine reveals the accuracy of predictions for three classes of scrap materials: metal, textile, and electronic waste (e-waste). The summary indicated that the textile class had the highest accuracy at 99.59%, followed by e-waste at 96.29% and metal at 94.46%. Notably, the analysis also highlights specific counts of incorrect predictions for each class, with textile having the lowest count of incorrect predictions and metal having the highest.

Usability testing using the System Usability Scale (SUS) framework was conducted to evaluate the application's effectiveness and user satisfaction. The input from the thirty (30) respondents gave important information that helped improve and streamline the procedure. The

evaluation included feedback on the intuitive UI, AI accuracy, communication features, and overall usability, providing valuable insights for further refinement. The survey highlights moderate satisfaction with an average SUS score of 69 for overall usability and meeting minimum requirements. Noteworthy strengths include a transaction usability score of 71 and a scrap material identification usability score of 74.25. However, areas like navigation (SUS score of 61), security (SUS score of 60), and notifications require enhancement. The registration/login function performed best with a usability score of 83.5.

However, despite receiving a score of 69.14 on the the System Usability Scale (SUS), indicating moderate satisfaction with general usability and meeting minimum requirements, the results from the Post-Study System Usability Questionnaire (PSSUQ) reveal a contrasting picture. The PSSUQ scores demonstrate a high level of satisfaction across all aspects of the web application, including system usefulness, information quality, interface quality, and overall user experience, with interface quality particularly shining with mean scores of 1.35 for buyers and 1.41 for sellers. These high PSSUQ scores indicate that the improvements made based on user feedback significantly enhanced user satisfaction, showcasing the effectiveness of user-driven enhancements in improving overall usability and satisfaction.

In conclusion, the web-based application APPCycle, which utilizes machine learning, has much potential to revolutionize the purchasing and selling of scrap materials, especially in the locality. Its creative application of AI technology improves usability for both buyers and sellers in addition to increasing accuracy in identifying and classifying waste products. Its importance as a useful instrument for advancing the circular economy by enabling the effective reuse and recycling of materials, ultimately contributing to waste reduction and environmental sustainability, is highlighted by the favorable feedback that users have provided.

Ultimately, the following objectives are achieved:

- Create a homepage that displays a comprehensive list of available items for purchase or sale, including detailed information such as the item's category, description, price, quantity, and seller information.
- Enable the sale and purchase of scrap materials listed on the web application by users registered as sellers in the system.
- To provide sellers with remarks and feedback for disapproved products upon upload by the admin.
- Incorporate messaging features that allow direct communication between users and sellers.
- Integrate machine learning algorithm for precise categorization of scrap materials using Google Teachable Machine.

## 5.2 Recommendation

In addition to receiving commendation from users during testing, APPCycle also received insightful comments and recommendations for development. The proponents acknowledge the significance of adding these recommendations to upcoming system versions to produce an even more potent and efficient web application. While the majority of responses gave a neutral response to the various statements, the majority of the scores point in the direction of a positive assessment of the system, including the ease of registration and login, the visually appealing nature of the design, the effectiveness of transactions, and the ability to identify and improve the Google Teachable Machine's user experience. Even though the online application satisfies the minimal requirements for system usability, there is still a need for improvement, especially in the system's

performance with Google Teachable Machine, convenience of use, navigation, and notification system. These suggestions can help the system move closer to its objective of contributing to the circular economy.

Apart from the system's accomplishment of its goals, the following key recommendations have surfaced:

- Improve the user interface and user experience of the system as the layout of the system is inconsistent when navigating between the system's webpages which can be confusing for the user when operating the system.
- Add visual cues in user interaction particularly when uploading an image for the AI model to validate and waiting for the response of the validation.
- Strengthen the security of the web application such as a verification system when registering an email into the system.
- Improve the notification system to be much timelier and more informative such as the actions the user has taken when using the web application.
- Encourage the development of a mobile application for future expansion, as mobile platforms offer enhanced accessibility and convenience for users.
- Consider integrating GCash and PayMaya as additional online payment options to provide users with more flexibility and convenience in completing transactions.

APPCycle web application can be further improved by the proponents by considering these suggestions, making it more reliable, versatile, and user-focused. With constant enhancement and a keen emphasis on user input, the system will maintain its goal of supporting the circular economy and acting as a prototype for adaptive technology in the future.



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## Appendix A

### LETTER OF RECOMMENDATION FOR ORAL DEFENSE



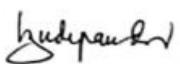
Mindanao State University – General Santos City  
**COLLEGE OF NATURAL SCIENCES AND MATHEMATICS**  
**IT&PHYSICS DEPARTMENT**  
Fatima, General Santos City  
Philippines

#### RECOMMENDATION FOR ORAL DEFENSE

*In partial fulfillment of the requirement for the degree of **BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**, this **UNDERGRADUATE Capstone Project** entitled:*

**APPCYCLE: AI-ASISSTED WEB APPLICATION FOR THE SALE AND PURCHASE OF SCRAP MATERIALS IN SUPPORT OF THE CIRCULAR ECONOMY**

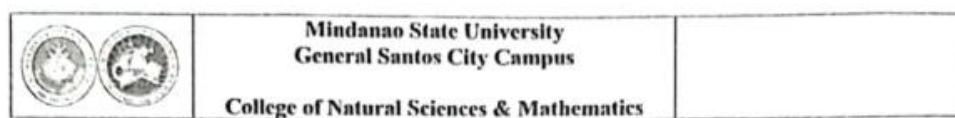
*has been prepared and submitted by, **FELMER JOHN B. ARAÑA, STEPHANIE KATE B. LEDESMA, AND CARL GIAN B. URASABIA**, and is recommended for **ORAL DEFENSE**.*

  
LUMER JUDE P. DOCE, DIT  
Adviser

*Figure 87. Letter of Recommendation for Oral Defense*

## Appendix B

### APPROVAL SHEETS FOR BINDING



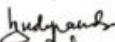
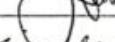
Date: 05/22/2024

#### APPROVAL FOR BINDING

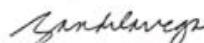
This is to certify that we have examined the manuscript of Mr./Ms. Felmer John B. Araña and found that all the comments and recommendations of the Oral Examination Panel had been reflected.

This certification is issued to allow the student to submit the manuscript for final binding.

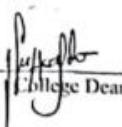
The Oral Examination Panel:

- |   |   |
|---|---|
| Name  | Signature   |
| Limer Jute R. Uoco, DEd<br>IT/Physics Department<br>MSU-GSC |  |
| 1. _____  | Chairperson/Adviser   |
| 2. <u>Khalil Anton Ambalang, MS</u>                         |  |
| 3. <u>Christine Jan B. dela Vega, MS</u>                    |  |

#### RECOMMENDING APPROVAL:

  
CHRISTINE JAN B. DELA VEGA, MS  
Department Chairperson

APPROVED:

  
\_\_\_\_\_  
College Dean

Prepared by: Approved by:	Status: Approved Version: 1.0	Issue Date: Effective Date:	Next review date: Document owner: CNSM	Page 1 of 1
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**Figure 88. Letter of Approval for Binding (Araña, Felmer John B.)**

 	<b>Mindanao State University General Santos City Campus</b> <b>College of Natural Sciences &amp; Mathematics</b>	
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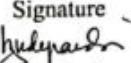
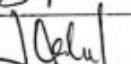
Date: 05/22/2024

#### APPROVAL FOR BINDING

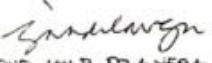
This is to certify that we have examined the manuscript of Mr./Ms. Stephanie Kate B. Ledesma and found that all the comments and recommendations of the Oral Examination Panel had been reflected.

This certification is issued to allow the student to submit the manuscript for final binding.

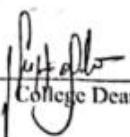
The Oral Examination Panel:

1. <u>Lomer Jude P. Uoco, PhD</u> II/Physics Department MSU-GSC	Name 	Signature 	Chairperson/Adviser <u>J. Uoco</u>
2. <u>Khalil Anton Ambalong, MS</u>		Member <u>J. Ambalong</u>	
3. <u>Christine Jan B. dela Vega, MS</u>		Member <u>C. dela Vega</u>	

#### RECOMMENDING APPROVAL:

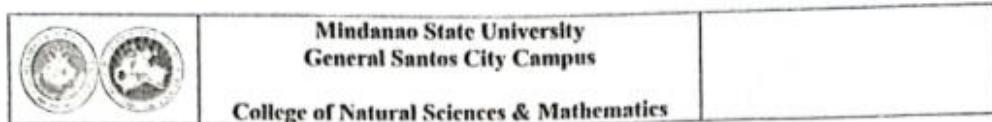
  
CHRISTINE JAN B. DELA VEGA, MS  
 Department Chairperson

APPROVED: —

  
 College Dean

Prepared by: Approved by	Status: Approved Version: 1.0	Issue Date: Effective Date:	Next review date: Document owner: CNSM	Page 1 of 1
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**Figure 89. Letter of Approval for Binding (Ledesma, Stephanie Kate B.)**



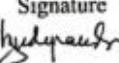
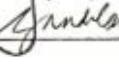
Date: 05/22/2024

#### APPROVAL FOR BINDING

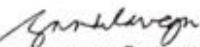
This is to certify that we have examined the manuscript of Mr./Ms.  
Carl Gian B. Ursabia and found that all the comments and recommendations of the Oral Examination Panel had been reflected.

This certification is issued to allow the student to submit the manuscript for final binding.

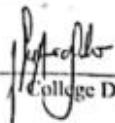
The Oral Examination Panel:

Name	Signature	Chairperson/Adviser
1. <u>Lomer Jude P. Jose, MS</u> Physics Department MSU-GSC		
2. <u>Khalil Anton Ambulang, MS</u>		Member
3. <u>Christine Jan B. Dela Vega, MS</u>		Member

#### RECOMMENDING APPROVAL:

  
CHRISTINE JAN B. DELA VEGA, MS  
 Department Chairperson

APPROVED:           

  
 College Dean

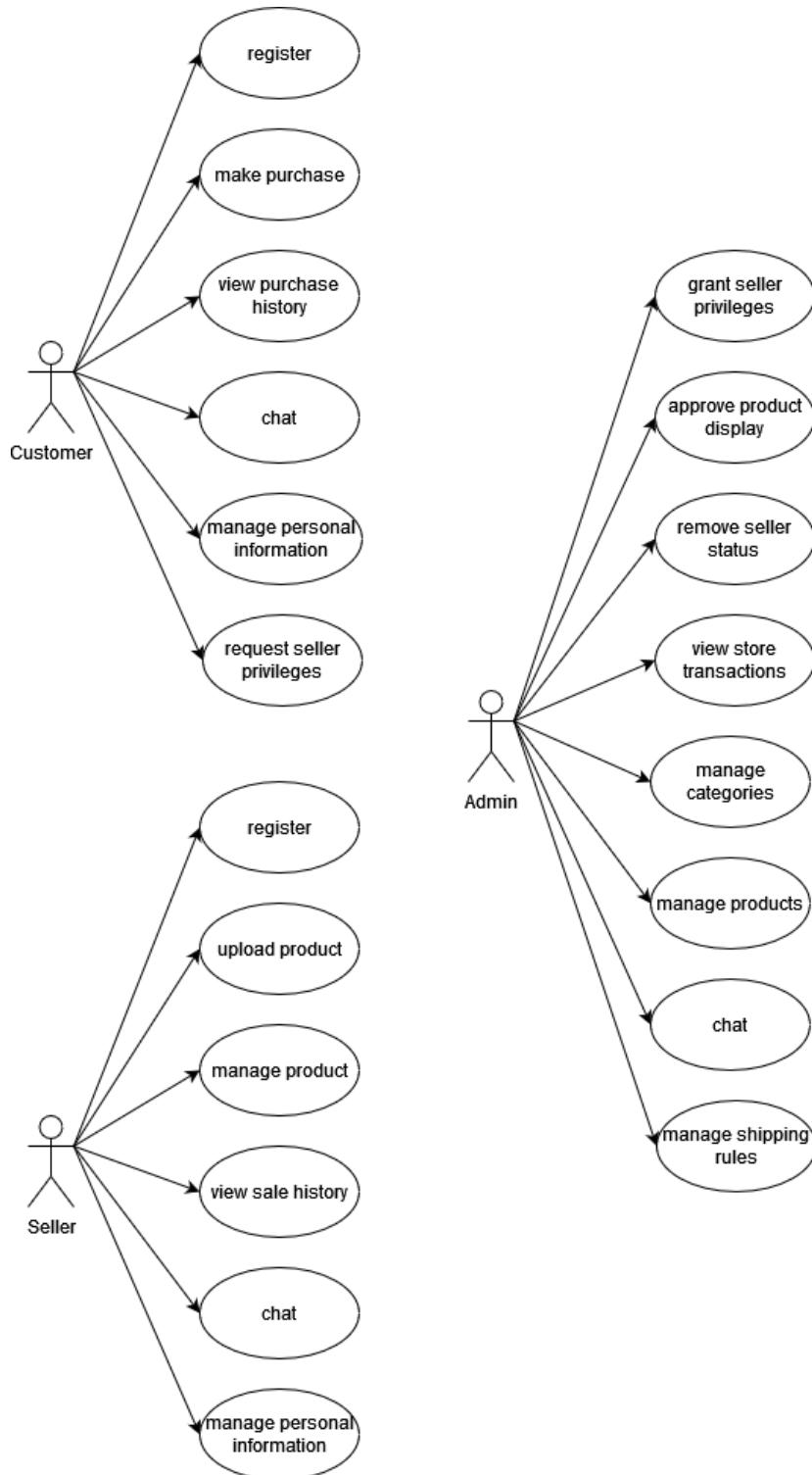
Prepared by: Approved by:	Status: Approved Version: 1.0	Issue Date: Effective Date:	Next review date: Document owner: CNSM	Page: 1 of 1
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**Figure 90.** Letter of Approval for Binding (Ursabia, Carl Gian B.)

# **Appendix C**

# **SYSTEM DIAGRAMS**

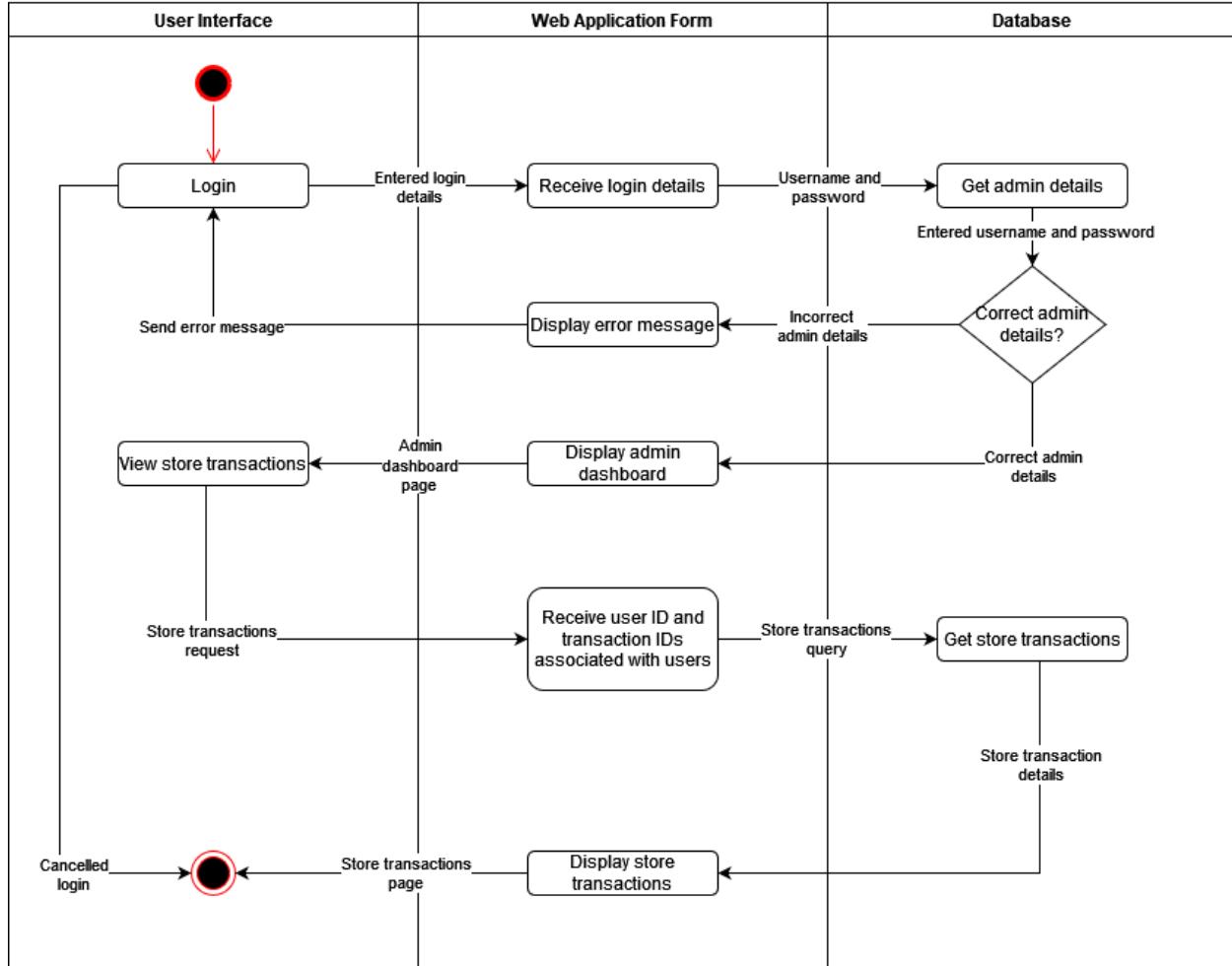
## Use Case Diagram



Appendix C.1 Use Case Diagram

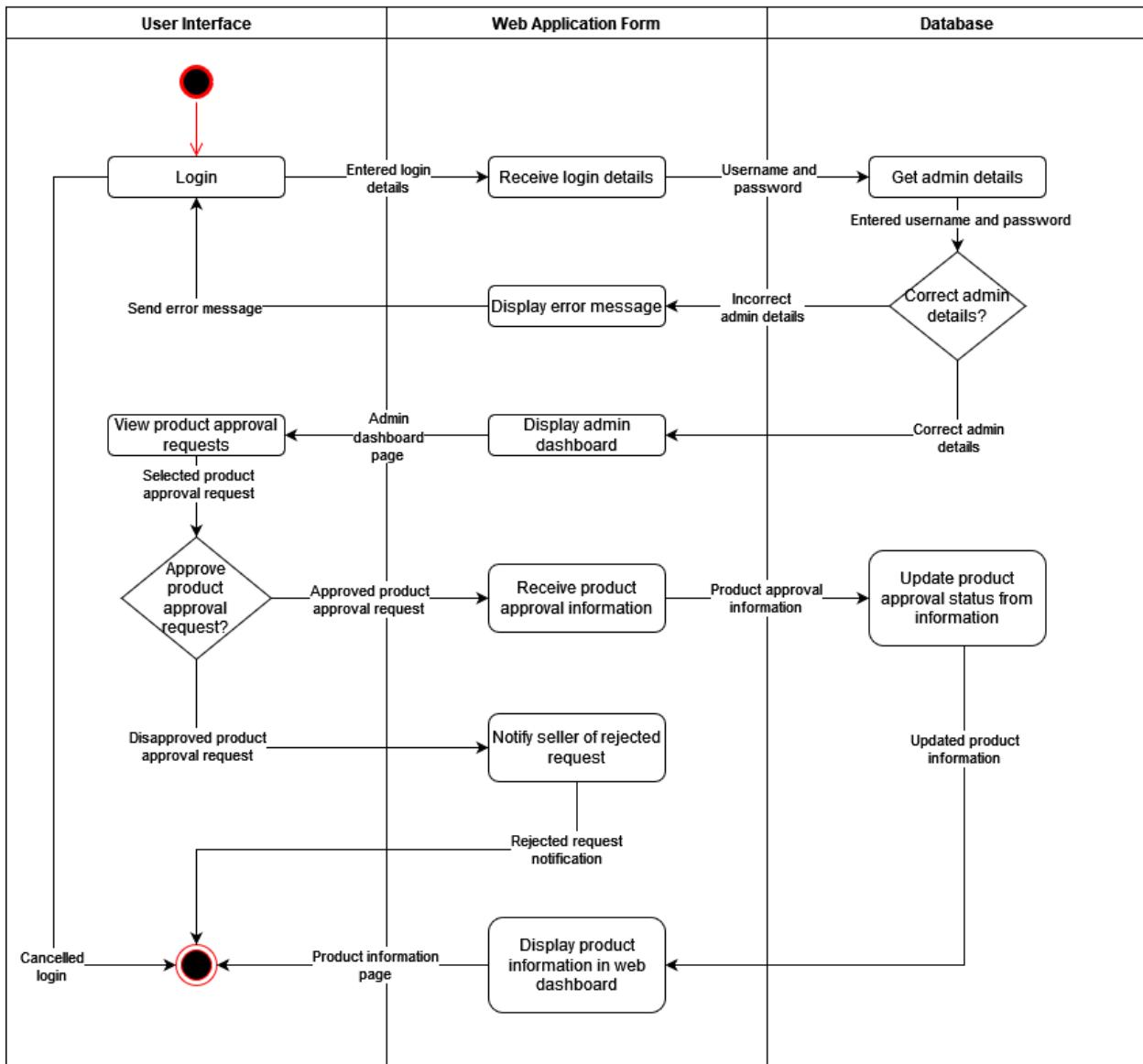
## Activity Diagrams

## Admin View Store Transactions



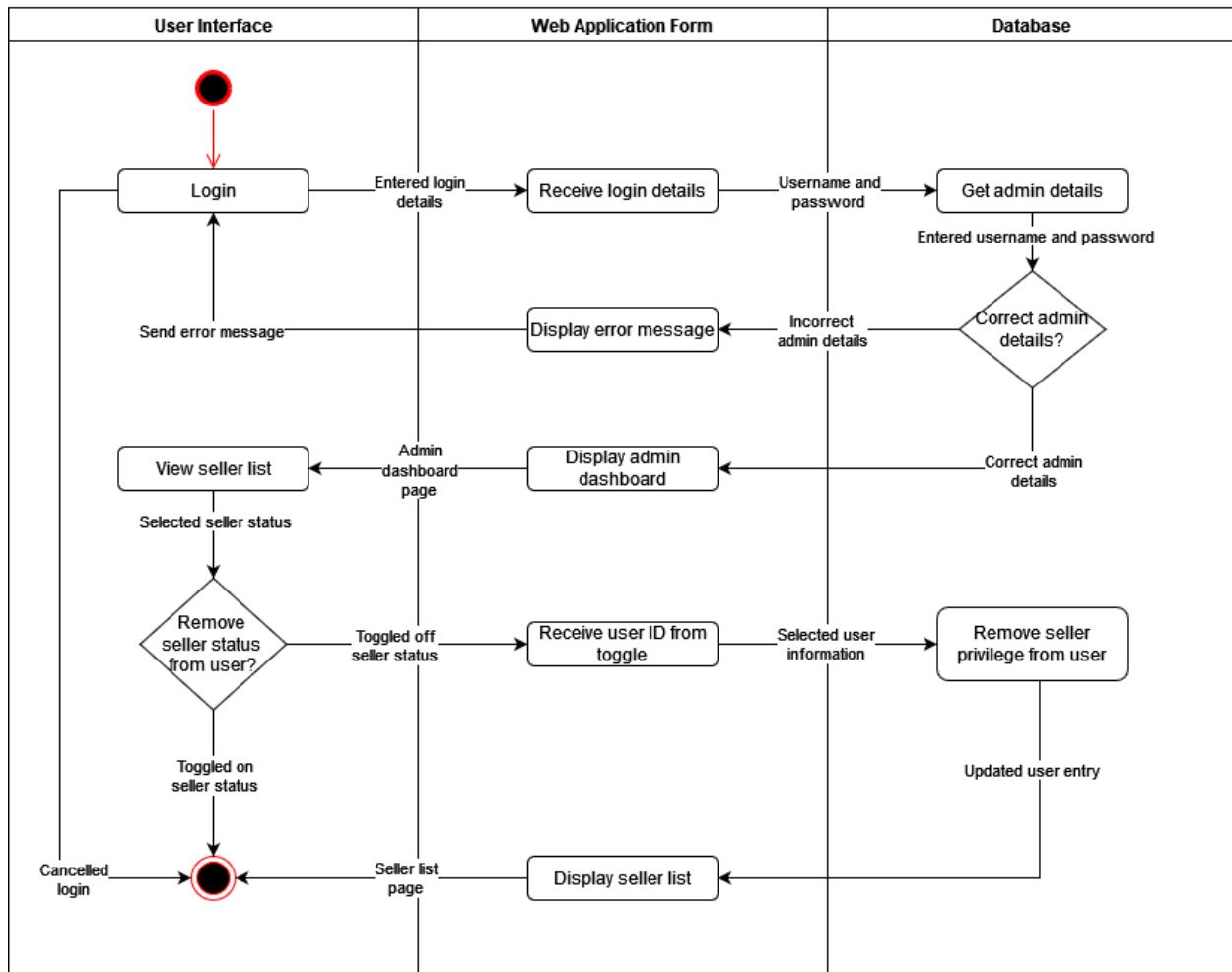
## Appendix C.2 Admin View Store Transactions Activity Diagram

## Admin Approve Product Display



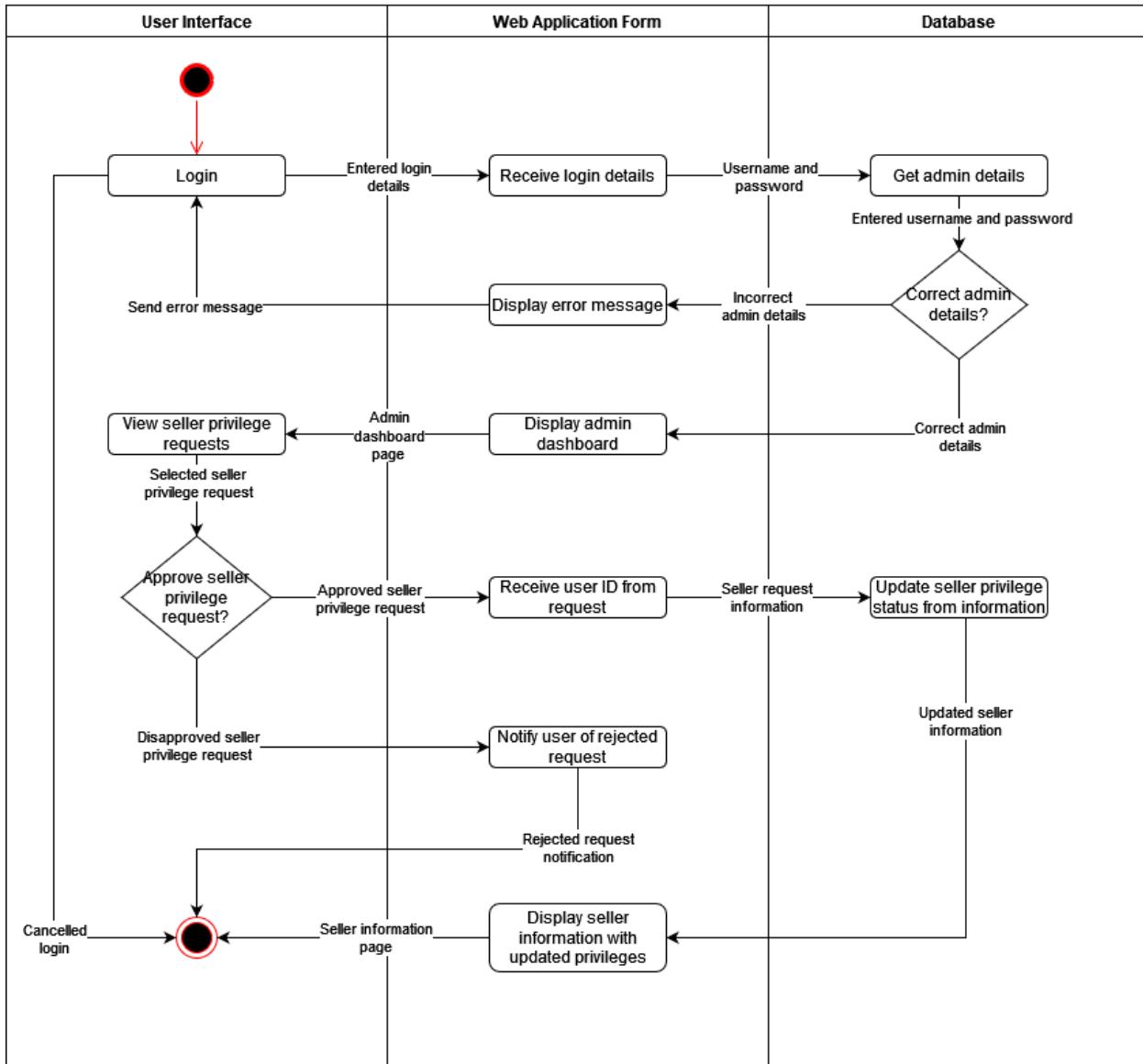
**Appendix C.3 Admin Approve Product Display Activity Diagram**

## Admin Remove Seller Status



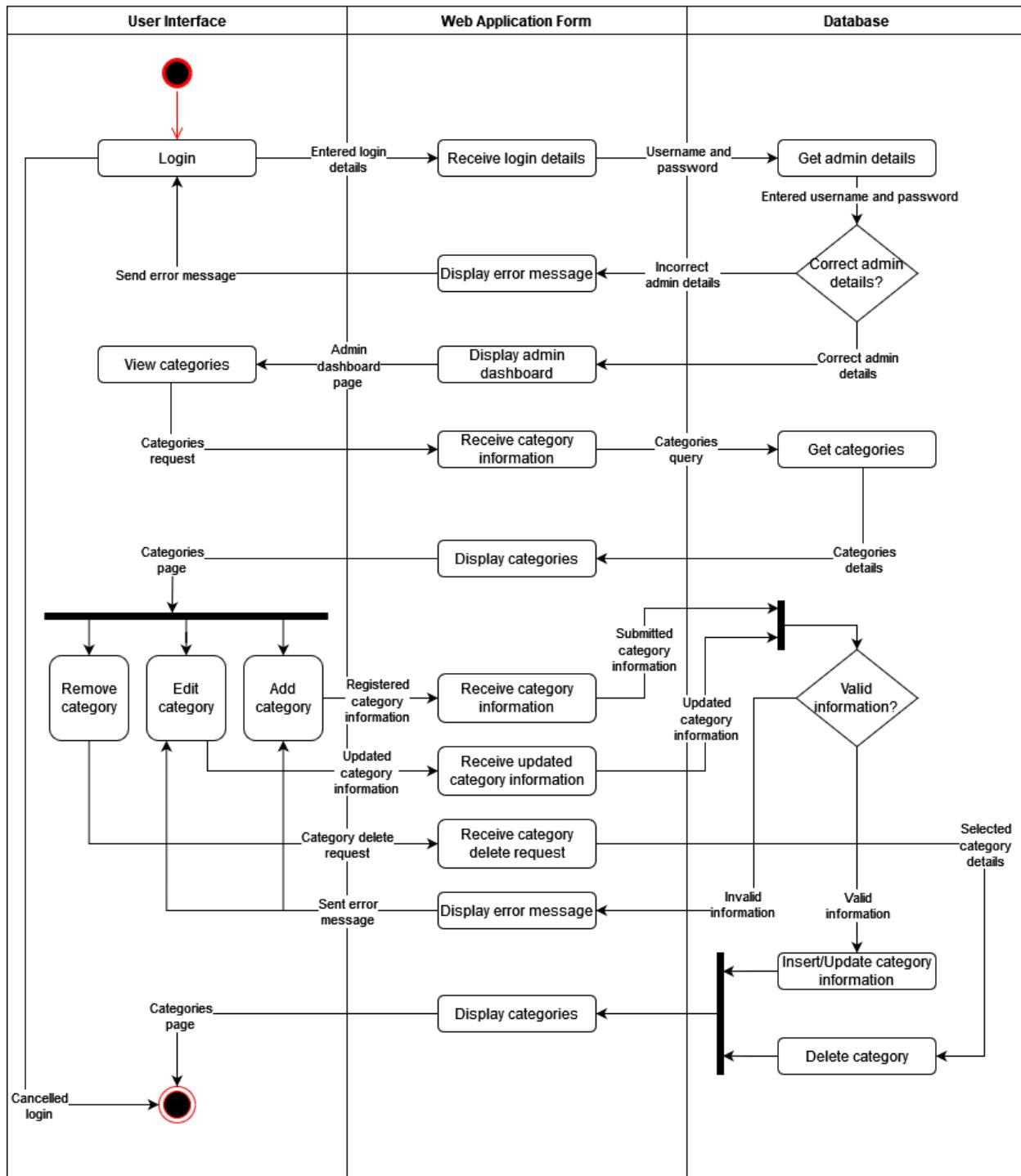
**Appendix C.4 Admin Remove Seller Status Activity Diagram**

## Admin Grant Seller Privileges



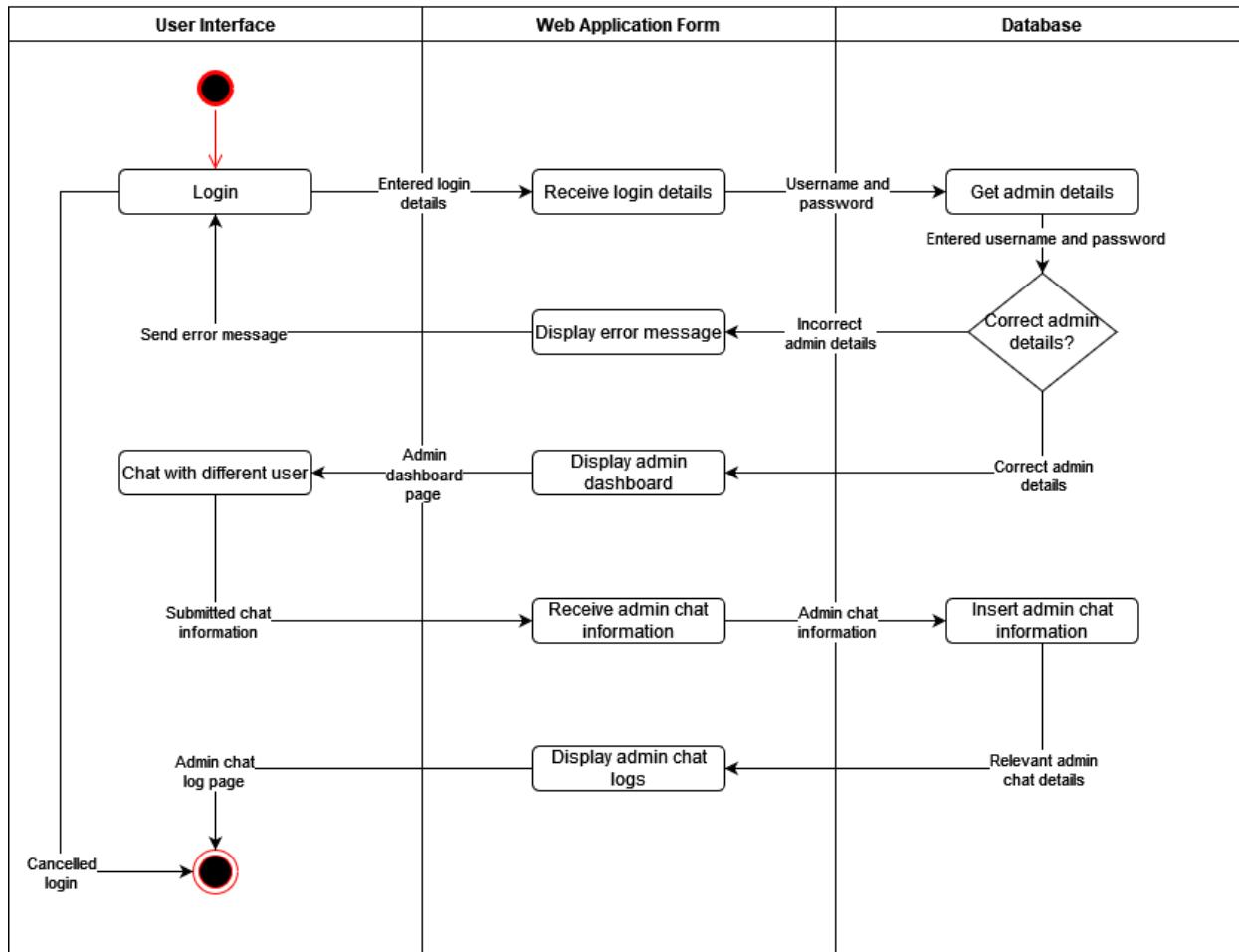
**Appendix C.5 Admin Grant Seller Privileges Activity Diagram**

## Admin Manage Categories



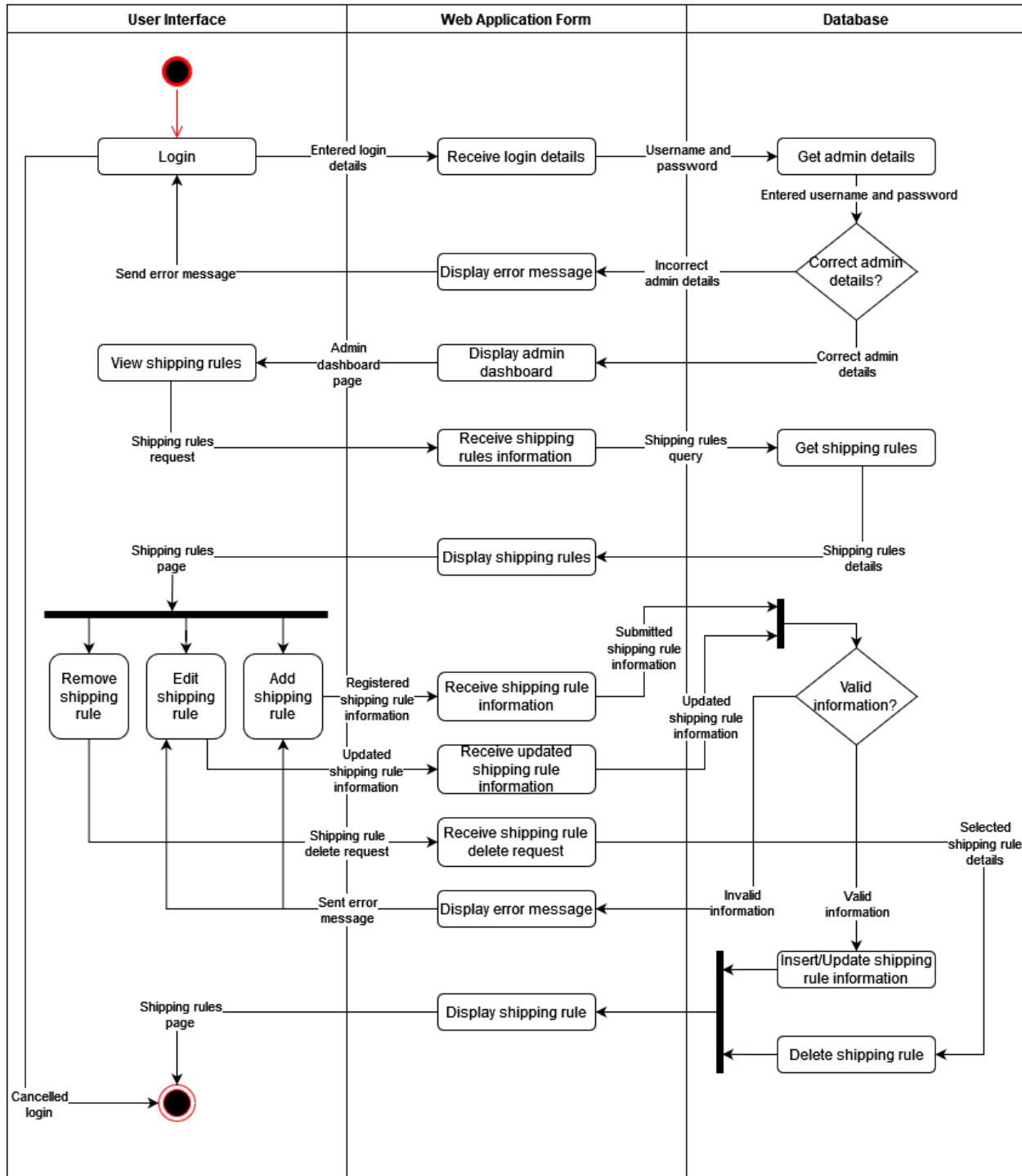
**Appendix C.6 Admin Manage Categories Activity Diagram**

## Admin Chat



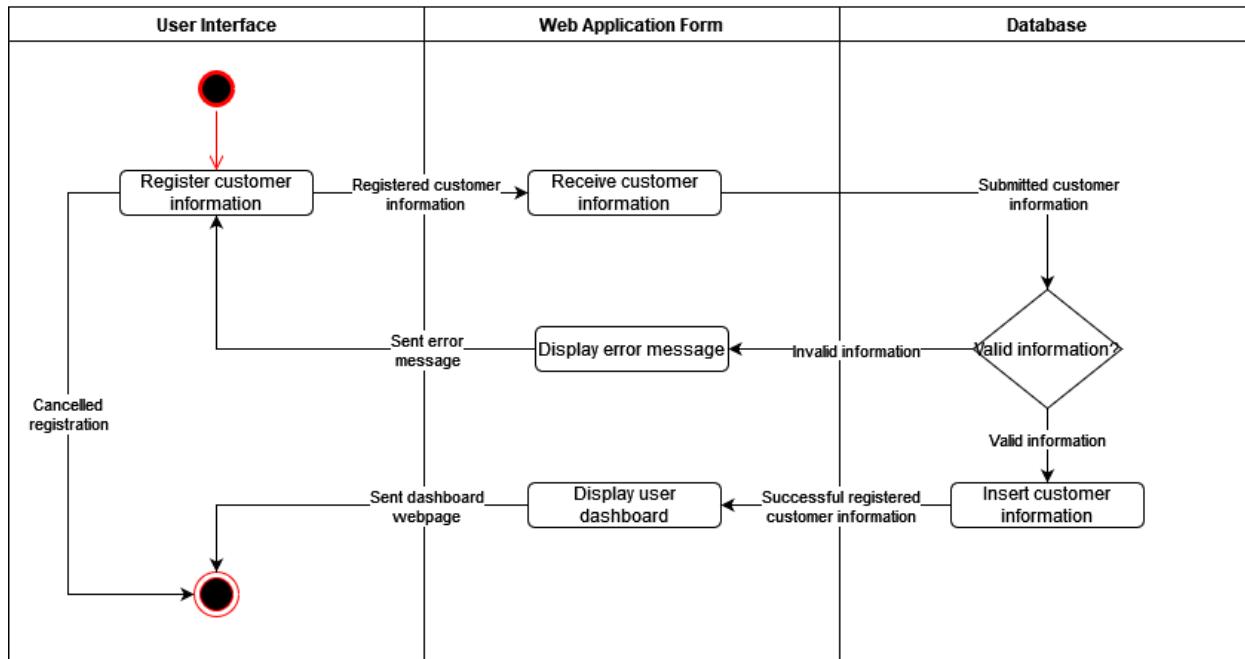
**Appendix C.7 Admin Chat Activity Diagram**

## Admin Manage Shipping Rules



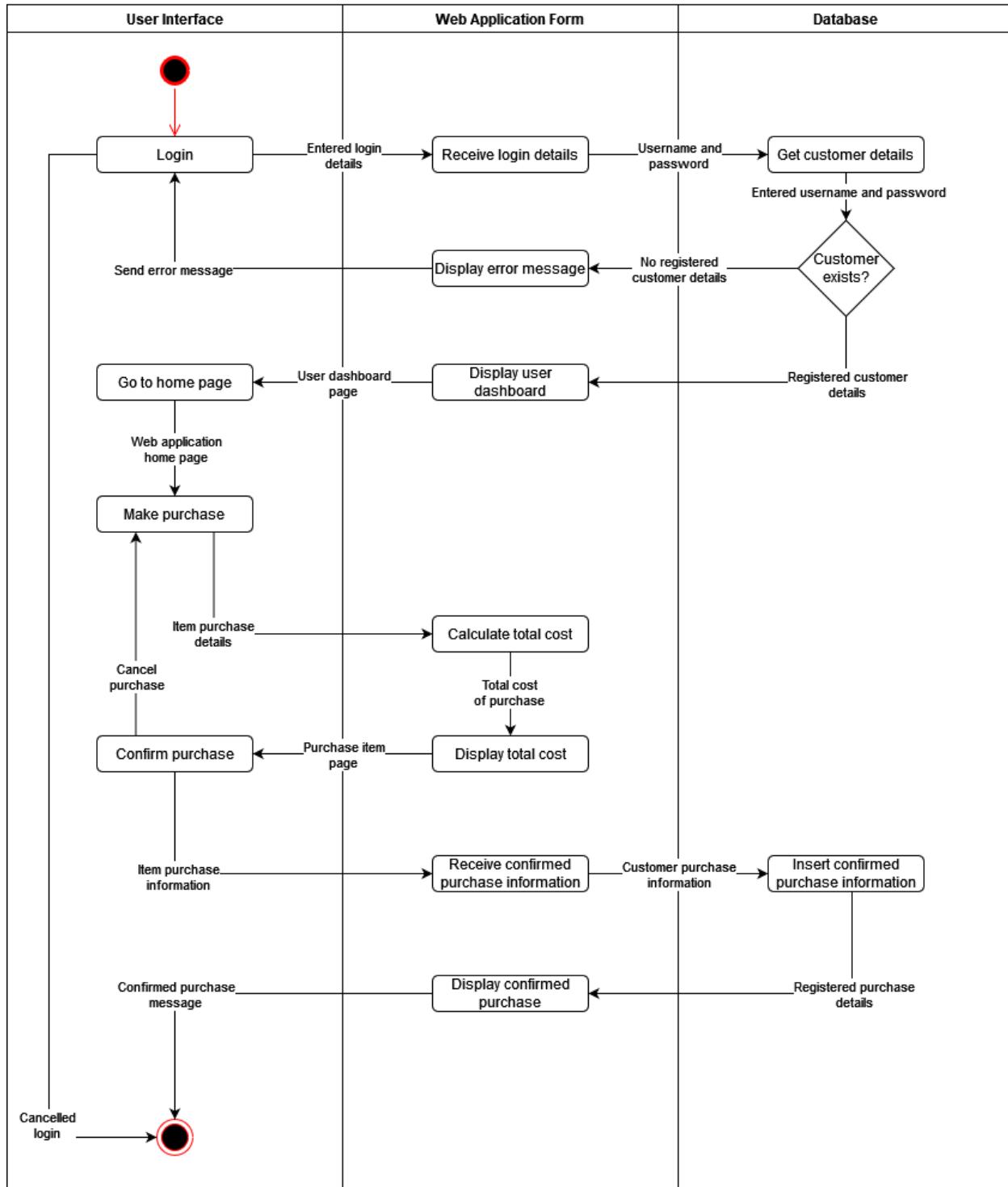
**Appendix C.8 Admin Manage Shipping Rules Activity Diagram**

## Customer Register



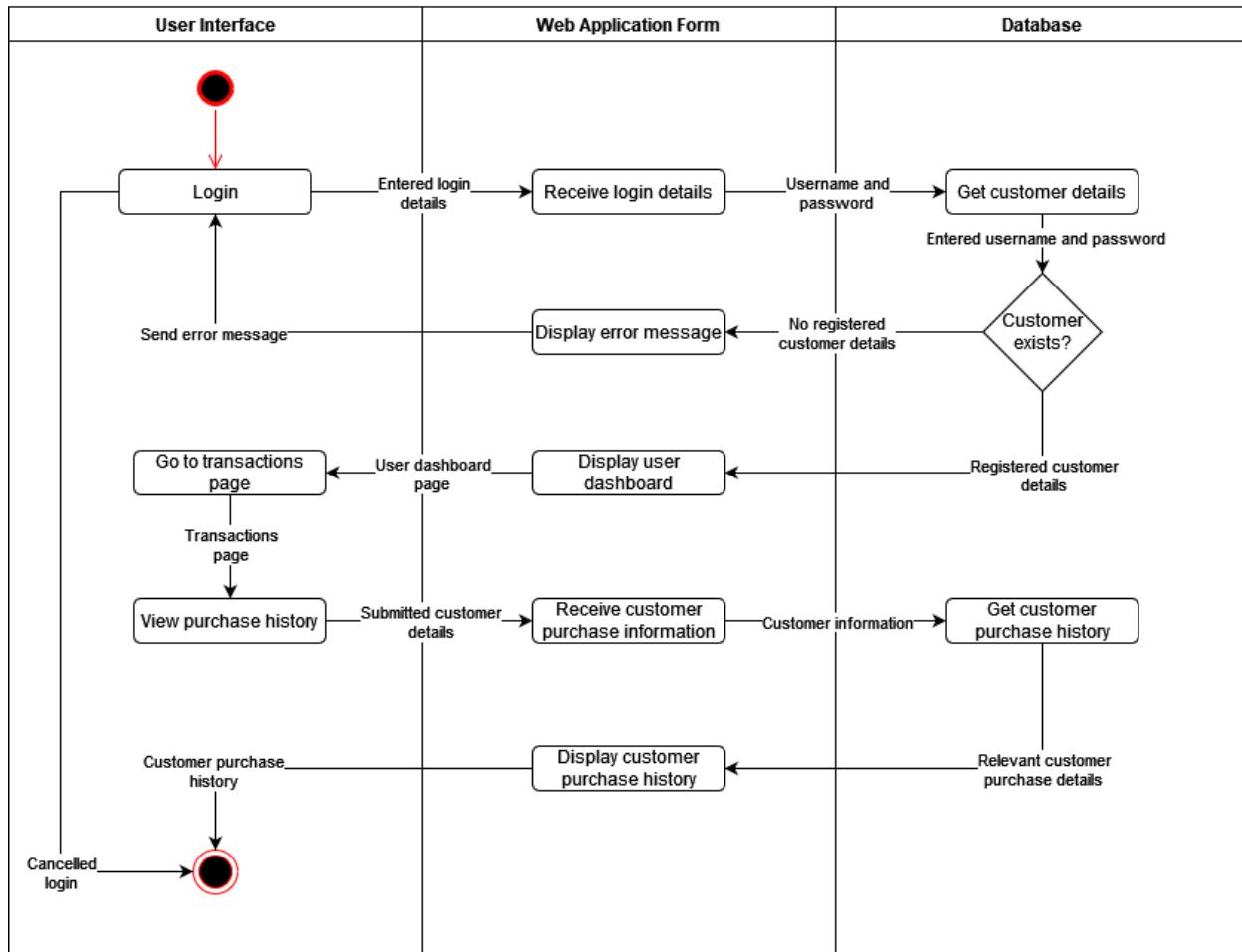
**Appendix C.9 Customer Register Activity Diagram**

## Customer Make Purchase



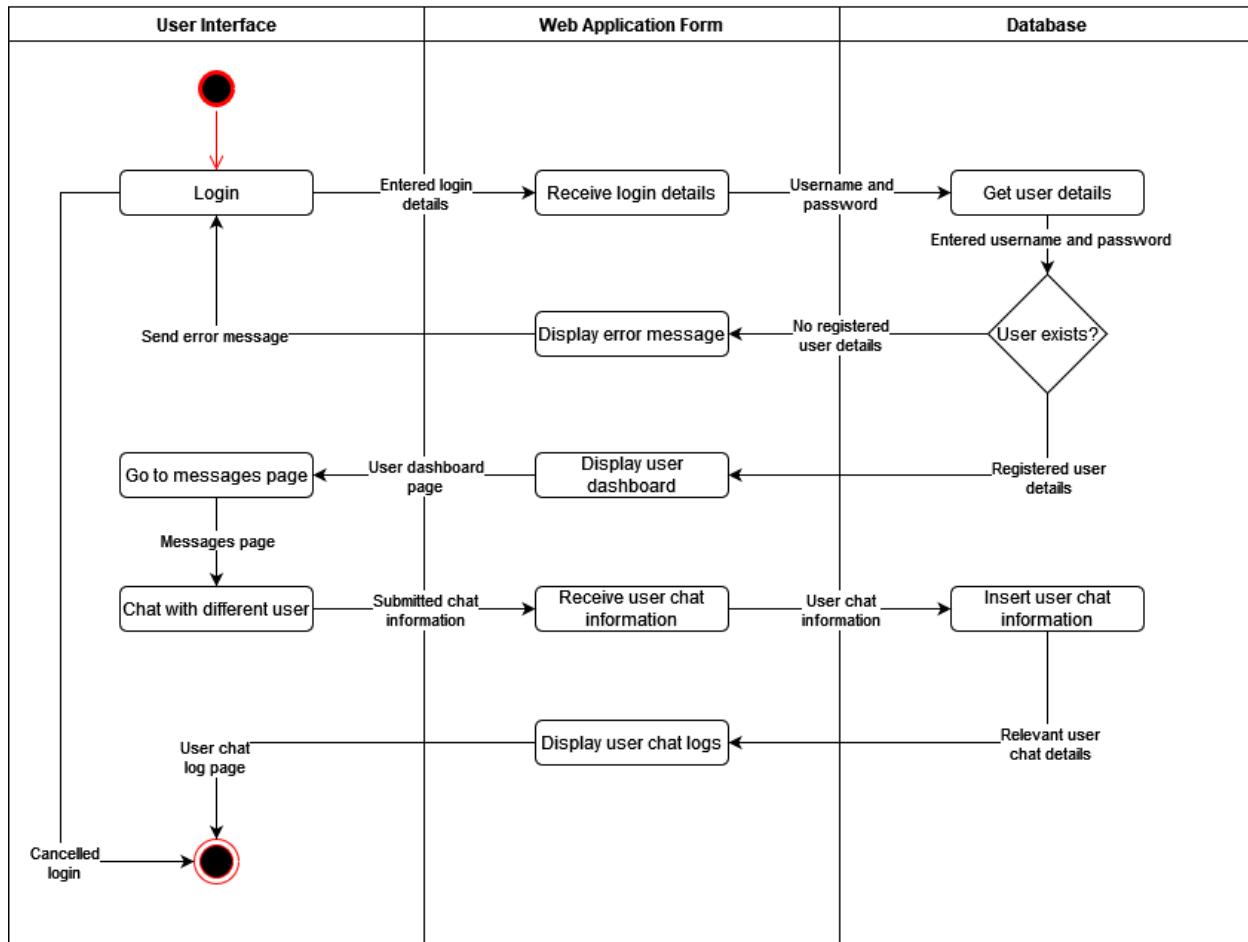
**Appendix C.10 Customer Make Purchase Activity Diagram**

## Customer View Purchase History



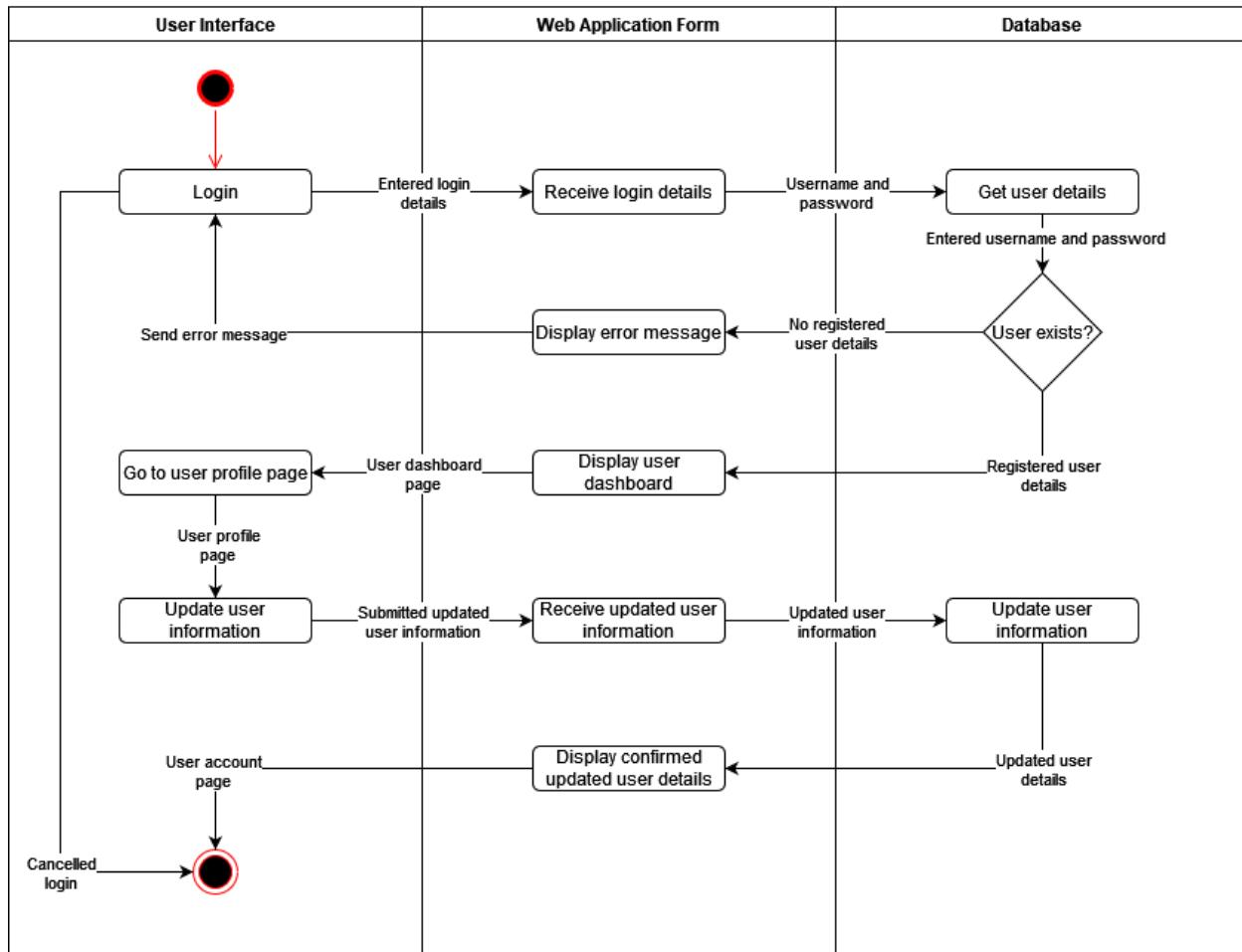
**Appendix C.11 Customer View Purchase History Activity Diagram**

## Customer Chat



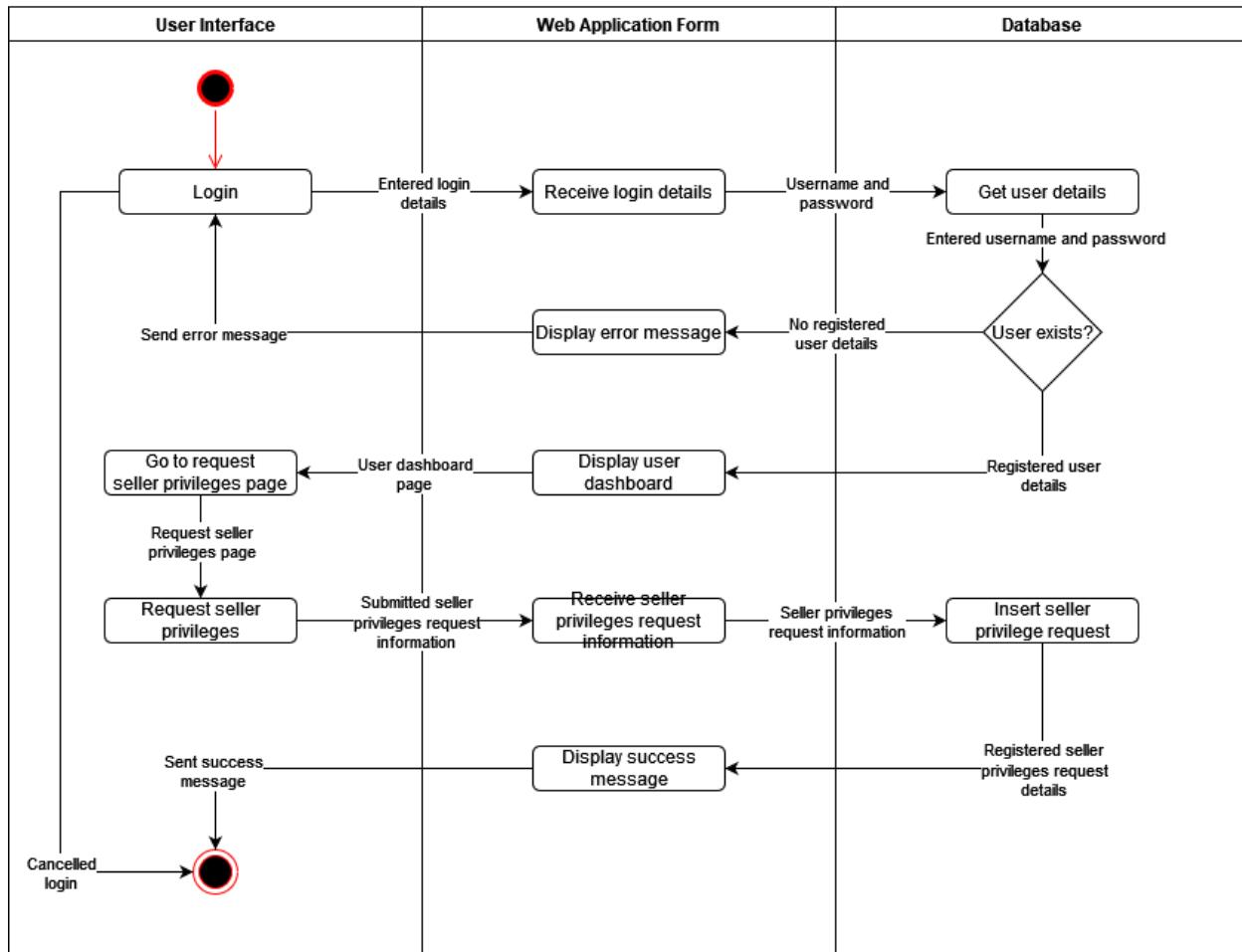
**Appendix C.12 Customer Chat Activity Diagram**

## Customer Manage Personal Information



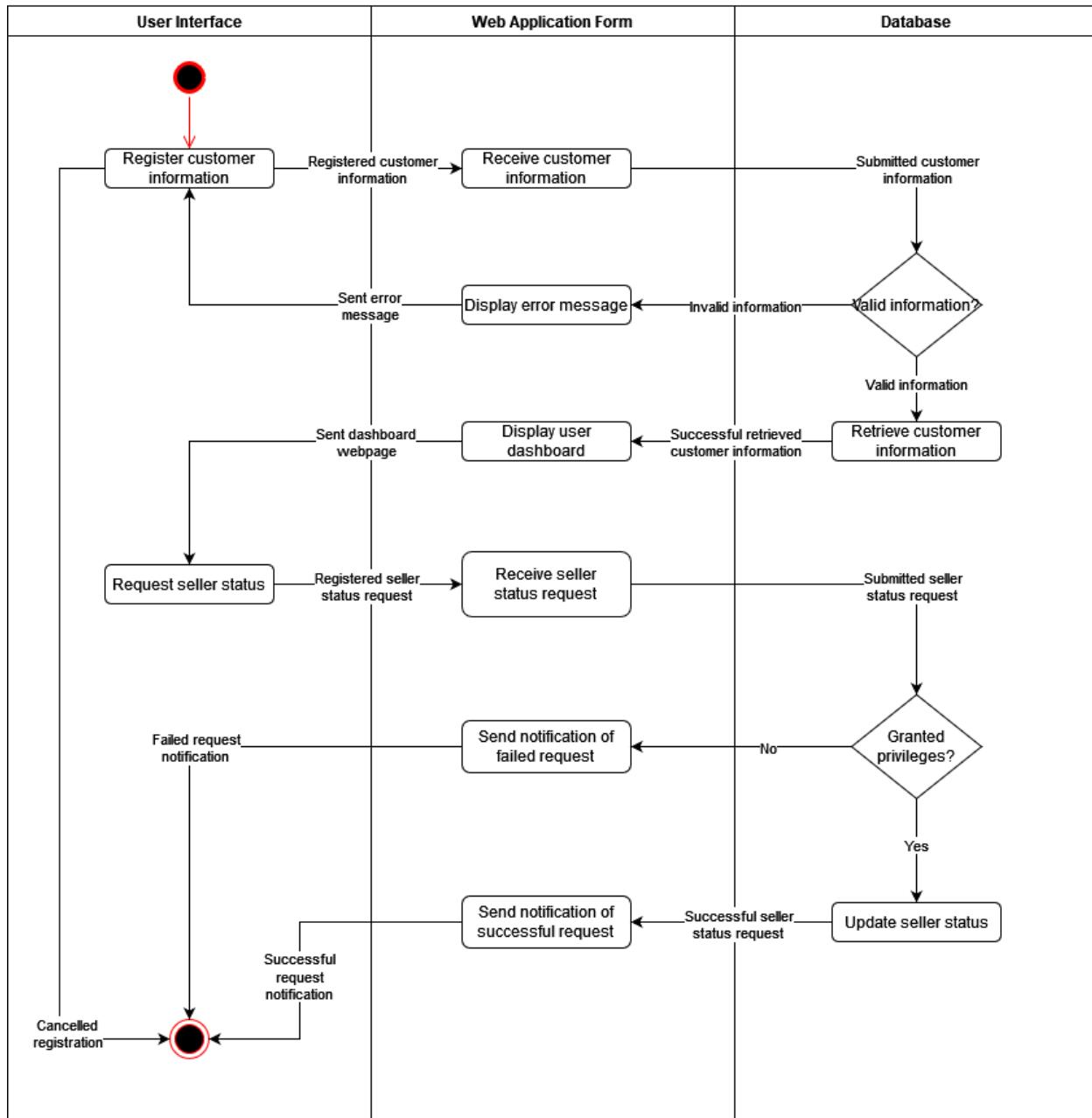
**Appendix C.13** Customer Manage Personal Information Activity Diagram

## Customer Request Seller Privileges



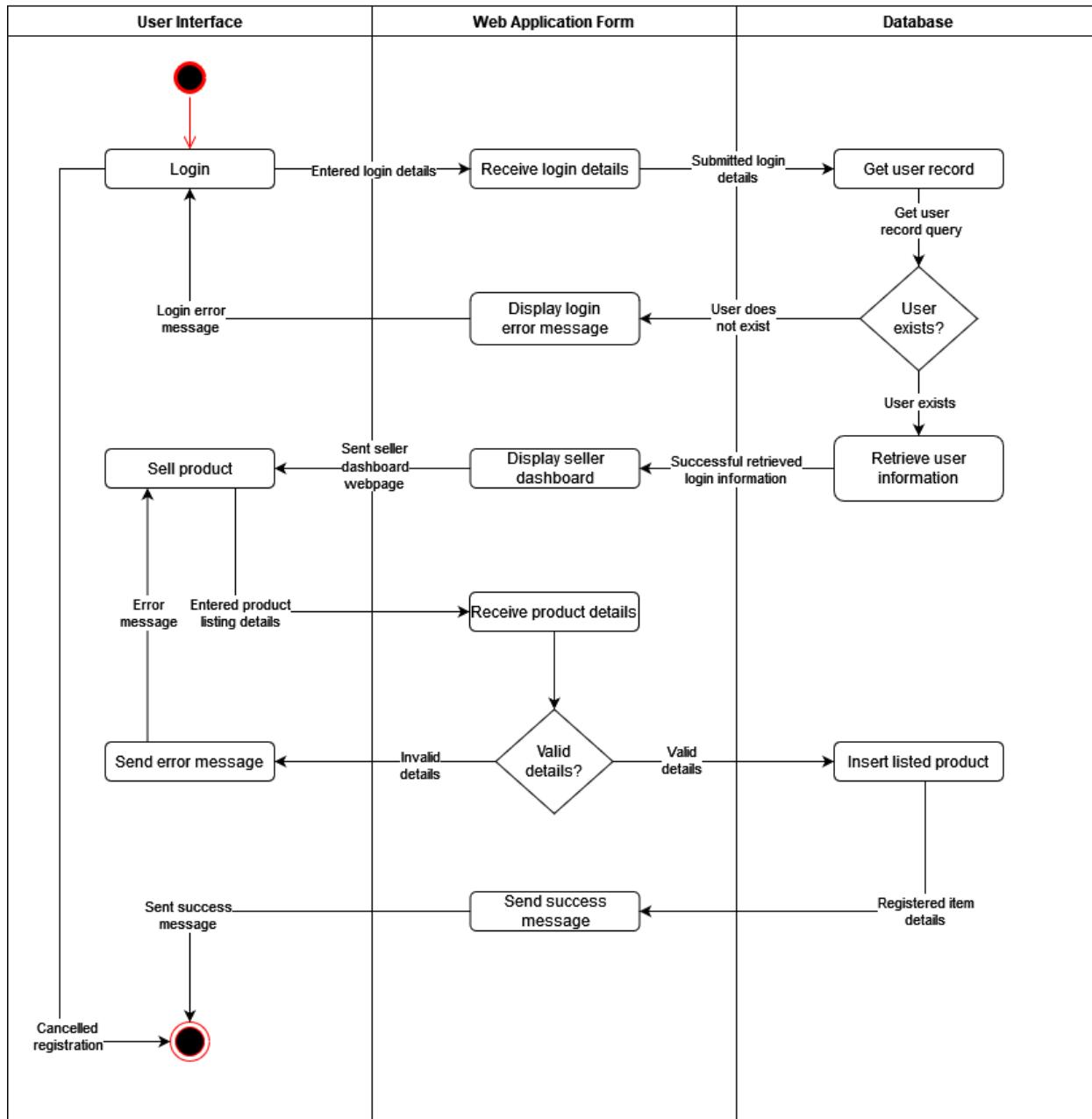
**Appendix C.14 Customer Request Seller Privileges Activity Diagram**

## Seller Register



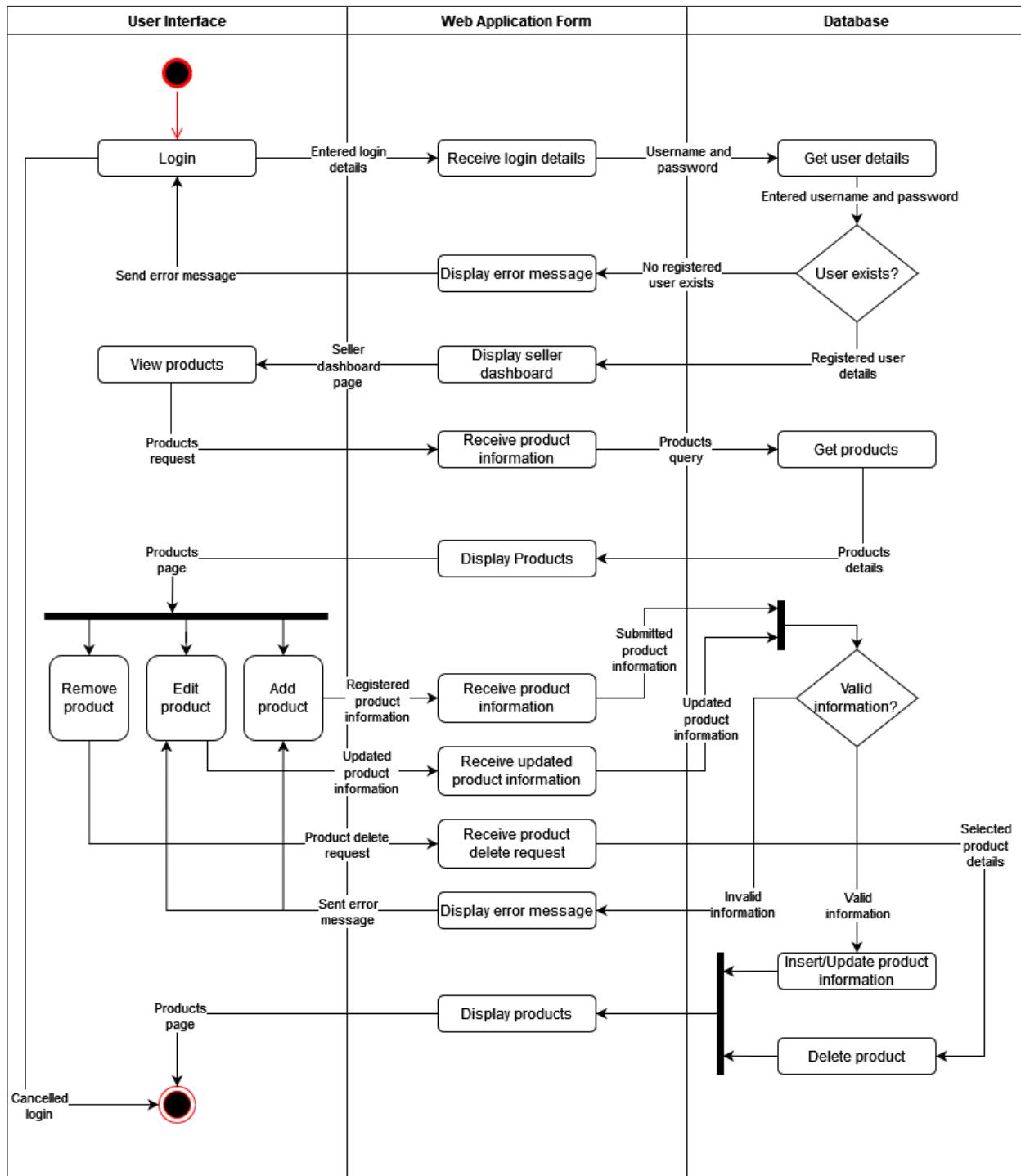
**Appendix C.15 Seller Register Activity Diagram**

## Seller Upload Product



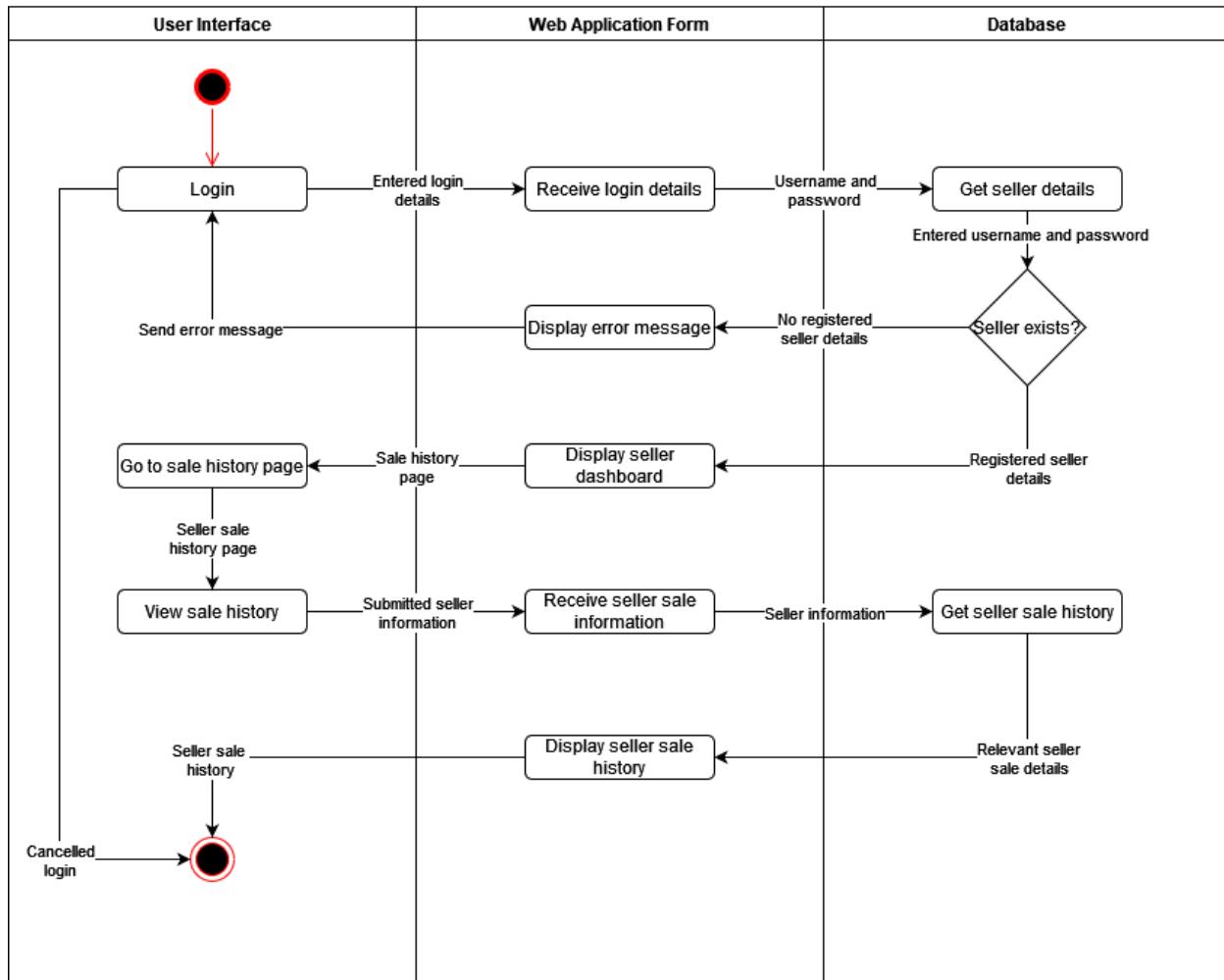
**Appendix C.16 Seller Upload Product Activity Diagram**

## Seller Manage Product



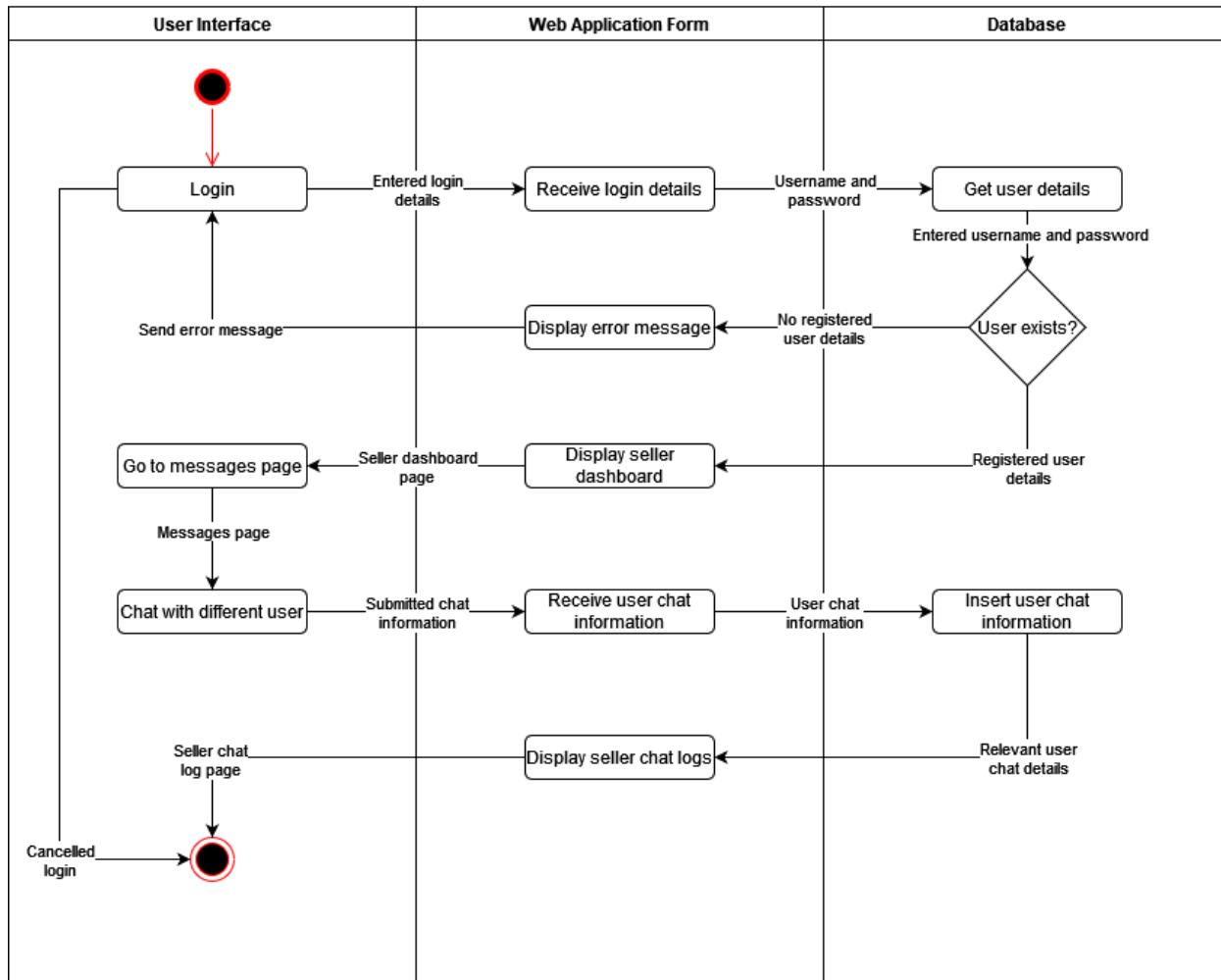
**Appendix C.17 Seller Manage Product Activity Diagram**

### Seller View Sale History



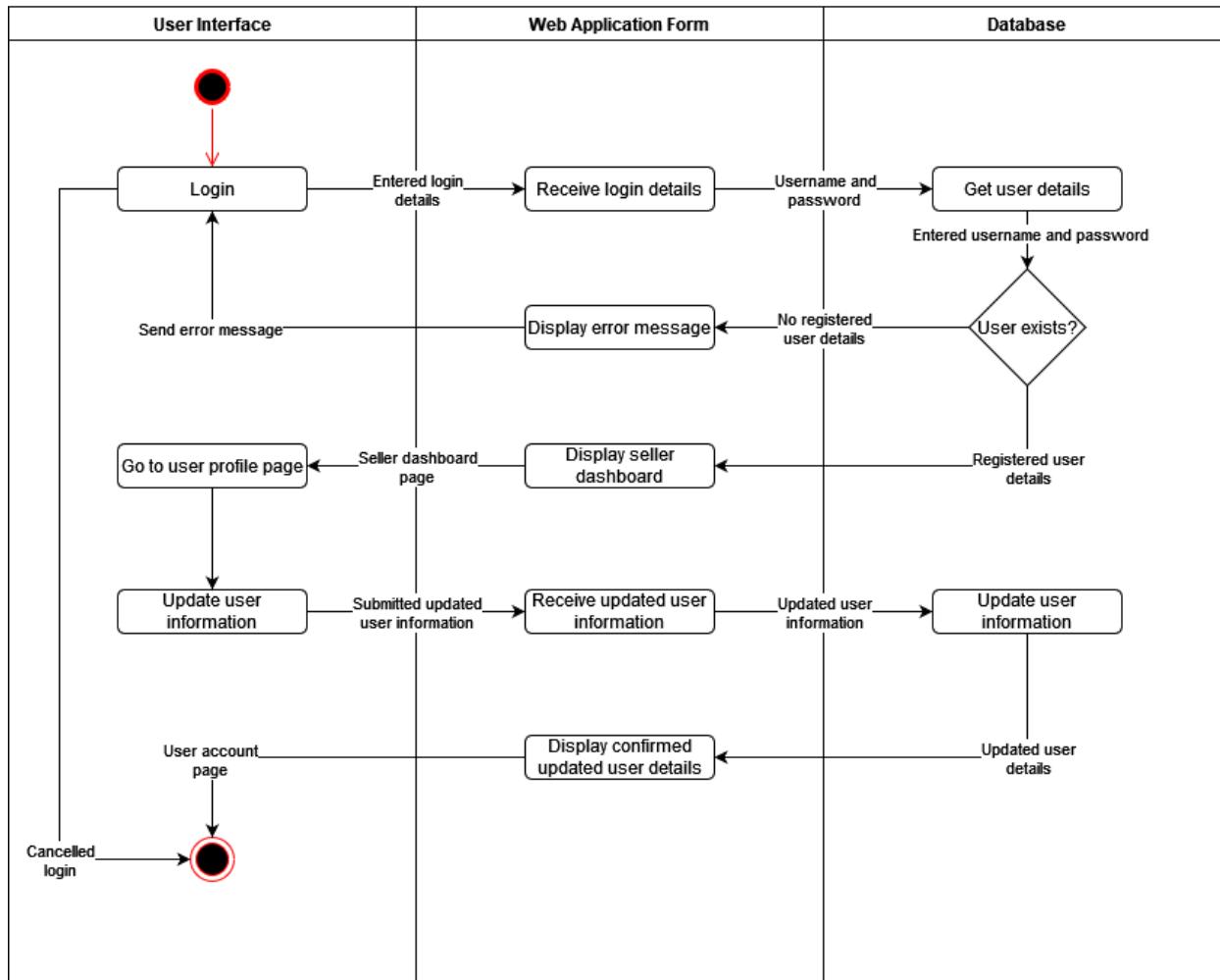
**Appendix C.18 Seller View Sale History Activity Diagram**

## Seller Chat

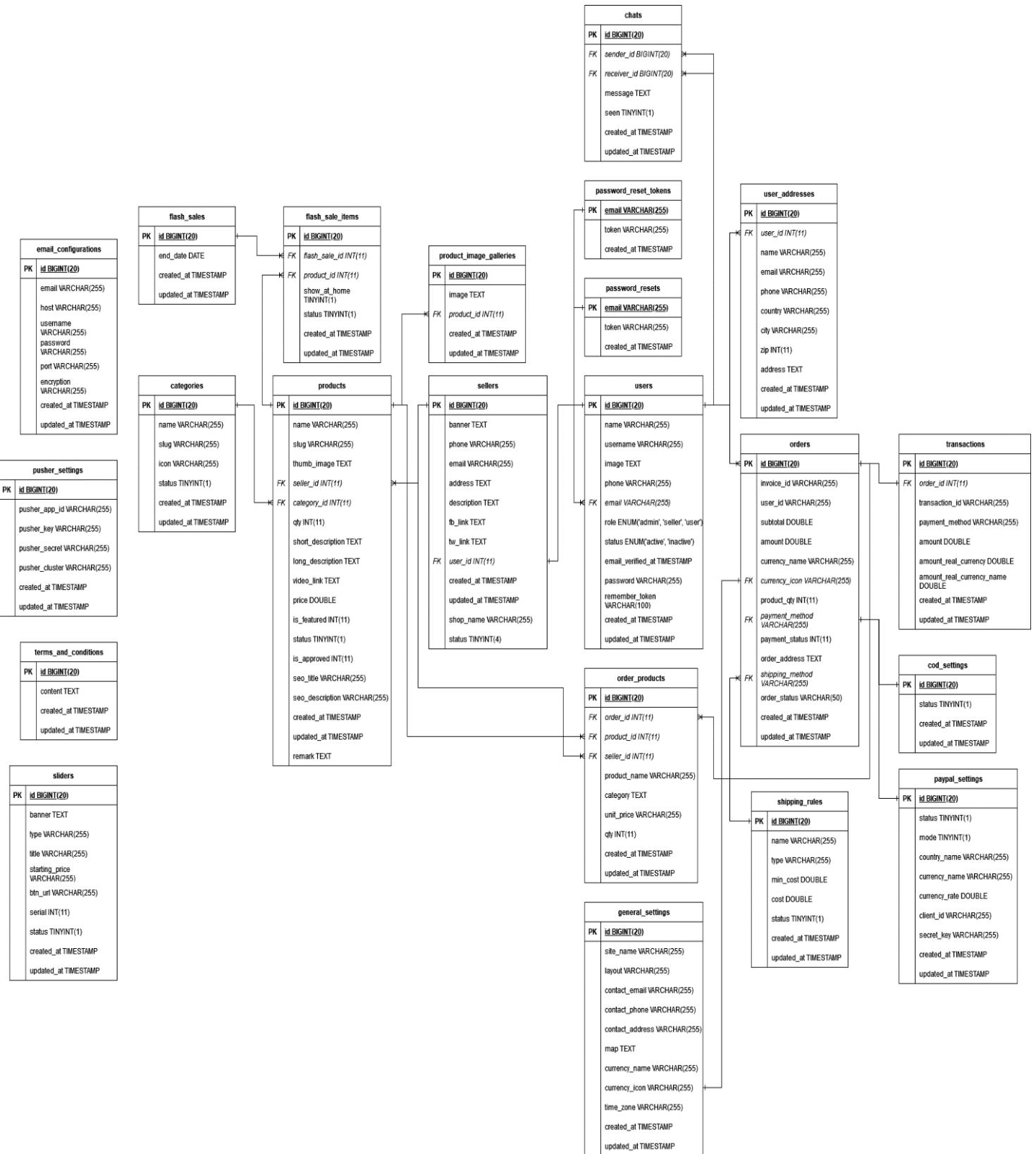


**Appendix C.19 Seller Chat Activity Diagram**

## Seller Manage Personal Information



**Appendix C.20 Seller Manage Personal Information Activity Diagram**



Appendix C.21 Entity-Relationship Diagram

## **Appendix D**

### **QUESTIONNAIRES**

#### **Appendix D.1 Pilot Interview for Needs Analysis**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

This questionnaire aims to understand potential users' experiences, needs, and preferences regarding the AI-assisted web application “APPCycle” for selling and purchasing scrap materials. The opening questions establish a foundation for understanding the user's current status. Then, we ask pertinent questions about their use of digital technology and their potential preferences for the APPCycle web application.

**Directions:** Choose or write your answer to the questions below.

**1. What is your role in recycling and scrap materials? Choose one:**

- a. Scrap Material Seller
- b. Scrap Material Buyer
- c. Recycling Center Operator
- d. Other (please specify):

---

**2. How frequently do you engage in selling or purchasing scrap materials?**

- a. Daily
- b. Weekly
- c. Monthly
- d. Occasionally
- e. Rarely

**3. What aspects of scrap materials' current sale and purchase process are challenging or inefficient?**

---

---

---

**4. Have you used digital platforms or applications for buying or selling scrap materials?**

- a. Yes
- b. No

**5. How satisfied are you with the efficiency of the current methods of buying or selling scrap materials?**

a. Very satisfied

b. Satisfied

c. Neutral

d. Dissatisfied

e. Very dissatisfied

**6. From an economic perspective, do you believe that adopting an AI-assisted web application for scrap material transactions would be cost-effective?**

a. Yes

b. No

c. Maybe I need more information

**7. Would you like to use an AI-assisted web application like APPCYCLE to improve operational efficiency in selling and purchasing scrap materials?**

a. Yes

b. No

c. Maybe I need more information

**8. If you answered 'Yes' to question 7, what features would you like to see in an AI-assisted web application for buying or selling scrap materials?**

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**9. Are you concerned about using AI technology to sell and purchase scrap materials?**

- a. Yes
- b. No

**10. How likely are you to recommend APPCYCLE to others based on your needs?**

- a. Very likely
- b. Likely
- c. Neutral
- d. Unlikely
- e. Very unlikely

**11. Do you have any additional comments or suggestions for the development team of APPCYCLE?**

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Thank you for your active participation and valuable input!

## **Appendix D.2 System Usability Scale (SUS) Testing Survey Questionnaire**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Thank you for participating in the Usability Testing for APPCycle: AI-assisted Web Application for the Sale and Purchase of Scrap Materials in Support of the Circular Economy. Usability testing is a crucial phase where real users evaluate the system to ensure it meets their expectations and business requirements. The goal is to validate that the application functions as intended, is easy to use, and provides a satisfactory user experience. During usability testing, real users simulate real-world scenarios to identify any usability issues and ensure a smooth and intuitive user experience. Your feedback is valuable in ensuring the application meets user expectations.

**Directions:** Please rate your agreement or satisfaction with the following statements using the Likert Scale: Rate your satisfaction on a scale of 1-5.

**1: Strongly Disagree**

**2: Disagree**

**3: Neutral**

**4: Agree**

**5: Strongly Agree**

Honest Feedback: Share your thoughts openly. We value your honesty..

Completion: Please finish the survey by [deadline/date].

SUSTQ	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1. Overall, I find the APPCycle web application is easy to use					
2. The registration and login process is direct and user-friendly					
3. I find it easy to navigate between different sections of the APPCycle web application					
4. The design of the APPCycle web application is visually appealing					
5. Completing a sale or purchase transaction in the APPCycle web application is efficient.					
6. The notification system for transactions					

on the APPCycle web application is timely and informative.					
<b>7.</b> I feel confident about the security of my personal information on APPCycle.					
<b>8.</b> The Google Teachable Machine accurately identifies scrap materials upon upload.					
<b>9.</b> Integrating Google Teachable Machine enhances my experience identifying and selling scrap materials.					
<b>10.</b> The performance of the Google Teachable Machine on the web application meets my expectations.					

**Please share any additional feedback, suggestions, or comments you have regarding your experience using the APPCycle web application.**

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Overall: Questions 1 to 10

System Usefulness (SYSUSE): Questions 1 to 3

Interface Quality (INTERQUAL): Question 4

Information Quality (INFOQUAL): Questions 5 to 7

Accuracy of Scrap Identification (ACCURACY): Question 8

Integration with Google Teachable Machine (INTEG): Questions 9 to 10

### **Appendix D.3 Post-Study System Usability Questionnaire for Seller Users**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

The PSSUQ (Post-Research System Usability Questionnaire) is a 16-item standardized questionnaire often used at the end of a study to gauge users' perceived satisfaction with a website, software, system, or product. PSSUQ follows a 7-point Likert Scale (+NA option). PSSUQ score starts with 1 (strongly agree) and ends with 7 (strongly disagree). The lower the score, the better the performance and satisfaction. This questionnaire is specifically designed for seller users of the APPCycle web application.

**Directions:** On a scale between Strongly Agree and Strongly Disagree, please rate the following statements:

PSSUQ	Strongly Agree (1)	2	3	4	5	6	Strongly Disagree (7)	N/A
<b>1. Overall, I am satisfied with how easy it is to use APPCycle.</b>								
<b>2. It was simple to use APPCycle.</b>								

<b>3. As a seller user, I was able to complete the tasks and scenarios quickly using the seller interface in APPCycle.</b>							
<b>4. I felt comfortable using APPCycle.</b>							
<b>5. It was easy to learn to use APPCycle.</b>							
<b>6. I believe I could become productive quickly using APPCycle.</b>							
<b>7. As a seller user, the system gave error messages that clearly told me how to fix problems.</b>							
<b>8. Whenever I made a mistake using the system, I could recover easily and quickly.</b>							
<b>9. The information (such as online help, on-screen messages, and other documentation) provided for the seller interface in APPCycle was clear.</b>							

<b>10. As a seller user, it was easy to find the information I needed.</b>							
<b>11. As a seller user, the information, including Google Teachable Machine Image Validation, was effective in helping me complete the tasks and scenarios.</b>							
<b>12. The organization of information on the system screens was clear.</b>							
<b>13. The interface of APPCycle for sellers was pleasant.</b>							
<b>14. I liked using the interface of APPCycle.</b>							
<b>15. As a seller user, APPCycle has all the functions and capabilities I expect it to have.</b>							
<b>16. Overall, I am satisfied with the seller interface in APPCycle.</b>							

Questions 1 to 16: Overall

Questions 1 to 6: System Usefulness (SYSUSE)

Questions 7 to 12: Information Quality (INFOQUAL)

Questions 13 to 16: Interface Quality (INTERQUAL)

#### **Appendix D.4 Post-Study System Usability Questionnaire for Buyer Users**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

The PSSUQ (Post-Research System Usability Questionnaire) is a 16-item standardized questionnaire often used at the end of a study to gauge users' perceived satisfaction with a website, software, system, or product. PSSUQ follows a 7-point Likert Scale (+NA option). PSSUQ score starts with 1 (strongly agree) and ends with 7 (strongly disagree). The lower the score, the better the performance and satisfaction. This questionnaire is specifically designed for buyer users of the APPCycle web application.

**Directions:** On a scale between Strongly Agree and Strongly Disagree, please rate the following statements:

PSSUQ	Strongly Agree (1)	2	3	4	5	6	Strongly Disagree (7)	N/A
<b>1. Overall, I am satisfied with how easy it is to use APPCycle.</b>								

<b>2. It was simple to use APPCycle.</b>							
<b>3. As a buyer user, I was able to complete the tasks and scenarios quickly using APPCycle.</b>							
<b>4. I felt comfortable using APPCycle.</b>							
<b>5. It was easy to learn to use APPCycle.</b>							
<b>6. I believe I could become productive quickly using APPCycle.</b>							
<b>7. As a buyer user, the system gave error messages that clearly told me how to fix problems.</b>							
<b>8. Whenever I made a mistake using the system, I could recover easily and quickly.</b>							

<b>9. The information (such as online help, on-screen messages, and other documentation) provided with APPCycle was clear for buyers.</b>							
<b>10. As a buyer user, it was easy to find the information I needed.</b>							
<b>11. As a buyer user, the information, including making transactions, was effective in helping me complete the tasks and scenarios.</b>							
<b>12. The organization of information on the system screens was clear.</b>							
<b>13. The interface of APPCycle for</b>							

<b>buyers was pleasant.</b>							
<b>14. I liked using the interface of APPCycle.</b>							
<b>15. As a buyer user, APPCycle has all the functions and capabilities I expect it to have.</b>							
<b>16. Overall, I am satisfied with the buyer interface in APPCycle.</b>							

Questions 1 to 16: Overall

Questions 1 to 6: System Usefulness (SYSUSE)

Questions 7 to 12: Information Quality (INFOQUAL)

Questions 13 to 16: Interface Quality (INTERQUAL)

## Appendix E

### PILOT INTERVIEW USER RESPONSES FOR NEEDS ANALYSIS

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## Interview Questions for APPCycling Users

Good day!

We are Stephanie Kate Ledesma, Felmer John Araña, and Carl Gian Ursabia, fourth-year students at Mindanao State University General Santos City taking up Bachelor of Science in Information Technology and are currently pursuing our undergraduate capstone project entitled "Closing the Loop: AI-assisted Web Application for the Sale and Purchase of Scrap Materials".

This questionnaire aims to understand potential users' experiences, needs, and preferences regarding the AI-assisted web application APPCycling for selling and purchasing scrap materials. The opening questions establish a foundation for understanding the user's current status. Then, we ask pertinent questions about their use of digital technology and their potential preferences for the APPCycling Web Application.

Thank you and we are hoping for a positive response and your cooperation.

#### Who has responded?

russellvincentatinado@gmail.com

rubyjanef892@gmail.com

caspequenejean@gmail.com

jungyein018@gmail.com

joshua.madula@msugensan.edu.ph

mikeplete26@gmail.com

cleidandreu.barroca@gmail.com

calilalson.barroca@msugensan.edu.ph

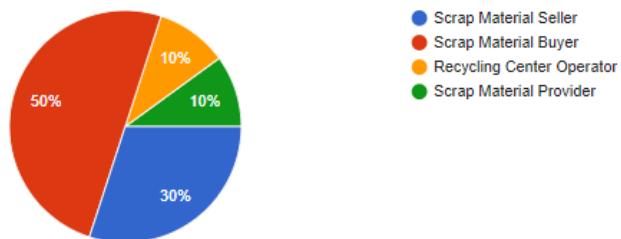
ninarose.sebial@msugensan.edu.ph

rodelynbang@gmail.com

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1. What is your role in recycling and scrap materials? Choose one.

10 responses

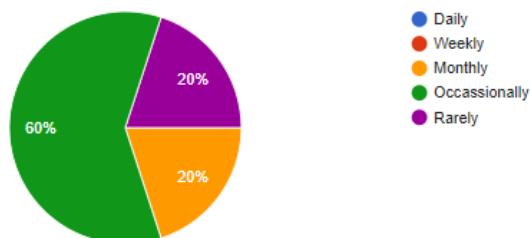


- Scrap Material Seller
- Scrap Material Buyer
- Recycling Center Operator
- Scrap Material Provider

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2. How frequently do you engage in selling or purchasing scrap materials?

10 responses



- Daily
- Weekly
- Monthly
- Occassionally
- Rarely

3. What aspects of scrap materials' current sale and purchase process are challenging or inefficient?

10 responses

Hard to find

irredeemable goods

Lack of scrap market

It's the lack of acknowledgment of scrap materials and buyers/sellers find it hassle to buy/sell scraps

The last time i sold scrap materials on a junk shop was like 4 years ago, and based on that experience i sold mostly plastic bottles, some metal craps, kartons, and corrugated iron sheets at the junk vendor that was roamed from house to house.

The challenge i find there was, some of the craps cannot be sold because it cannot be recycled like a broken porcelain, paint thinners, gas tanks and such, so I can say that it was a challenging thing to do how to deal with these unuseful craps.

Environment

None

electronic parts

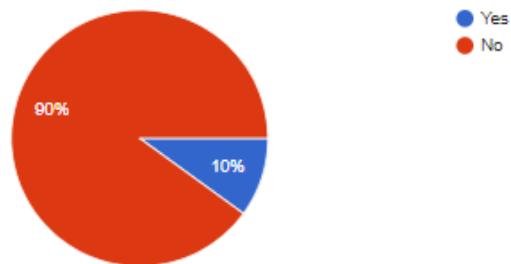
The effort of going to junkyards.

pricing and occasionally present costumers

 Copy

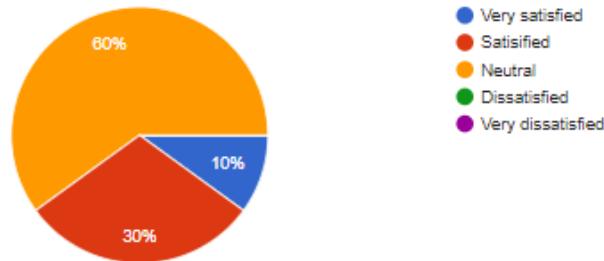
4. Have you used digital platforms or applications for buying or selling scrap materials?

10 responses



5. How satisfied are you with the efficiency of the current methods of buying or selling scrap materials?

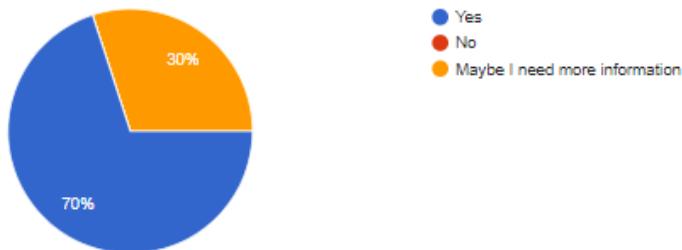
10 responses



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6. From an economic perspective, do you believe that adopting an AI-assisted web application for scrap material transactions would be cost-effective?

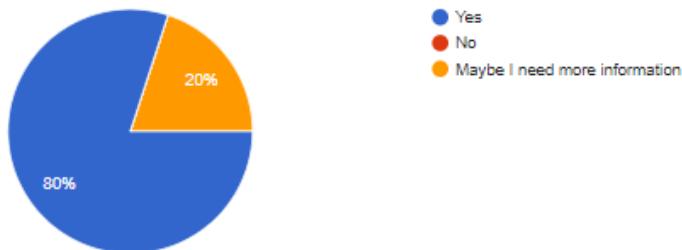
10 responses



 Copy

7. Would you like to use an AI-assisted web application like APPCYCLING to improve operational efficiency in selling and purchasing scrap materials?

10 responses



8. If you answered 'Yes' to question 7, what features would you like to see in an AI-assisted web application for buying or selling scrap materials?

8 responses

ability to be engaging to a bigger audience

Secure users information

Same as Shopee, I'd want a messaging feature so I can reach out to the user regarding my chosen product, track my item status, and an online payment like Gcash. Also, if I'm a seller, I'd want to have a sales report so that it'd be easy to manage my transactions.

I can't think one right now but hopefully the application is very handy, app friendly that it can be used to someone that is not a tech person specifically by old vendors.

Easy navigation

Market Value of scrap

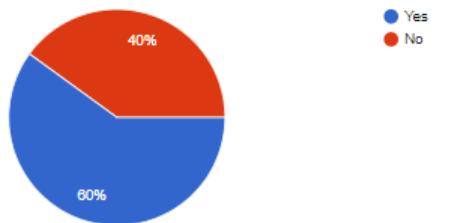
Door to door delivery

Efficient access to customers or sellers

[Copy](#)

9. Are you concerned about using AI technology to sell and purchase scrap materials?

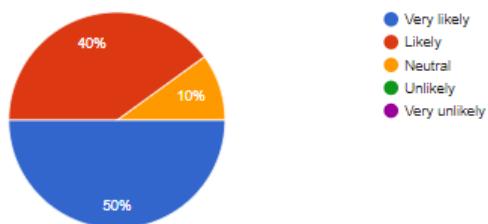
10 responses



[Copy](#)

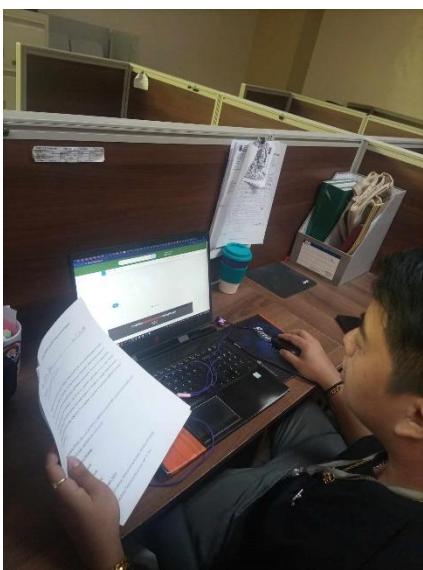
10. How likely are you to recommend APPCYCLING to others based on your needs?

10 responses



## Appendix F

### PHOTO DOCUMENTATION DURING THE FINAL VERSION OF SYSTEM TESTING



**PHOTO DOCUMENTATION DURING THE POST-TESTING PHASE OF THE  
SYSTEM**



## **Appendix G**

### **APPCYCLE: User Manual**

**AI-ASSISTED WEB APPLICATION FOR THE SALE AND PURCHASE OF SCRAP**

**MATERIALS IN SUPPORT OF THE CIRCULAR ECONOMY**



**Project Adviser:**

Dr. Lumer Jude P. Doce, DIT

**Project Team:**

Stephanie Kate B. Ledesma

Felmer John B. Araña

Carl Gian B. Ursabia

# **1.0 General Information**

## **1.1 Application Overview**

The APPCycle web application is an innovative technology developed by a project team led by Stephanie Kate B. Ledesma, Felmer John B. Araña, and Carl Gian B. Ursabia under the guidance of project adviser, Dr. Lumer Jude P. Doce, DIT. The application aims to reduce the production of recyclable waste by providing a digital marketplace platform dedicated to the sale and purchase of scrap material and utilizing image recognition technology powered by Google Teachable Machine in the system's image submission acting as a verifier.

One of the main features of the APPCycle web application is its image recognition ability when submitting an image of the scrap material to be listed on the platform. By using machine learning algorithms, the web application can identify what type of scrap material is being submitted to the system. This functionality provides an easier method of identification as users would only need to submit an image of the scrap material they are planning to list in the system without needing to confirm the type as the AI model handles the verification of the submitted image.

Similar to other digital marketplace or e-commerce web applications, APPCycle provides a listing of the submitted products into the system which is currently divided into three distinct classes which are metal, textile, and electronic waste or e-waste. APPCycle allows the user to click on any of the listed items to be provided a more detailed description of the item and the images showcasing the item itself. This also includes a messaging system in which users of the system are able to engage with each other to communicate between the sales and purchases made in the system.

The significance of APPCycle web application lies in its purpose as a digital marketplace platform to promote the concept of upcycling which may promote sustainable consumption

through the sale and purchase of scrap materials made within the system. By providing a platform dedicated in the practice of upcycling through scrap materials, the web application simplifies the upcycling process which, in turn, reduces the waste production caused by unused materials and allows a more sustainable consumption of products by maximizing the scrap materials being sold and purchased through the created digital platform. This project demonstrates the potential of technology in the scope of mitigating waste production and promoting the practice of upcycling and the concept of circular economy.

## **1.2 Authorized Use Permission**

Unauthorized copy and use of the code of this project as intended will render the project useless and may result in criminal and/or civil prosecution.

## **1.3 Organizational Manual**

- **General Information** explains the web application's general terms and the intended purpose of the web application. This includes the functionalities, processes, significance, responsible organization, web application name, and development environment.
- **Getting Started** provides an overview of the application from start to finish. It also describes the various functions and processes involved in general terms in relation to the web application.

# **2.0 Getting Started**

## 2.1 Admin Module

The screenshot shows the APPCYCLE admin dashboard with the URL <https://www.appcycle.infinityfreeapp.com/admin/category> highlighted in the browser's address bar. The left sidebar includes sections for Dashboard, Starter (Manage Categories, Manage Store, Manage Product, E-Commerce, Current Users, Orders, Transactions, Settings, Messages, Terms and Conditions), and Circular Economy. The main content area is titled 'CATEGORY' and shows a table of 'All Categories'. The table has columns for Id, Icon, Name, Status, and Action. It lists three entries: Textile (Id 21, shopping cart icon, status on, edit/delete buttons), Metal (Id 20, anchor icon, status on, edit/delete buttons), and Electronics (Id 19, telephone icon, status on, edit/delete buttons). A search bar and pagination controls (Showing 1 to 3 of 3 entries, Previous, Next) are also present.

Note: Only the admin account can access the admin dashboard.

1. Login with the admin account.
2. Go to this URL: <https://www.appcycle.infinityfreeapp.com/admin/dashboard>

### 2.1.1 Category Management

#### 2.1.1.1 Add Category

This screenshot is identical to the one above, showing the APPCYCLE admin dashboard. However, the 'Add new' button in the top right corner of the category table is now highlighted with a red box, indicating where the user should click to add a new category.

2. Go to this URL

<https://www.appcycle.infinityfreeapp.com/admin/dashboard>

3. On the sidebar, click *Category*.
4. Select a category, and it will display the category page.
5. In the upper right corner, click the *Add New* button.
6. Click the *Create* button to create a new category after filling out the form.

Id	Icon	Name	Status	Action
21	🛒	Textile	On	<a href="#">edit</a> <a href="#">delete</a>
20	⚓	Metal	On	<a href="#">edit</a> <a href="#">delete</a>
19	📞	Electronics	On	<a href="#">edit</a> <a href="#">delete</a>

### 2.1.1.2 Edit Category

1. Login with the admin account.

2. Go to this URL:

<https://www.appcycle.infinityfreeapp.com/admin/dashboard>

3. On the sidebar, click the *Category*.
4. Select a category, and it will display the category page.
5. You will see the displayed data tables. In the datatable click the *Edit* button.
6. Click *Update* after editing the category to update the category details.

ID	Icon	Name	Status	Action
21		Textile	<input checked="" type="checkbox"/>	
20		Metal	<input checked="" type="checkbox"/>	
19		Electronics	<input checked="" type="checkbox"/>	

### 2.1.1.3 Delete Category

1. Login with the admin account.
2. Go to this URL:  
<https://www.appcycle.infinityfreeapp.com/admin/dashboard>
3. On the sidebar, click the *Category*.

4. Select a category, and it will display the category page.
5. You will see the displayed data tables. In the datatable click the *Delete* button and confirm to delete a category.

### 2.1.2 Website Ads

ID	Banner	Title	Serial	Status	Action
3		Fabric Scraps	1	Active	<button>edit</button> <button>delete</button>
4		Cellular Phones	2	Active	<button>edit</button> <button>delete</button>
5		Soda Cans	3	Active	<button>edit</button> <button>delete</button>
6		Repudiandae rem et v	4	Inactive	<button>edit</button> <button>delete</button>

#### 2.1.2.1 Add Website Ads

1. Login with the admin account.
2. Go to this URL:  
<https://www.appcycle.infinityfreeapp.com/admin/dashboard>
3. On the sidebar, select *Manage Store* and click the *Slider*.
4. After clicking the *Slider*, it will display the slider page, then click the *Add New* button at the upper right corner.

- After you fill up the form, click the *Add* button to add a new Ad.

Id	Banner	Title	Serial	Status	Action
3		Fabric Scraps	1	Active	<span>Edit</span> <span>Delete</span>
4		Cellular Phones	2	Active	<span>Edit</span> <span>Delete</span>
5		Soda Cans	3	Active	<span>Edit</span> <span>Delete</span>
6		Repudiandae rem et v	4	Inactive	<span>Edit</span> <span>Delete</span>

### 2.1.2.2 Edit Website Ads

- Login with the admin account.
- Go to this URL:  
<https://www.appcycle.infinityfreeapp.com/admin/dashboard>
- On the sidebar, select *Manage Store* and click the *Slider*.
- After clicking the *Slider*, the slider page will be displayed. In the table, click the *Edit* button of the specific item, which will redirect you to the ads' edit page.
- After you edit the item details, click the *Update* button to update the changes to the item. This will redirect you again to the slider page.

ID	Banner	Title	Serial	Status	Action
3		Fabric Scraps	1	Active	<button>Edit</button> <button>Delete</button>
4		Cellular Phones	2	Active	<button>Edit</button> <button>Delete</button>
5		Soda Cans	3	Active	<button>Edit</button> <button>Delete</button>
6		Repudiandae rem et v	4	Inactive	<button>Edit</button> <button>Delete</button>

### 2.1.2.3 Delete Website Ads

1. Login with the admin account.
2. Go to this URL:  
<https://www.appcycle.infinityfreeapp.com/admin/dashboard>
3. On the sidebar, select *Manage Store* and click the *Slider*.
4. After clicking the slider it will display the slider page. In the table, click the *Delete* button of the specific item and it will pop up a confirmation.
5. Once the action has been confirmed, the item will be deleted.

### 2.1.3 Product Management

#### 2.1.3.1 Product Page

All Products					
	<a href="#">Product</a>	<a href="#">Sellers Product</a>	<a href="#">Edit</a>	<a href="#">Delete</a>	<a href="#">Details</a>
	<a href="#">Sellers Product</a>				

1. In the admin dashboard, on the sidebar, you can see the *Manage Product* button. Click on it, and in the list, select *Product* to view all products in the shop.

ID	Name	Image	Price	Is Featured	Status	Action
50	<script>alert('eyyyyy')</script>		12312	On	On	<button>Edit</button> <button>Delete</button>
47	new phone		500	On	On	<button>Edit</button> <button>Delete</button>
46	Metal Stocks		415	On	On	<button>Edit</button> <button>Delete</button>
45	Fitzgerald Wilkinson		810	On	Off	<button>Edit</button> <button>Delete</button>

### 2.1.3.2 Add Product

1. In the admin dashboard, view all the products to render the page.
2. In the upper right corner, you can see an *Add New* button; click on it.

3. After filling out the form, at the bottom, there's a *Submit* button; click on it to add the product.

ID	Name	Image	Price	Is Featured	Status	Action
50	<script>alert('yyyyy')</script>		12312	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button> More Action
47	new phone		500	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button> More Action
46	Metal Stocks		415	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button> More Action
45	Fitzgerald Wilkinson		810	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<button>Edit</button> <button>Delete</button> More Action

### 2.1.3.3 Edit Product

1. In the product page, you can see a table format that displays the product item. Click the *Edit* button of the item you want to edit.
2. After filling out the form you can submit it by clicking the *Update* button at the bottom.

ID	Name	Image	Price	Is Featured	Status	Action
50	<script>alert('yyyyy')</script>		12312	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button>
47	new phone		500	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button>
46	Metal Stocks		415	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button>
45	Fitzgerald Wilkinson		810	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button>

#### 2.1.3.4 Delete Product

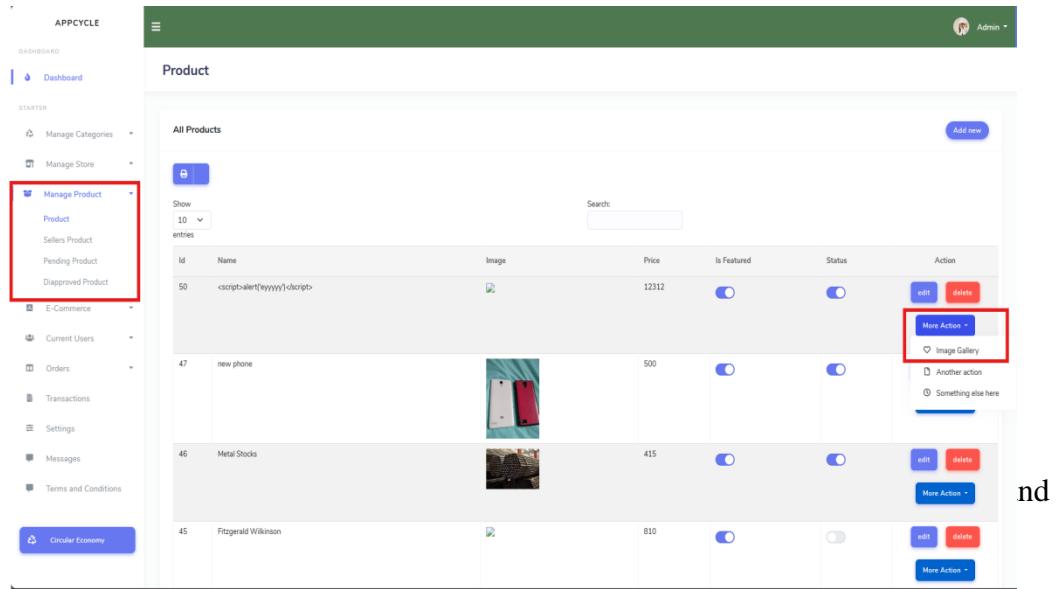
- On the product page, you can click the *Delete* button for the specific item you wish to delete and confirm the pop-up notification to delete it.

#### 2.1.3.5 Change Product Status

ID	Name	Image	Price	Is Featured	Status	Action
50	<script>alert('yyyyy')</script>		12312	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button>
47	new phone		500	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button>
46	Metal Stocks		415	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button>
45	Fitzgerald Wilkinson		810	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button>

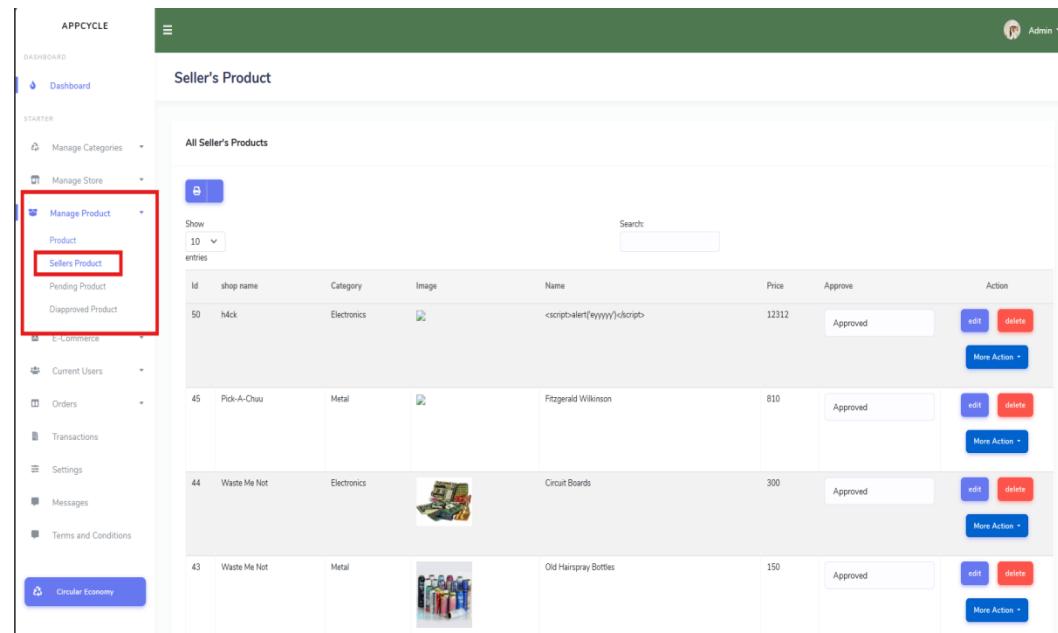
- On the product page, you can see a column named *Status* on the table. Click the switch icon to change the product's status.

### 2.1.3.6 Product Image Gallery



The screenshot shows the APPCYCLE platform's Product management interface. On the left, a sidebar menu is visible with categories like Dashboard, Starter, E-Commerce, Current Users, Orders, Transactions, Settings, Messages, and Terms and Conditions. Under Starter, 'Manage Product' is expanded, showing options: Product, Sellers Product, Pending Product, Disapproved Product, and Circular Economy. The main area is titled 'Product' and shows a table of 'All Products'. The table has columns for Id, Name, Image, Price, Is Featured, Status, and Action. A specific product row for 'new phone' is highlighted with a red box around its 'More Action' dropdown, which contains 'Image Gallery', 'Another action', and 'Something else here'. The 'Image' column for this row shows a thumbnail of a smartphone.

2. After submitting an image, click the *Upload* button to upload the product's image gallery.



The screenshot shows the APPCYCLE platform's Seller's Product management interface. The sidebar menu is identical to the previous screenshot. The main area is titled 'Seller's Product' and shows a table of 'All Seller's Products'. The table has columns for Id, shop name, Category, Image, Name, Price, Approve, and Action. A specific product row for 'h4ck' is highlighted with a red box around its 'More Action' dropdown, which contains 'Image Gallery', 'Another action', and 'Something else here'. The 'Image' column for this row shows a thumbnail of a smartphone.

### 2.1.3.7 Sellers' Product

- Under the *Manage Product* menu on the sidebar, click *Sellers' Product* to view all products of the sellers.

ID	shop name	Category	Image	Name	Price	Approve	Action
50	h4ck	Electronics		<script>alert('yyyyy')</script>	12312	Approved	<button>edit</button> <button>delete</button>
45	Pick-A-Chau	Metal		Fitzgerald Wilkinson	810	Approved	<button>edit</button> <button>delete</button>
44	Waste Me Not	Electronics		Circuit Boards	300	Approved	<button>edit</button> <button>delete</button>
43	Waste Me Not	Metal		Old Hairspray Bottles	150	Approved	<button>edit</button> <button>delete</button>

### 2.1.3.8 Edit Sellers' Product

- In the sellers' product page, you can click the *Edit* button of the item, which will redirect you to the edit form of the product.
- After filling out the form, click the *Update* button at the bottom to submit it.

ID	shop name	Category	Image	Name	Price	Approve	Action
60	h4ck	Electronics		<script>alert('yyyyy')</script>	12312	Approved	<button>edit</button> <button>delete</button> More Action ▾
45	Pick-A-Chau	Metal		Fitzgerald Wilkinson	810	Approved	<button>edit</button> <button>delete</button> More Action ▾
44	Waste Me Not	Electronics		Circuit Boards	300	Approved	<button>edit</button> <button>delete</button> More Action ▾
43	Waste Me Not	Metal		Old Hairspray Bottles	150	Approved	<button>edit</button> <button>delete</button> More Action ▾

### 2.1.3.9 Delete Sellers' Product

1. In the sellers' product page, click the *Delete* button of the item and confirm it to delete the product.

ID	shop name	Image	Name	Price	Approve	Action
47	Pick-A-Chau		new phone	500	Pending	<button>edit</button> <button>delete</button> Disapprove

### 2.1.3.10 Pending Products

- To view all pending products, select *Pending Products* in the *Manage Product* menu to render all the pending products in the store.

### 2.1.3.11 Approve Pending Product

ID	shop name	Image	Name	Price	Approve	Action
47	Pick-A-Chua		new phone	500	<input checked="" type="button" value="Pending"/> <input type="button" value="Approved"/> <input type="button" value="Disapprove"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Disapprove</a>

Note: Only approved products will be displayed on the home page.

- Go to *Pending Products*.
- In the table, you can see a column named *Approve*, select a product then within the approved column, click on the option boxes and select *Approve* to approve the product.

ID	shop name	Image	Name	Price	Action
47	Pick-A-Chau		new phone	500	<button>Pending</button> <button>edit</button> <button>delete</button> <b>Disapprove</b>

### 2.1.3.12 Disapprove the Pending Product

1. Go to *Pending Products*.
2. In the table, you can see a column named *Action*, select a product then within the action column, click on the disapprove button and it will redirect you to the disapprove form page.
3. Put a remark on why the product is disapproved.
4. Click *Save* to save the product's approval status.

Seller's Disapproved Product

All Disapproved Products

ID	Shop Name	Image	Name	Price	Approve	Remark	Action
46	Pick-A-Chau		Metal Stocks	415	Disapproved	not a scraps	<button>Edit</button> <button>Delete</button> <button>More Action</button>

Showing 1 to 1 of 1 entries

### 2.1.3.13 View All Disapproved Products

1. To view all pending products, select Disapproved Products on the Manage Product menu.

### 2.1.4 Shop Profile

Seller Shop Profile

Update Seller Shop Profile

Preview

Banner Image

Choose File No file chosen

Shop Name

Admin Shop

Phone

123123123

Email

admin@gmail.com

Address

USB

Description

ew ew ew ew ew ew

Facebook

Note: The product details page will display the shop profile as seller information.

1. Go to the *E-Commerce* menu on the sidebar and click *Shop Profile* to render the profile information.

#### 2.1.4.1 Edit Shop Profile

The screenshot shows the APPCYCLE admin interface. On the left, a sidebar menu is open under the 'E-Commerce' section, with 'Shop Profile' selected. The main content area is titled 'Shop Profile' and contains fields for 'Banner Image' (choose file), 'Shop Name' (Admin Shop), 'Phone' (123123123), 'Email' (admin@gmail.com), 'Address' (USB), 'Description' (ew ew ew ew ew), 'Facebook' (empty), and 'Twitter' (empty). A blue 'Update' button is highlighted with a red box. At the bottom, there's a 'Copyright' section and a URL: <http://www.appcycleinfinityapp.com/admin/shop-profile>.

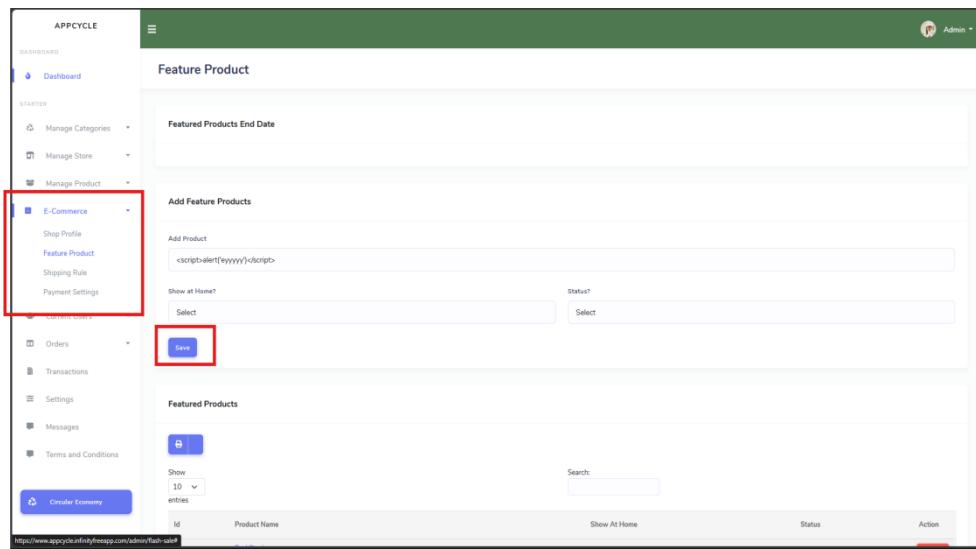
1. Go to your *Shop Profile*, edit the form/shop information, and click the *Update* button to submit the changes.

#### 2.1.5 Feature Product

The screenshot shows the APPCYCLE admin interface. On the left, a sidebar menu is open under the 'E-Commerce' section, with 'Feature Product' selected. The main content area is titled 'Feature Product' and has sections for 'Featured Products End Date' (empty) and 'Add Feature Products'. Under 'Add Feature Products', there's a 'Add Product' field containing '<script>alert('yyyyyy')</script>', a 'Show at Home?' dropdown set to 'Select', and a 'Status?' dropdown also set to 'Select'. A blue 'Save' button is visible. Below this, there's a 'Featured Products' table with columns for 'Id', 'Product Name', 'Show At Home', 'Status', and 'Action'. The table shows one row with ID 1, Product Name 'Product 1', Show At Home checked, Status 'Active', and an Action button. The URL at the bottom is <http://www.appcycleinfinityapp.com/admin/feature-product>. The page number '225' is located in the bottom right corner.

Note: Featured products are products being displayed first before all other products on the home page.

1. Go to the “E-Commerce” menu on the sidebar and click “Feature Products” to render the feature product table.



### 2.1.5.1 Add Featured Product

Note: The *Show at Home* and *Status* in the product page must be active/enabled and approved by admin before being displayed here.

1. Go to the featured product and navigate to the featured product form.
2. After filling up the form click the “save” button to submit and add the product

Note: The *Show at Home* and *Status* must be active to automatically display the product in featured products.

### 2.1.5.2 Delete Product in the Featured List

ID	Product Name	Show at Home	Status	Action
21	Tool Steel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
22	Film Camera Bundle	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
23	Curtain Fabrics	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
24	Gadget Bundle	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
25	Circuit Board	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
26	Nonfunctional Alcatel Phone	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>
27	Unused Muscle Tee	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<button>Delete</button>

1. Navigate to the *Feature Products*.
2. In the table, click the *Delete* button and confirm to delete the product from the list.

### 2.1.6 Shipping Rule

ID	Name	Type	Min Cost	Cost	Status	Action
5	xmas shipping fee bunos	Minimum Amount	₱1000	₱0	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
3	Normal	Flat Amount	₱0	₱100	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
4	New Year Deal	Minimum Amount	₱4000	₱10	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
2	February shipping deals	Minimum Amount	₱1000	₱50	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
1	Christmas Shipping Fee	Minimum Amount	₱5000	₱0	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>

Note: The shipping rule will be the shipping method of the store.

- In the admin dashboard, go to the sidebar, click the *E-Commerce* menu, and select *Shipping Rule* to render the shipping rule page.

ID	Name	Type	Min Cost	Cost	Status	Action
5	xmas shipping fee bonus	Minimum Amount	₱1000	₱0	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
3	Normal	Flat Amount	₱0	₱100	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
4	New Year Deal	Minimum Amount	₱4000	₱10	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
2	February shopping deals	Minimum Amount	₱1000	₱50	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
1	Christmas Shipping Fee	Minimum Amount	₱5000	₱0	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>

### 2.1.6.1 Add Shipping Rule

- Go to the *Shipping Rule* page. On the rendered page, click the *Add New* button at the upper right, redirecting you to the *Create Shipping Rule* form.
- Fill up the form then click the “Add” button to submit the form.

### 2.1.6.2 Edit Shipping Rule

ID	Name	Type	Min Cost	Cost	Status	Action
5	xmas shipping fee bonus	Minimum Amount	₱1000	₱0	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
3	Normal	Flat Amount	₱0	₱100	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
4	New Year Deal	Minimum Amount	₱4000	₱10	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
2	February shopping deals	Minimum Amount	₱1000	₱50	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>
1	Christmas Shipping Fee	Minimum Amount	₱5000	₱0	<input checked="" type="checkbox"/>	<button>Edit</button> <button>Delete</button>

1. Go to the *Shipping Rule* page. On the table, you can see a column named *Action*. Click the *Edit* button, which will redirect you to the edit page.
2. In the *Edit* page, after editing the information click the *Update* button to save the changes.

### 2.1.6.3 Delete Shipping Rule

ID	Name	Type	Min Cost	Cost	Status	Action
5	xmas shipping fee bonus	Minimum Amount	₱1000	₱0	On	<button>Edit</button> <button>Delete</button>
3	Normal	Flat Amount	₱0	₱100	On	<button>Edit</button> <button>Delete</button>
4	New Year Deal	Minimum Amount	₱4000	₱10	On	<button>Edit</button> <button>Delete</button>
2	February shipping deals	Minimum Amount	₱1000	₱50	On	<button>Edit</button> <button>Delete</button>
1	Christmas Shipping Fee	Minimum Amount	₱5000	₱0	On	<button>Edit</button> <button>Delete</button>

1. Go to the *Shipping Rule* page; on the table, you can see a column named *Action*. Click the *Delete* button and confirm to delete the shipping rule.

## 2.1.7 Payment Settings Configuration

The screenshot shows the APPCYCLE admin dashboard with the sidebar expanded. Under the 'E-Commerce' menu, the 'Payment Settings' option is selected and highlighted with a red box. The main content area is titled 'Payment Settings' and shows the configuration for the 'Paypal' payment method. The 'Paypal Status' is set to 'Enable'. The 'Account Mode' is set to 'Sandbox'. The 'Country' is set to 'Philippines'. The 'Currency Name' is set to 'PHP'. The 'Currency rate (Per PHP)' is set to '1'. The 'Paypal Client Id' and 'Paypal Secret Key' fields contain long alphanumeric strings. A blue 'Update' button is at the bottom.

Note: the status must be enabled to use it as a payment method.

1. In the admin dashboard, go to the sidebar, click the *E-Commerce* menu, and select *Payment Settings* to render the payment settings page.

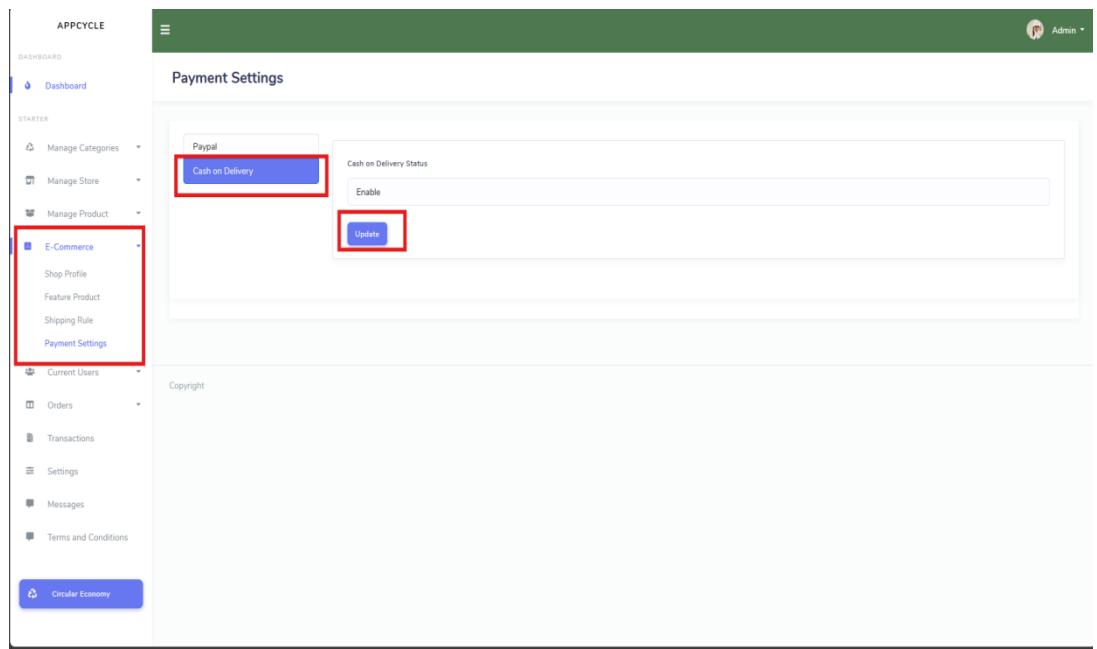
### 2.1.7.1 PayPal Setting Configuration

This screenshot is identical to the one above, showing the 'Payment Settings' page for PayPal. The 'Payment Settings' section is visible, and the 'Update' button at the bottom is highlighted with a red box.

1. Navigate to the *Payment Settings* then click the *PayPal* *Settings* to render the PayPal setting form.
2. Fill out the information needed in the PayPal setting form, then click the *Update* button to save the changes.

Note: Make sure the client ID and secret key is correct. Go to developer.paypal.com to check the API credentials.

#### 2.1.7.2 Cash on Delivery Setting



1. Navigate to the payment setting then click *Cash on Delivery* to render the COD form,
2. Change the option to enable/disable then click the *Update* button to save the changes.

## 2.1.8 User Management

The screenshot shows the APPCYCLE admin dashboard. On the left, there's a sidebar with various management options like 'Manage Categories', 'Manage Store', 'Manage Product', and 'E-Commerce'. Under 'E-Commerce', the 'Current Users' section is expanded, showing 'Pending Sellers', which is highlighted with a red box. Other options in this section include 'Regular Users' and 'Seller List'. The main content area is titled 'Pending Request of Seller' and shows a table with one entry:

ID	User Name	Shop Name	Shop Email	Status	Action
7	Pikachu	test	testuser@gmail.com	pending	<button>view</button>

Below the table, it says 'Showing 1 to 1 of 1 entries'. There are 'Previous' and 'Next' buttons at the bottom.

1. In the admin dashboard, go to the sidebar and click the *Current User* menu to view all options.

### 2.1.8.1 Pending Sellers

This screenshot is similar to the previous one, but the 'Pending Sellers' option in the 'Current Users' menu of the sidebar is highlighted with a red box. The main content area shows the same pending seller entry as before.

Note: pending sellers are users you wish to upload a product to the store

1. Navigate to *User Management* and select *Pending Sellers* to display the list of users who requested to be sellers in tabular form.

### 2.1.8.2 Accept Seller's Request

The screenshot shows the 'Seller Request Details' page. On the left is a sidebar with 'STARTER' and 'Current Users' sections. Under 'Current Users', 'Pending Sellers' is selected. The main area shows a table with one row of data. Below the table is a 'Status Action' section containing two buttons: 'Approve' and 'Save', both of which are highlighted with red boxes.

1. In the pending sellers, click the *View* button and it will redirect to the seller's request details page.
2. In the seller's request details page, change the *Status Action* to *Approve* then click the *Save* button to save the changes.

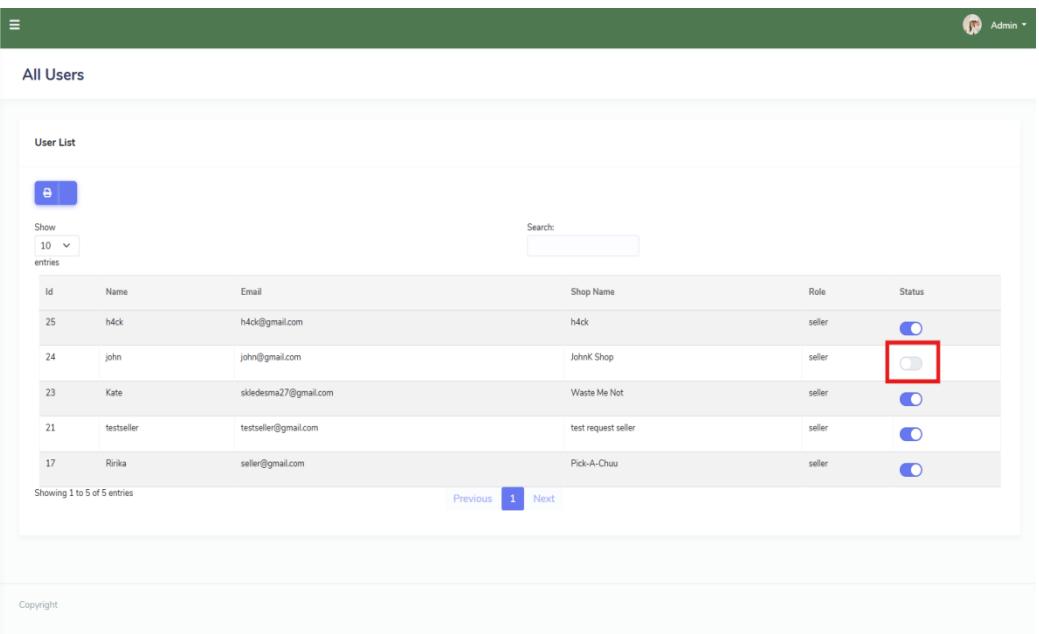
### 2.1.8.3 Block Customer Account

The screenshot shows the 'All Users' page. On the left is a sidebar with 'STARTER' and 'Current Users' sections. Under 'Current Users', 'Pending Sellers' is highlighted with a red box. The main area shows a table of users. One user, 'Pikachu', has a status switch highlighted with a red box. The table includes columns for Id, Name, Email, Role, and Status.

ID	Name	Email	Role	Status
22	user2	user2@gmail.com	user	<input checked="" type="checkbox"/>
20	test10	test10@gmail.com	user	<input type="checkbox"/>
19	Pikachu	testuser@gmail.com	user	<input checked="" type="checkbox"/>
18	user 2	user@gmail.com	user	<input checked="" type="checkbox"/>

1. In the *User Management* menu select the *Regular Users* to render the list of regular users of the web application.
  
2. In the column named *Status*, change the user account status to Inactive by clicking the switch button. This will block the user account.

#### 2.1.8.4 Block Seller Account



The screenshot shows the APPCYCLE dashboard with the 'All Users' page selected. The sidebar on the left has a 'Seller List' option highlighted with a red box. The main area displays a table of users with columns for Id, Name, Email, Shop Name, Role, and Status. The 'Status' column contains a switch button for each user. The switch for user ID 24 (john) is shown as off (inactive), with a red box highlighting it. The table shows 5 entries out of 5 total.

ID	Name	Email	Shop Name	Role	Status
25	h4ck	h4ck@gmail.com	h4ck	seller	<input checked="" type="checkbox"/>
24	john	john@gmail.com	JohnK Shop	seller	<input type="checkbox"/> (highlighted)
23	Kate	skledesma27@gmail.com	Waste Me Not	seller	<input checked="" type="checkbox"/>
21	testseller	testseller@gmail.com	test request seller	seller	<input checked="" type="checkbox"/>
17	Ririka	seller@gmail.com	Pick-A-Chuu	seller	<input checked="" type="checkbox"/>

1. In the *User Management* menu, select the *Seller List* to render the list of regular users of the web application.
  
2. In the column named *Status*, change the *User Account Status* to Inactive by clicking the switch button. This will block the user account.

## 2.1.9 Order Management

All Order									
									Action
17	32279235210	user 2	30-Apr-2024	1	₱400	<span>pending</span>	<span>Pending</span>	COD	<button>view</button>
16	40995197866	user 2	22-Apr-2024	1	₱250	<span>out for delivery</span>	<span>Complete</span>	paypal	<button>view</button>
15	10878404477	user 2	22-Apr-2024	1	₱2550	<span>Canceled</span>	<span>Pending</span>	COD	<button>view</button>
14	68182523711	john	22-Apr-2024	1	₱600	<span>delivered</span>	<span>Complete</span>	paypal	<button>view</button>
13	53138803943	john	22-Apr-2024	2	₱350	<span>pending</span>	<span>Complete</span>	paypal	<button>view</button>
12	99854994792	Pikachu	21-Apr-2024	1	₱175	<span>pending</span>	<span>Pending</span>	COD	<button>view</button>
11	12545717321	Pikachu	18-Apr-2024	1	₱150	<span>pending</span>	<span>Pending</span>	COD	<button>view</button>
10	73866083301	user 2	18-Apr-2024	1	₱150	<span>processed</span>	<span>Complete</span>	paypal	<button>view</button>
9	26194566125	user 2	16-Apr-2024	1	₱223	<span>pending</span>	<span>Complete</span>	paypal	<button>view</button>
8	45701430470	user 2	11-Apr-2024	1	₱1856	<span>out for delivery</span>	<span>Complete</span>	COD	<button>view</button>

- In the admin dashboard's sidebar, click on the Order menu to display all the different options.

### 2.1.9.1 All Orders

All Order									
									Action
17	32279235210	user 2	30-Apr-2024	1	₱400	<span>pending</span>	<span>Pending</span>	COD	<button>view</button>
16	40995197866	user 2	22-Apr-2024	1	₱250	<span>out for delivery</span>	<span>Complete</span>	paypal	<button>view</button>
15	10878404477	user 2	22-Apr-2024	1	₱2550	<span>Canceled</span>	<span>Pending</span>	COD	<button>view</button>
14	68182523711	john	22-Apr-2024	1	₱600	<span>delivered</span>	<span>Complete</span>	paypal	<button>view</button>
13	53138803943	john	22-Apr-2024	2	₱350	<span>pending</span>	<span>Complete</span>	paypal	<button>view</button>
12	99854994792	Pikachu	21-Apr-2024	1	₱175	<span>pending</span>	<span>Pending</span>	COD	<button>view</button>
11	12545717321	Pikachu	18-Apr-2024	1	₱150	<span>pending</span>	<span>Pending</span>	COD	<button>view</button>
10	73866083301	user 2	18-Apr-2024	1	₱150	<span>processed</span>	<span>Complete</span>	paypal	<button>view</button>
9	26194566125	user 2	16-Apr-2024	1	₱223	<span>pending</span>	<span>Complete</span>	paypal	<button>view</button>
8	45701430470	user 2	11-Apr-2024	1	₱1856	<span>out for delivery</span>	<span>Complete</span>	COD	<button>view</button>

- To view all the orders, go to Order Management, then select All Orders to render the page.

All Order								
Show <input type="button" value="10"/> entries <input placeholder="Search:" type="text"/>								
ID	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method
17	32279235210	user 2	30-Apr-2024	1	₱400	<span>Pending</span>	<span>Pending</span>	COD
16	40995197866	user 2	22-Apr-2024	1	₱250	<span>out for delivery</span>	<span>Complete</span>	paypal
15	10878404477	user 2	22-Apr-2024	1	₱2550	<span>Canceled</span>	<span>Pending</span>	COD
14	68182523711	john	22-Apr-2024	1	₱600	<span>delivered</span>	<span>Complete</span>	paypal
13	53138803943	john	22-Apr-2024	2	₱350	<span>Pending</span>	<span>Complete</span>	paypal
12	99854994792	Pikachu	21-Apr-2024	1	₱175	<span>Pending</span>	<span>Pending</span>	COD
11	12545717321	Pikachu	18-Apr-2024	1	₱150	<span>Pending</span>	<span>Pending</span>	COD
10	73866083301	user 2	18-Apr-2024	1	₱150	<span>processed</span>	<span>Complete</span>	paypal
9	26194566125	user 2	16-Apr-2024	1	₱223	<span>Pending</span>	<span>Complete</span>	paypal
8	45701430470	user 2	11-Apr-2024	1	₱1856	<span>out for delivery</span>	<span>Complete</span>	COD

### 2.1.9.2 Change Order Status

- Go to all orders, then click the *View* button, which will redirect you to the order details page.
- On the Order Details page, click on Payment Status or Order Status at the bottom and select an option.
- After selecting an option, it will automatically change the status of the order.

### 2.1.9.3 Print Order Details

The screenshot shows the APPCYCLE dashboard with the 'Orders' section selected. On the right, a detailed view of an order is displayed. The order summary table includes:

#	Item	Category	Seller	Price	Quantity	Totals
1	Circuit Boards	Electronics	Waste Me Not	₱300	1	₱300

Below the table, there are two input fields with red boxes around them:

- Payment Status: Pending
- Order Status: Pending

On the far right, the order details are summarized:

- Subtotal: ₱300
- Shipping (+): ₱100
- Total: ₱ 400

At the bottom right is an orange 'Print' button.

1. Go to all orders, then click the *View* button, which will redirect you to the order details page.
2. The order details page has a print button; click on it to print the details.

### 2.1.9.4 Delete Order

1. Go to All Orders, click the *Delete* button, and confirm to delete the order.

ID	Invoice Id	Customer	Date	Product Types	Amount	Order-Status	Payment Status	Payment Method	Action
17	32279235210	user 2	30-Apr-2024	1	₹400	Pending	Pending	COD	<button>view</button>
13	53138803943	john	22-Apr-2024	2	₹350	Pending	Complete	paypal	<button>view</button>
12	99854994792	Pikachu	21-Apr-2024	1	₹175	Pending	Pending	COD	<button>view</button>
11	12545717321	Pikachu	18-Apr-2024	1	₹150	Pending	Pending	COD	<button>view</button>
9	26194566125	user 2	16-Apr-2024	1	₹223	Pending	Complete	paypal	<button>view</button>

## 2.1.9.5 Pending Orders

- To view all orders, go to *Order Management* and select *Pending Orders* to render the page.

## 2.1.9.6 Processed Orders

ID	Invoice Id	Customer	Date	Product Types	Amount	Order-Status	Payment Status	Payment Method	Action
10	73866083301	user 2	18-Apr-2024	1	₹150	processed	Complete	paypal	<button>view</button>

- To view all orders, go to *Order Management* and select *Processed Orders* to render the page.

### 2.1.9.7 Dropped Off Orders

The screenshot shows the APPCYCLE Order Management interface. On the left, there's a sidebar with a 'Orders' dropdown menu open. Under 'Orders', the 'Dropped Off Orders' option is highlighted with a red box. The main content area is titled 'Dropped Off Orders' and displays a table with columns: Id, Invoice Id, Customer, Date, Product Types, Amount, Order Status, Payment Status, Payment Method, and Action. A message at the top says 'No data available in table'. At the bottom, it shows 'Showing 0 to 0 of 0 entries' and 'Previous' and 'Next' buttons.

### 2.1.9.8 Shipped Out Orders

The screenshot shows the APPCYCLE Order Management interface. On the left, there's a sidebar with a 'Orders' dropdown menu open. Under 'Orders', the 'Out for Delivery' option is highlighted with a red box. The main content area is titled 'Out For Delivery Orders' and displays a table with columns: Id, Invoice Id, Customer, Date, Product Types, Amount, Order Status, Payment Status, Payment Method, and Action. It shows two entries: one with Id 16 and another with Id 8. Both entries have 'out for delivery' status and 'Complete' payment status. At the bottom, it shows 'Showing 1 to 2 of 2 entries' and 'Previous' and 'Next' buttons.

- To view all orders, go to the *Order Management* then select *Shipped Out Orders* to render the page.

All Shipped Orders

ID	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
No data available in table									

### 2.1.9.9 Out For Delivery

- To view all orders, go to the *Order Management* then select *Out For Delivery* to render the page.

All Cancelled Orders

ID	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
15	10878404477	user 2	22-Apr-2024	1	P2550	Cancelled	Pending	COD	<button>view</button>

### 2.1.9.10 Canceled Orders

1. To view all orders, go to Order Management, then select *Canceled Orders* to render the page.

The screenshot shows the APPCYCLE admin dashboard. The sidebar on the left is titled 'STARTER' and includes links for 'Manage Categories', 'Manage Store', 'Manage Product', 'E-Commerce', 'Current Users', 'Orders' (with 'Transactions' highlighted), 'Settings', 'Messages', and 'Terms and Conditions'. Below the sidebar is a blue button labeled 'Circular Economy'. The main content area is titled 'Transaction' and contains a section for 'All Transactions' with fields for 'Start Date' and 'End Date', and buttons for 'Filter' and 'Clear filter'. Below this is a blue banner with the text 'Mindanao State University', 'APPCYCLE', and 'Transaction Table'. At the bottom is a table with columns 'Id', 'Invoice Id', 'Payment Method', 'Amount In Base Currency', and 'Amount In Real Currency'. One row is shown: Id 17, Invoice Id #32279235219, Payment Method COD, Amount In Base Currency 400 PHP, and Amount In Real Currency 400 PHP.

Id	Invoice Id	Payment Method	Amount In Base Currency	Amount In Real Currency
17	#32279235219	COD	400 PHP	400 PHP

## 2.1.10 Transactions

1. In the admin dashboard's sidebar, click *Transactions* to view all transactions in the store. You can filter the data by clicking the *Filter* button after selecting a start date and end date

Note: If you want to filter the transactions within the day, the starting date must be before the day.

The screenshot shows the APPCycle admin dashboard. The sidebar on the left has a 'STARTER' section with 'Manage Categories', 'Manage Store', 'Manage Product', 'E-Commerce', 'Current Users', 'Orders', 'Transactions', and 'Settings'. The 'Settings' option is highlighted with a red box. Below these are 'Messages' and 'Terms and Conditions'. A blue button labeled 'Circular Economy' is at the bottom. The main content area is titled 'General Settings'. It contains a sidebar with 'General Setting', 'Email Configuration', and 'Message Setting (Pusher)'. The main form fields include: Site Name (APPcycle), Nav Bar Layout (Left To Right), Contact Email (admin@gmail.com), Contact Phone (09957220171), Contact Address (Tambler, General Santos City), Google Map Url (a long URL), Currency Name (PHP), and Currency Icon (a small icon). The top right corner shows the user 'Admin'.

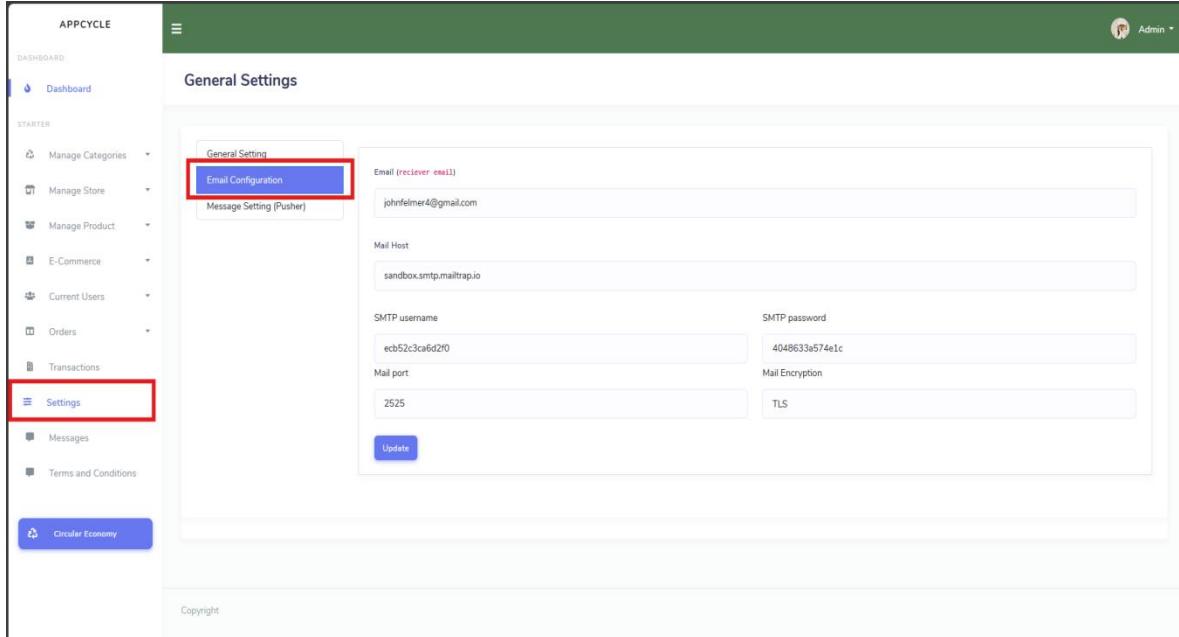
## 2.1.11 Settings

1. In the admin dashboard's sidebar, click on *Settings* to view the web application's general settings and other configurations.

This screenshot is identical to the one above, showing the 'General Settings' page. The 'General Setting' tab in the sidebar is highlighted with a red box. The rest of the interface, including the sidebar options and the form fields, remains the same.

### 2.1.11.1 General Settings

1. Go to *Settings*, then click *General Settings* and it will render the general settings form.
  
2. You can edit the settings by clicking the *Update* button to save the changes.



### 2.1.11.2 Email Configuration

Note: This data is very sensitive, don't randomly change the settings in this form.

1. Go to *Settings*, then click *Email Configuration* to render the email configuration settings form.
  
2. You can edit the value in the form and click the *Update* button to save the changes.

### 2.1.11.3 Message Configuration

The screenshot shows the APPCYCLE platform's General Settings page. On the left, there is a sidebar with various menu items under 'STARTER' such as Manage Categories, Manage Store, Manage Product, E-Commerce, Current Users, Orders, Transactions, and Settings. The 'Settings' item is highlighted with a red box. Below it are 'Messages' and 'Terms and Conditions'. At the bottom of the sidebar is a 'Circular Economy' button. The main content area is titled 'General Settings' and contains several sections: 'General Setting', 'Email Configuration', and 'Message Setting (Pusher)'. The 'Message Setting (Pusher)' section is highlighted with a blue box. It includes fields for 'APP ID (PUSHER)', 'Key (PUSHER)', 'SECRET (PUSHER)', and 'CLUSTER (PUSHER)'. There is also a 'Save' button at the bottom. The top right corner shows the user 'Admin'.

Note: This data is very sensitive, don't randomly change the settings in this form.

1. Go to Settings, then click *Message Settings (Pusher)* to render the email configuration settings form.
2. You can edit the value in the form and click the *Update* button to save the changes.

### 2.1.12 Chat

The screenshot shows the APPCYCLE platform's Chat interface. The sidebar on the left has the 'Messages' item highlighted with a red box. The main content area is titled 'Messages' and displays a 'Who's Online?' section with icons for 'Rinka' and 'user 2'. To the right is a chat window for 'Rinka' showing a list of messages. The messages are as follows:

- Apr 09, 2024, 09:38 AM: test
- Apr 09, 2024, 11:38 PM: test
- Apr 09, 2024, 12:32 PM: test
- Apr 09, 2024, 12:43 PM: test
- Apr 09, 2024, 02:25 PM: test

At the bottom of the chat window, there is a text input field with the placeholder 'Type a message' and a send button with a blue icon.

- In the sidebar of the admin dashboard, click on *Messages* to render the chat page.

Note: You can reply to the chat in this page.

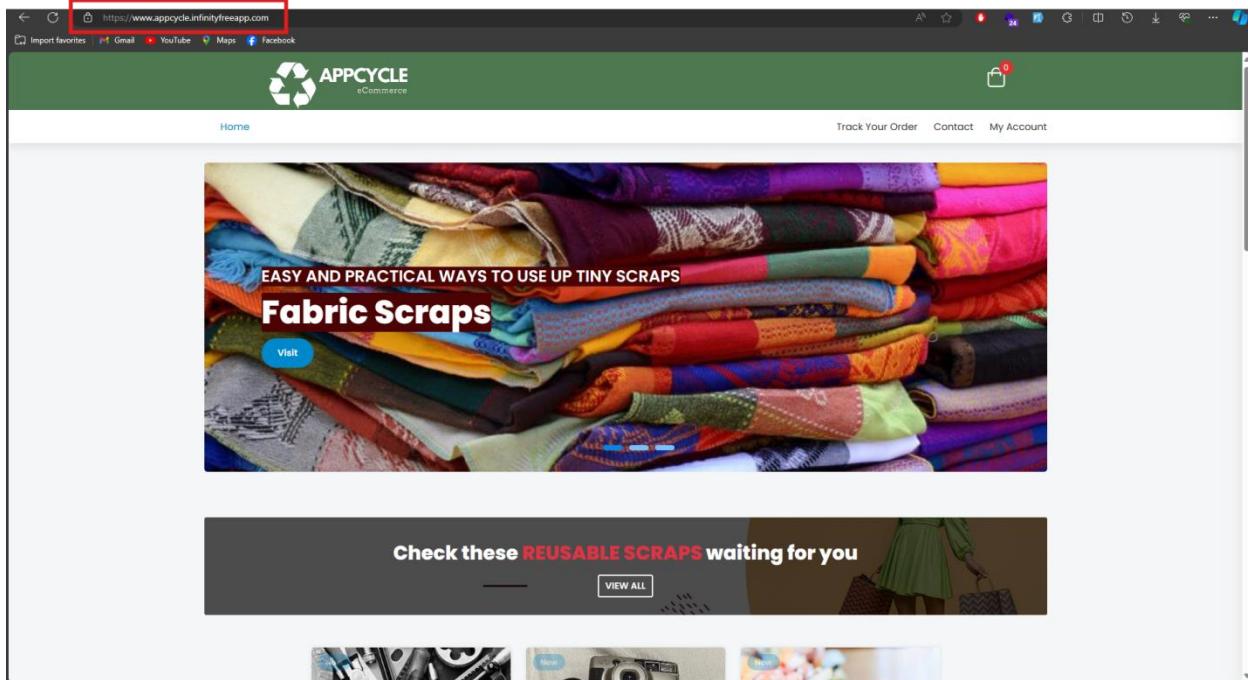
The screenshot shows the APPCYCLE admin dashboard. The sidebar on the left has a red box around the 'Messages' item, which is currently selected. The main content area shows the 'Terms and Conditions' page with a large text box containing legal text. A blue 'UPDATE' button is at the bottom.

## 2.1.13 Terms and Conditions

- Click Terms and Conditions on the form page in the admin dashboard's sidebar.
- You can change the terms and conditions by clicking on the *Update* button after changing the value of the content.

Note: The content will be read in HTML tag format.

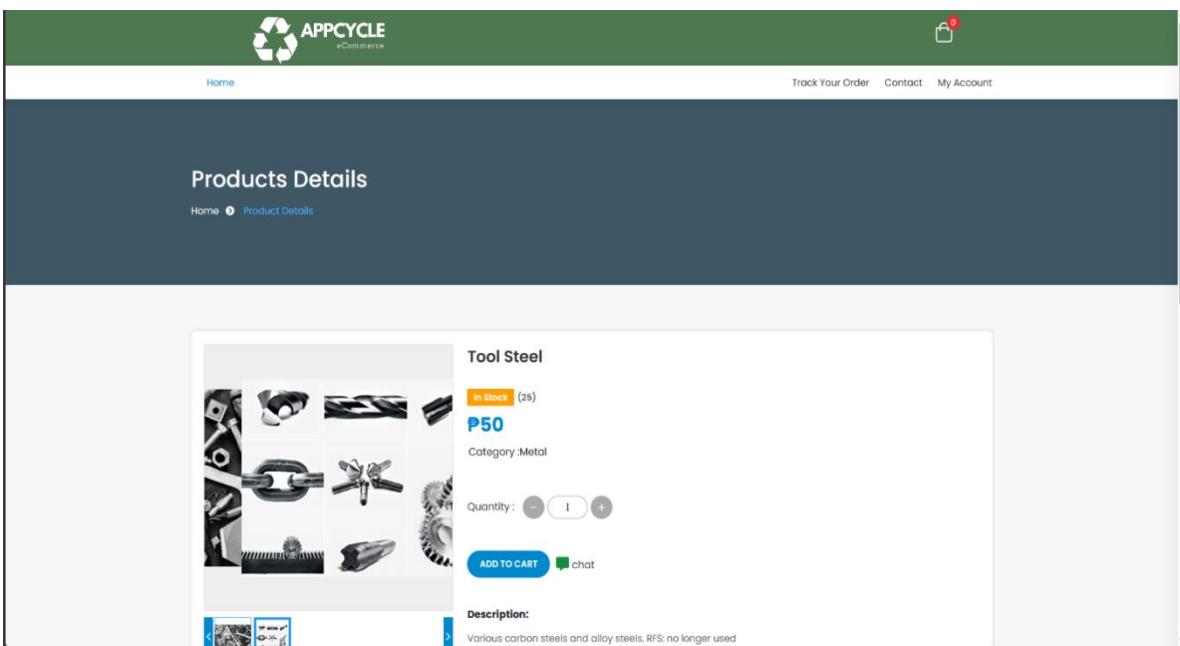
## 2.2 Customer Module



### 2.2.1 Home Page

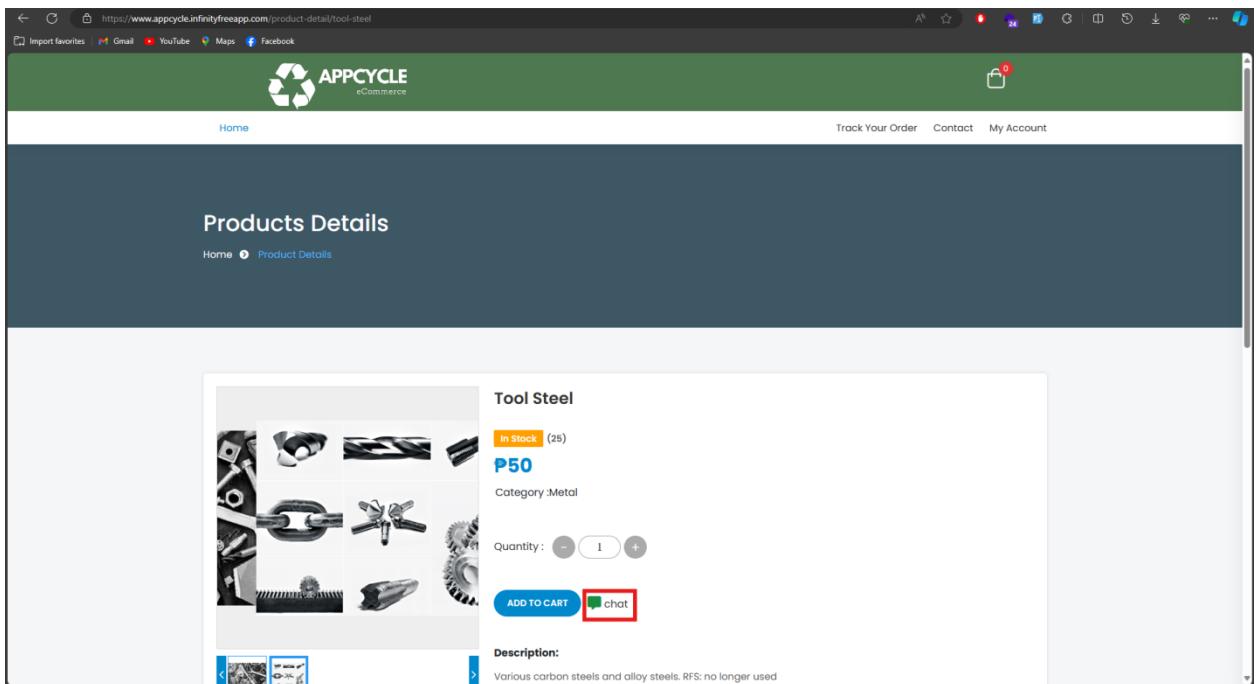
1. Go to this URL: <https://www.appcycle.infinityfreeapp.com/> to view the home page.

### 2.2.2 View Product Details



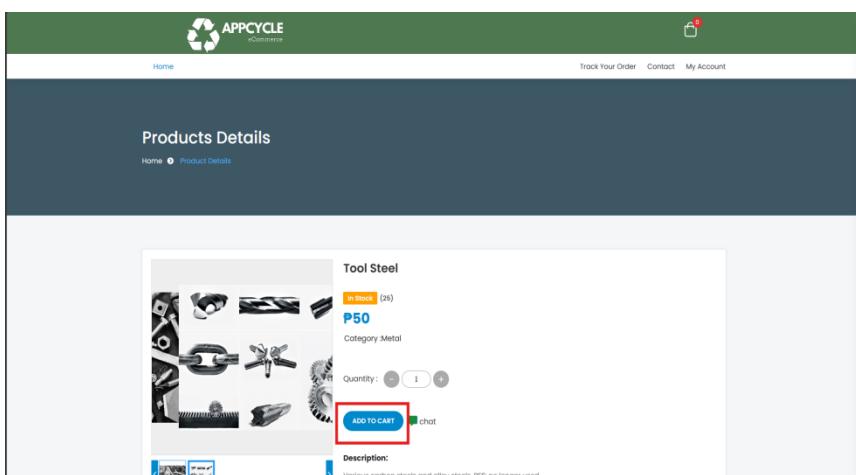
- Products are displayed on the home page. Clicking on a product will redirect you to the product detail page.

### 2.2.3 Chat Product Seller



- The product details page has a chat icon beside the add-to-cart button.  
Click on the "Chat" button, and it will pop up a message container.
- You can send a message to the seller of the product by clicking the "Send" button to submit the message.

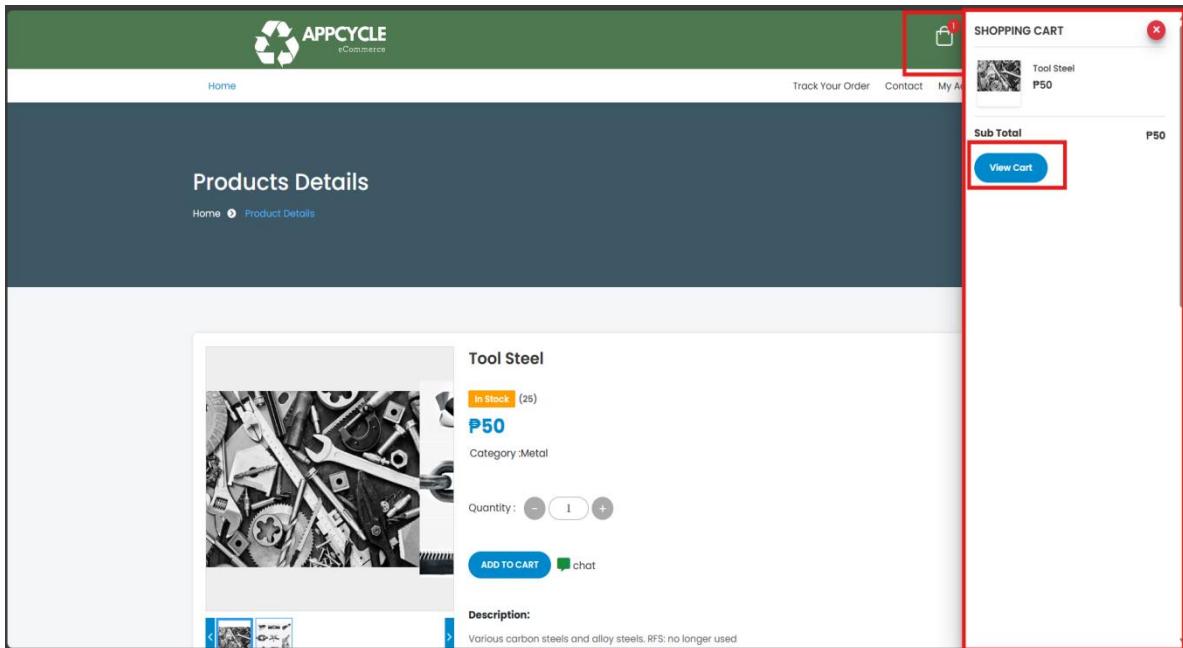
### 2.2.4 Add To Cart



1. You can add the product to your cart by clicking the *Add to Cart* button in the product details.

Note: After clicking the add to cart button, your shopping cart will automatically be shown.

### 2.2.5 Cart Details



1. To view your cart details, click on the cart icon in the upper right corner of the navbar, and it will show your shopping cart
2. In your shopping cart, click the *View Cart* button to redirect you to the cart details page.

## 2.2.6 Check Out

The screenshot shows the 'Cart View' page of the APPCYCLE eCommerce website. At the top, there's a green header bar with the APPCYCLE logo and a shopping cart icon showing a red notification. Below the header, a dark blue navigation bar contains links for 'Home', 'Track Your Order', 'Contact', and 'My Account'. The main content area has a light gray background and features a table for managing items in the cart. The table columns are 'Product Item', 'Product Details', 'Price', 'Quantity', and 'Total'. A 'Clear Cart' button is located at the top right of the table. The first item listed is 'Tool Steel Metal' with a price of ₱50, quantity 1, and total ₱50. There are minus and plus buttons for adjusting the quantity, and a 'remove' button. To the right of the table is a 'Total Cart' summary showing Subtotal ₱50, Delivery 'Go To Checkout', and a Total of ₱50. A large blue 'Checkout' button is highlighted with a red box. At the bottom of the page, there's a footer with copyright information, an email address (admin@gmail.com), and a phone number (09957220171).

1. On the cart details page, click the *Check Out* button, which will redirect you to the check-out page.

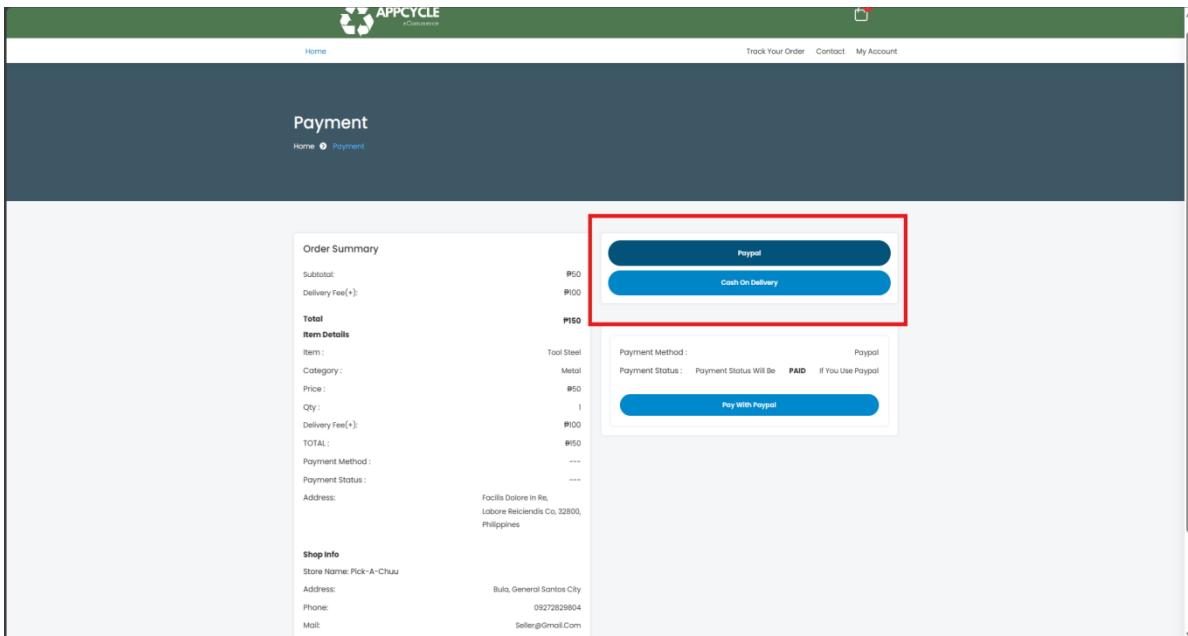
## 2.2.7 Payment Details

The screenshot shows the 'Order Details' page of the APPCYCLE eCommerce website. The top part displays 'Order Details' with a summary of the purchase. It includes sections for 'Item Details' (Tool Steel, ₱50, Qty 1, Subtotal ₱50) and 'Shop Info' (Rick-A-Chui, Bula, General Santos City, 09272829804, Selz@gmail.com). Below this, the 'Billing Details' section is shown, featuring a 'Select Address' dropdown and a 'add new address' button, which is highlighted with a red box. The 'Shipping Details' section shows a radio button for 'Normal' delivery (cost ₱50) and a summary of the total cost: Subtotal ₱50, Delivery Fee ₱50, and Total ₱100. A checkbox for accepting terms and conditions is checked, and a 'Place Order' button is visible. The entire page has a light gray background with a white form area.

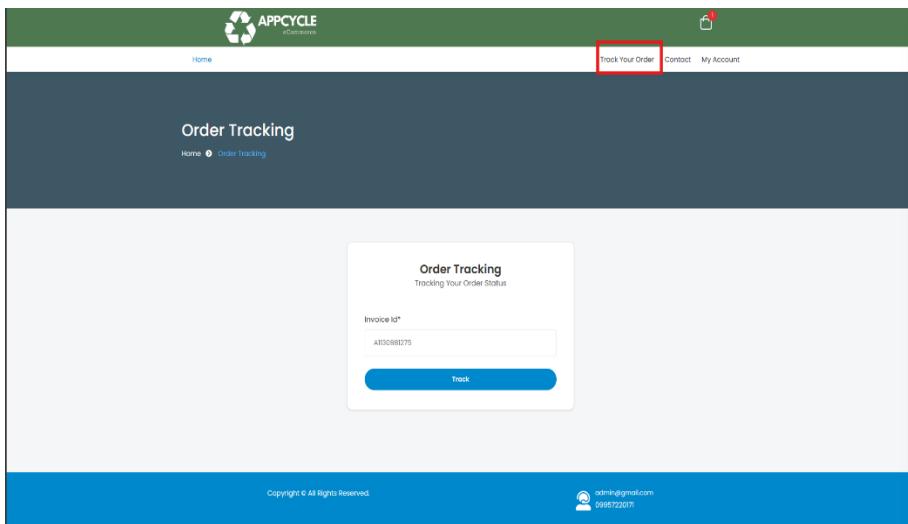
1. The billing details are on the checkout page. Click *Add New Address* to select or add an address.

Note: All required fields must be filled out to continue using the payment method.

### 2.2.8 Payment Method



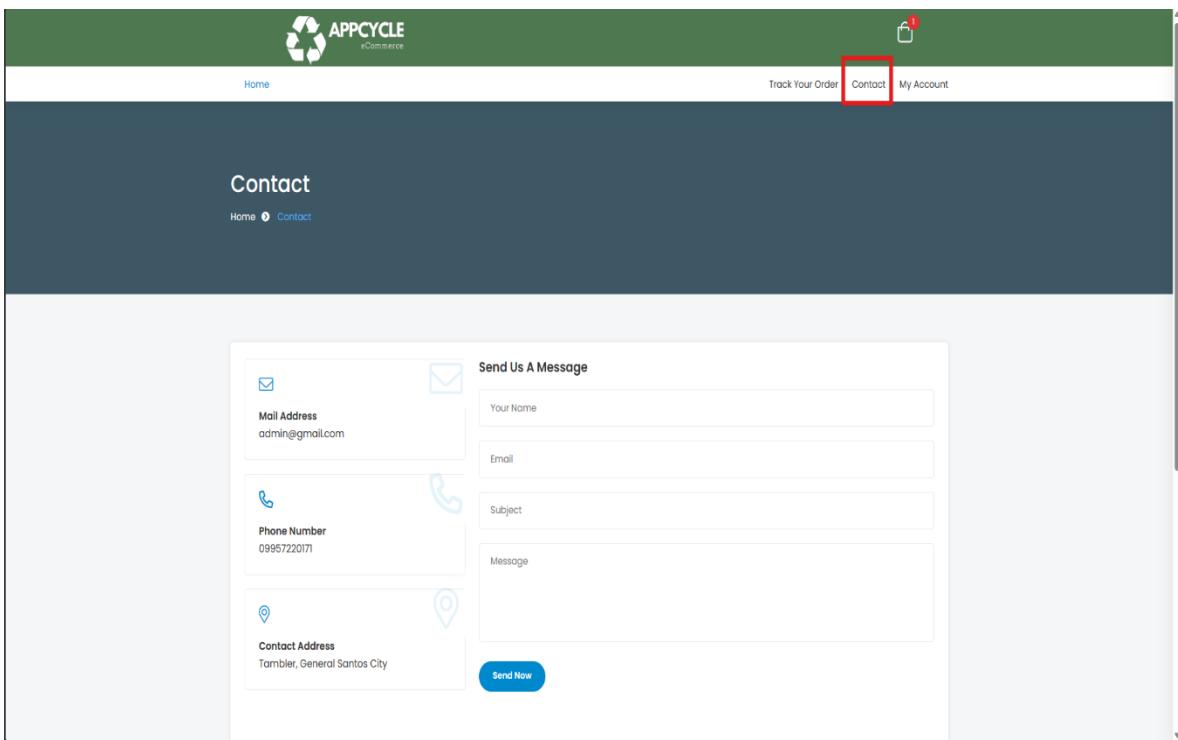
1. After completing the payment details, click the *Place Order* button to redirect you to the payment method page.
2. Click a payment method.
3. If you click PayPal as a payment method, complete the payment procedure, and it will redirect you to the success payment page when you are finished.



## 2.2.9 Track Your Order

1. On the home page, click *Track Your Order* in the navigation bar menu, and it will redirect you to the tracking page.
2. Put the invoice ID of your order item, then click *Track* to submit, and it will display the status of your order.

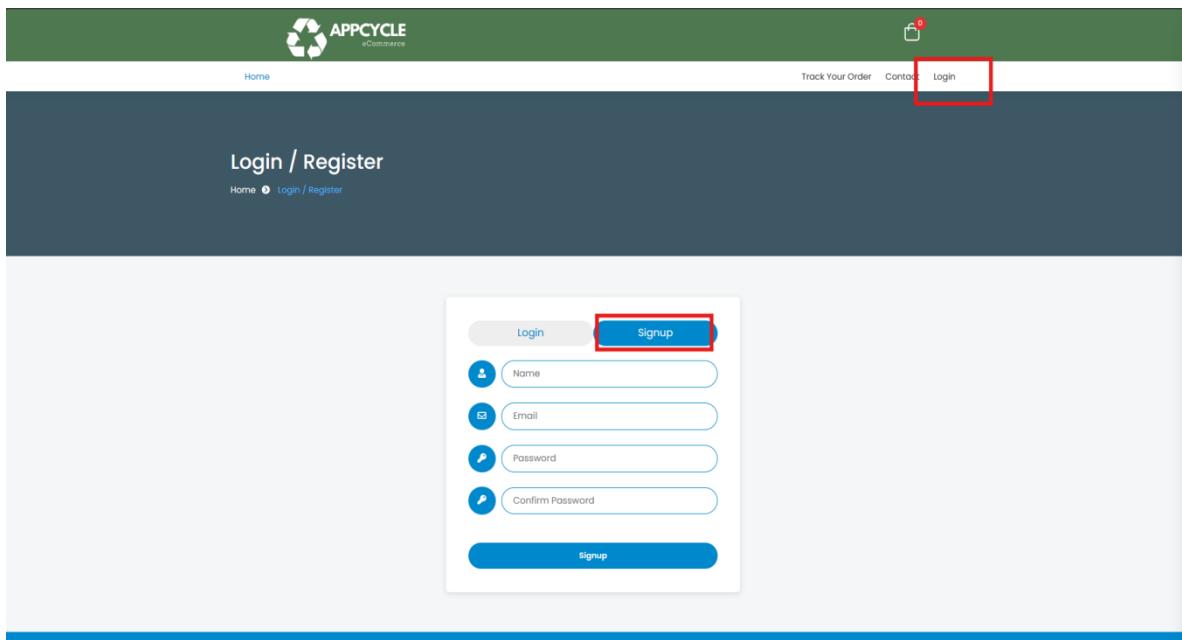
## 2.2.10 Contact



1. On the home page, click *Contact* in the navigation bar menu, which will redirect you to the contact page.
2. On the contact page, fill out the form and click *Send Now* to send the message.

Note: This message will be sent via email.

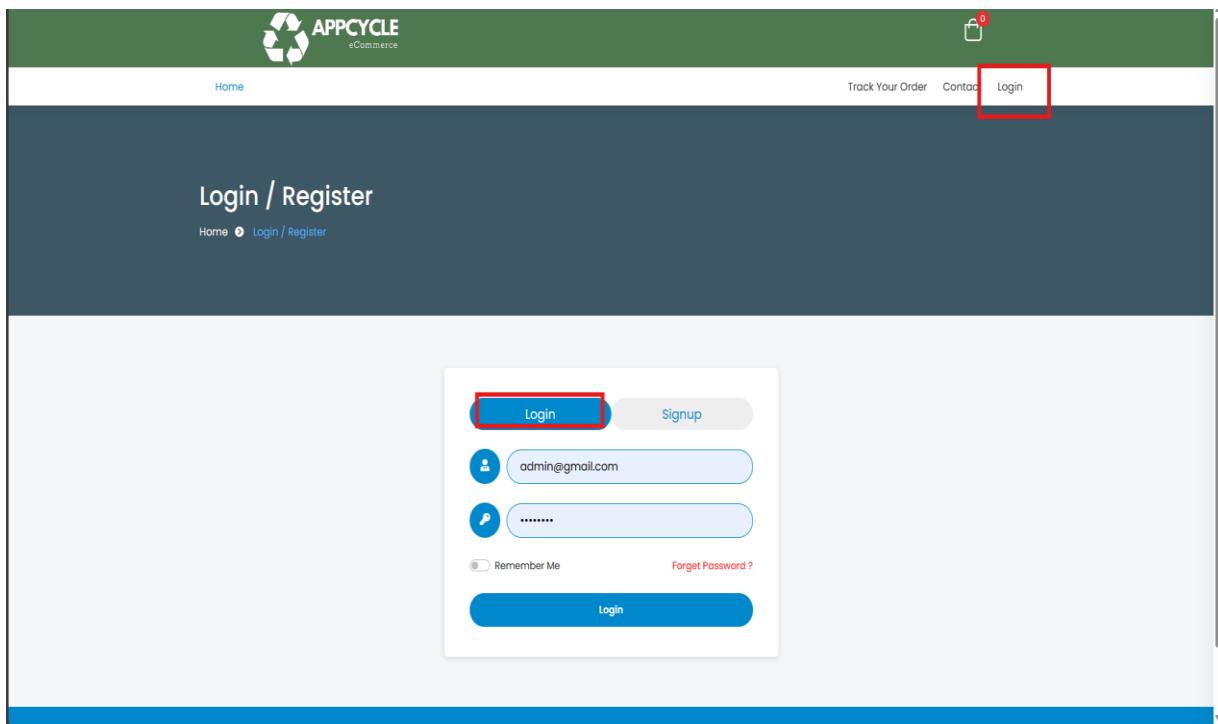
### 2.2.11 Signup



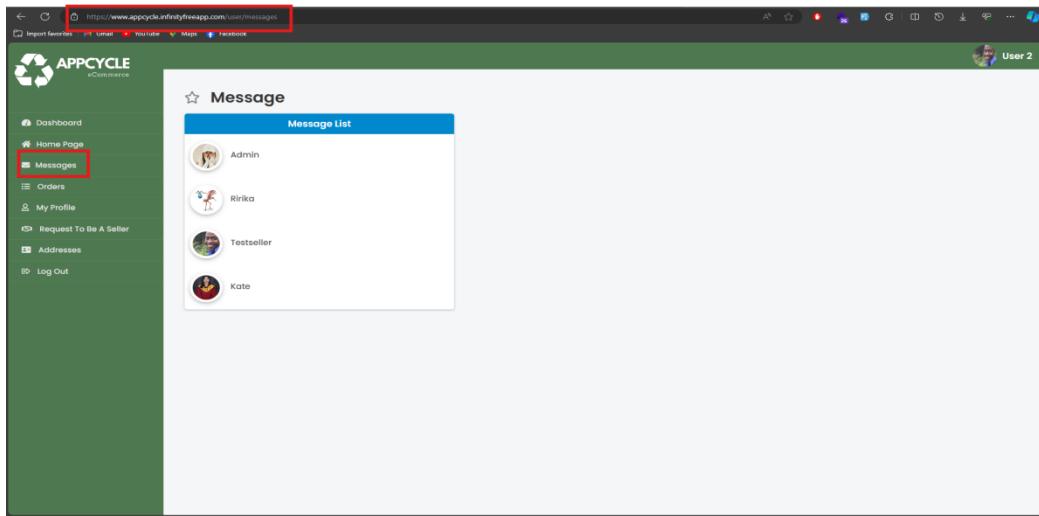
1. On the home page, click *Login* in the navigation bar menu, which will redirect you to the login page.
2. On the login page, select the *Signup* option enter the required details, such as the name, email, and password, and confirm the password, which is a repeat entry to confirm the password used.

3. Click on the *Signup* button after all the required details have been entered to successfully register an account into the system, leading to the account's dashboard.

### 2.2.12 Login



1. On the home page, click *Login* in the navigation bar, redirecting you to the login page.
2. On the login page, select the *Login* option and enter the account details to be logged in.
3. After entering all the details, click the *Login* button to access the account's dashboard. If there is a mismatch between the entered details and the details of the account being accessed, a prompt will appear informing you that the credentials do not match.



### 2.2.13 Message User

1. In the customer dashboard, select the *Message* option in the sidebar to the page's left.
2. Select a user from the message list.
3. Enter the message to be sent to the selected user, which is found at the bottom of the loaded message logs.
4. Submit the message by clicking on the *Submit* button to the right of the message bar or pressing the enter keypad.

ID	Invoice ID	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
17	32279235210	user 2	30-Apr-2024	I	₱400	Pending	Pending	COD	<button>view</button>
16	40995197866	user 2	22-Apr-2024	I	₱250	out for delivery	Complete	paypal	<button>view</button>
15	10878404477	user 2	22-Apr-2024	I	₱2550	Canceled	Pending	COD	<button>view</button>
10	73866083301	user 2	18-Apr-2024	I	₱150	processed	Complete	paypal	<button>view</button>
9	26194566125	user 2	16-Apr-2024	I	₱223	Pending	Complete	paypal	<button>view</button>
8	45701430470	user 2	11-Apr-2024	I	₱856	out for delivery	Complete	COD	<button>view</button>
7	40385232205	user 2	05-Apr-2024	I	₱709	delivered	Complete	paypal	<button>view</button>

## 2.2.14 Orders

ID	Invoice ID	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
17	32279235210	user 2	30-Apr-2024	I	₱400	Pending	Pending	COD	<button>view</button>
16	40995197866	user 2	22-Apr-2024	I	₱250	out for delivery	Complete	paypal	<button>view</button>
15	10878404477	user 2	22-Apr-2024	I	₱2550	Canceled	Pending	COD	<button>view</button>
10	73866083301	user 2	18-Apr-2024	I	₱150	processed	Complete	paypal	<button>view</button>
9	26194566125	user 2	16-Apr-2024	I	₱223	Pending	Complete	paypal	<button>view</button>
8	45701430470	user 2	11-Apr-2024	I	₱856	out for delivery	Complete	COD	<button>view</button>
7	40385232205	user 2	05-Apr-2024	I	₱709	delivered	Complete	paypal	<button>view</button>

### 2.2.14.1 View Order

- In the customer dashboard, select the *Orders* option, which is colored red. Alternatively, select the *Orders* option in the sidebar to the page's left.

- To view a specific order, click on the *View* button associated with the order to load a detailed view of the order.

#### 2.2.14.2 Print Order

The screenshot shows the APPCYCLE eCommerce platform's Order Details page. At the top right, it says "User 2". The main content area is titled "Order Details" with a subtitle "Order id: #32279235210". It contains two sections: "Billing Information" and "Shipping Information". Under "Billing Information", the details are: Name: Medge Kim, Email: joko@mailinator.com, Phone: +1 (820) 847-8104, and address: Explicabo Anim sint, Sit sint aliquid si, 62495 Philippines. Under "Shipping Information", the details are: Name: Medge Kim, Email: joko@mailinator.com, Phone: +1 (820) 847-8104, and address: Explicabo Anim sint, Sit sint aliquid si, 62495 Philippines. To the right, there is a summary table:

Product	Seller	Amount	Quantity	Total
Circuit Boards Category: Electronics	Waste Me Not	P300	1	P300

Below the table, the breakdown is: Sub Amount: P 300, Shipping Fee (+): P100, Total Amount: P400. In the bottom right corner of the main content area, there is a yellow "Print" button with a red rectangular box around it.

- Following the steps in 2.2.14.1, print the order by selecting the *Print* option, which will open a prompt in the settings where the order should be printed.
- Once set, print the order by selecting the *Print* option. If not, select the *Cancel* option.

### 2.2.14.3 Search Order

**Billing Information**

**Shipping Information**

**Order Details**

Product	Seller	Amount	Quantity	Total
Circuit Boards Category : Electronics	Waste Me Not	₱300	1	₱300

Sub Amount: ₱300  
Shipping Fee (+): ₱100  
Total Amount: ₱400

**User 2**

**Order Id: #32279235210**

**Order Status:** Pending

**Payment Method:** COD

**Payment Status:** 0

**Transaction Id:** U8YKGE607

**print**

- Search for the specified order by entering its invoice ID in the search bar above the orders table and waiting for the results to load.

### 2.2.14.4 Change Orders View

**Products**

ID	Invoice ID	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
17	32279235210	user 2	30-Apr-2024	1	₱400	Pending	Pending	COD	<button>view</button>
16	40995197866	user 2	22-Apr-2024	1	₱250	out for delivery	Complete	paypal	<button>view</button>
15	10878404477	user 2	22-Apr-2024	1	₱2550	Canceled	Pending	COD	<button>view</button>
10	73866083301	user 2	18-Apr-2024	1	₱150	processed	Complete	paypal	<button>view</button>
9	26194566125	user 2	16-Apr-2024	1	₱223	Pending	Complete	paypal	<button>view</button>
8	45701430470	user 2	11-Apr-2024	1	₱1856	out for delivery	Complete	COD	<button>view</button>
7	40385232205	user 2	05-Apr-2024	1	₱709	delivered	Complete	paypal	<button>view</button>

Show: 10 entries

Search:

Showing 1 to 7 of 7 entries

Previous | Next

**User 2**

1. Open the dropdown option below to change the order view based on the number of entries. Show and select the requested number.  
The options are 10, 25, 50, and 100 orders per page

#### 2.2.14.5 Browse Orders

ID	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
17	32279235210	user 2	30-Apr-2024	1	P400	<span style="background-color: yellow; color: black;">pending</span>	<span style="background-color: yellow; color: black;">Pending</span>	COD	<button style="background-color: #007bff; color: white; border: none; padding: 2px 5px;">View</button>
16	40995197866	user 2	22-Apr-2024	1	P250	<span style="background-color: blue; color: white;">out for delivery</span>	<span style="background-color: green; color: black;">Complete</span>	paypal	<button style="background-color: #007bff; color: white; border: none; padding: 2px 5px;">View</button>
15	10878404477	user 2	22-Apr-2024	1	P2550	<span style="background-color: red; color: white;">Canceled</span>	<span style="background-color: yellow; color: black;">Pending</span>	COD	<button style="background-color: #007bff; color: white; border: none; padding: 2px 5px;">View</button>
10	73866083301	user 2	18-Apr-2024	1	P150	<span style="background-color: green; color: black;">processed</span>	<span style="background-color: green; color: black;">Complete</span>	paypal	<button style="background-color: #007bff; color: white; border: none; padding: 2px 5px;">View</button>
9	26194566125	user 2	16-Apr-2024	1	P223	<span style="background-color: yellow; color: black;">pending</span>	<span style="background-color: green; color: black;">Complete</span>	paypal	<button style="background-color: #007bff; color: white; border: none; padding: 2px 5px;">View</button>
8	45701430470	user 2	11-Apr-2024	1	P1856	<span style="background-color: blue; color: white;">out for delivery</span>	<span style="background-color: green; color: black;">Complete</span>	COD	<button style="background-color: #007bff; color: white; border: none; padding: 2px 5px;">View</button>
7	40385232205	user 2	05-Apr-2024	1	P709	<span style="background-color: green; color: black;">delivered</span>	<span style="background-color: green; color: black;">Complete</span>	paypal	<button style="background-color: #007bff; color: white; border: none; padding: 2px 5px;">View</button>

Showing 1 to 7 of 7 entries

Previous  Next

1. To move to the next page of orders, if any, click the *Next* button below the orders table.
2. To move to the previous page of orders, if any, click the *Previous* button below the orders table.
3. To move to a specific orders page, if any, click the page number button below the orders table.

Id	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
									View
17	32279235210	user 2	30-Apr-2024	1	P400	Pending	Pending	COD	<button>View</button>
16	40995197866	user 2	22-Apr-2024	1	P250	Out for delivery	Complete	paypal	<button>View</button>
15	10878404477	user 2	22-Apr-2024	1	P2550	Cancelled	Pending	COD	<button>View</button>
10	73866083301	user 2	18-Apr-2024	1	P150	Processed	Complete	paypal	<button>View</button>
9	26194566125	user 2	16-Apr-2024	1	P223	Pending	Complete	paypal	<button>View</button>
8	45701430470	user 2	11-Apr-2024	1	P1856	Out for delivery	Complete	COD	<button>View</button>
7	40385232205	user 2	05-Apr-2024	1	P709	Delivered	Complete	paypal	<button>View</button>

Showing 1 to 7 of 7 entries

Previous 1 Next

#### 2.2.14.6 View Printed Table

1. To view a printed version of the table, click the *Print* button on the top left of the table above the Change Orders View option.

#### 2.2.15 Profile

##### 2.2.15.1 View Customer Profile

**Profile**

**Basic Information**


  
Choose File  No file chosen

User:	user 2
E-mail:	user@gmail.com

**Update**

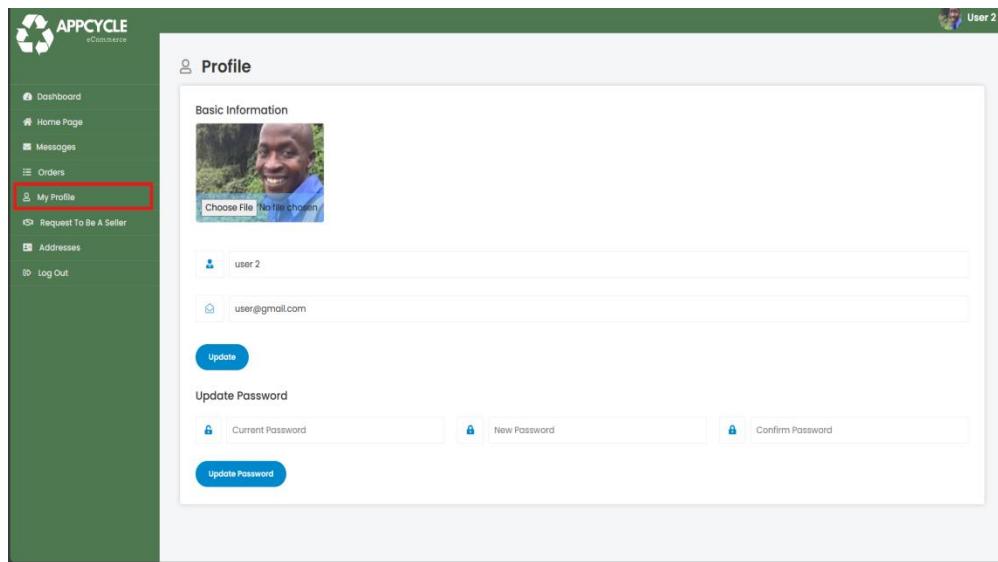
**Update Password**

Current Password	New Password	Confirm Password
------------------	--------------	------------------

**Update Password**

1. In the customer dashboard, select the *orange Profile option*.

Alternatively, select the *Profile*” option in the sidebar to the page's left.



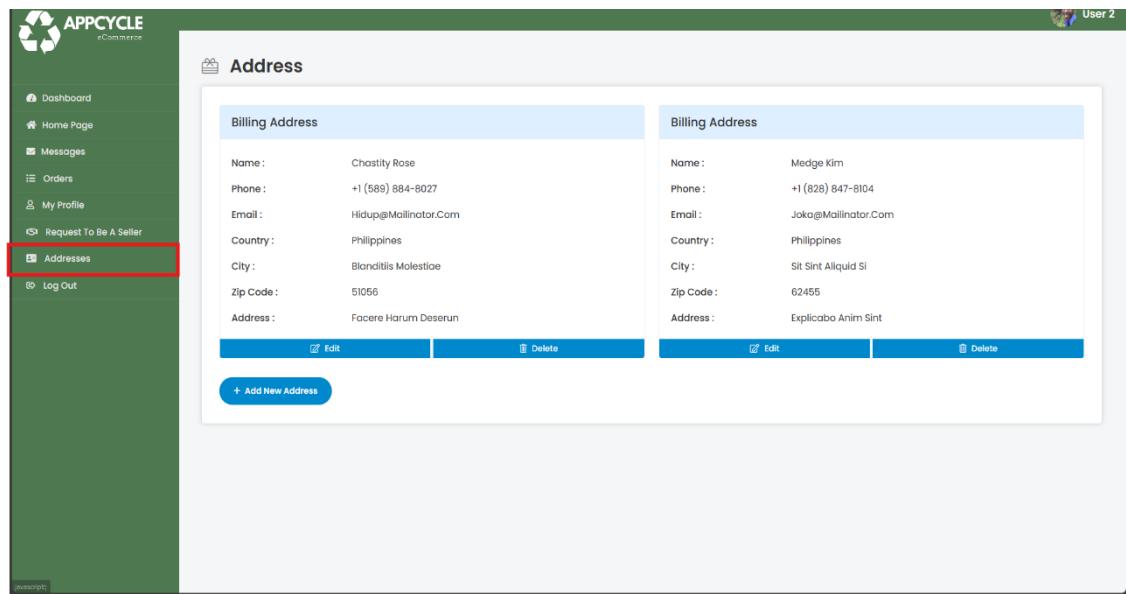
### 2.2.15.2 Update Customer Profile

1. Following the step in 2.2.15.1, fill in the required entries, such as the profile image, profile name, email, and password. In the case of the password, the current password, new password, and confirmation of the new password are required.
2. Click on the *Update* button below the form to update the profile to the recently updated details. In the case of the password, an *Update Password* button is provided to update the account password.

### 2.2.16 Request To Be A Seller

1. In the customer dashboard, select the *Request To Be A Seller* option in the sidebar to the page's left.
2. Complete the required details, such as the shop image, shop name, shop email, shop phone number, shop address, and shop description.
3. Click on the *Submit* button below the form to request that the admin be granted seller privileges in the system, allowing the customer to sell scrap materials as their shop.

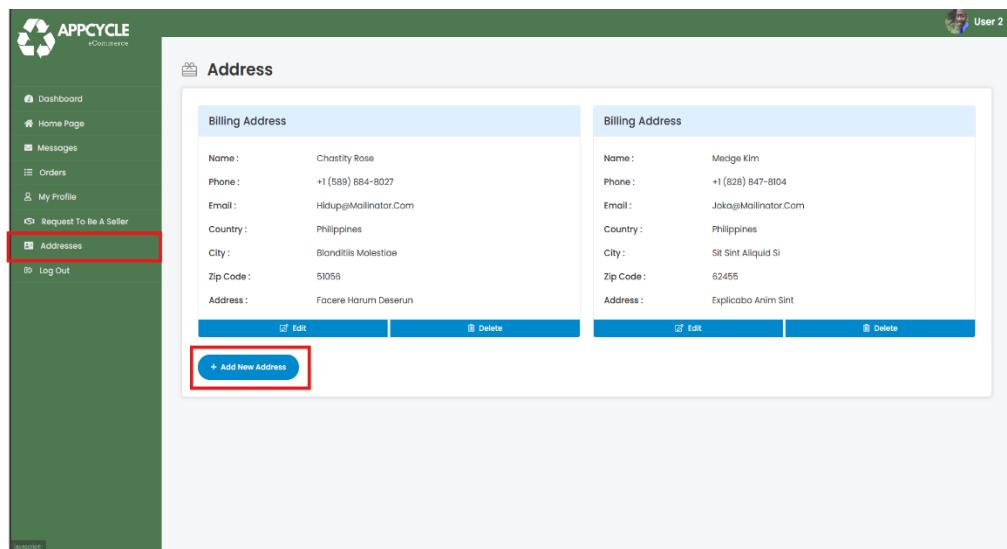
## 2.2.17 Addresses



### 2.2.17.1 View Addresses

1. In the customer dashboard, select the *purple Address option*.

Alternatively, select the *Addresses* option in the sidebar to the left of the page.



### 2.2.17.2 Add Address

- Following the step in 2.2.17.1, click on the *Add New Address* button to open a form for adding a new address for the customer to use in the system.
- Fill out the required entries such as the name, phone number, country, city, ZIP code, and the address. The email may be filled up, but it is an optional entry to fill up.
- Click on the *Create* button below the form to create a new address based on the submitted address details.

### 2.2.17.3 Edit Address

Billing Address		Billing Address	
Name :	Chrostity Rose	Name :	Medge Kim
Phone :	+1 (589) 884-8027	Phone :	+1 (828) 847-8104
Email :	Hidup@Mailinator.Com	Email :	Joko@Mailinator.Com
Country :	Philippines	Country :	Philippines
City :	Blondititis Molestiae	City :	Sit Sint Aliquid Si
Zip Code :	51056	Zip Code :	62455
Address :	Facere Horum Deserunt	Address :	Explicabo Anim Sint
<a href="#">Edit</a>		<a href="#">Edit</a>	<a href="#">Edit</a>
<a href="#">Delete</a>			
<a href="#">+ Add New Address</a>			

- Following the step in 2.2.17.1, click on the *Edit* button associated with the address to have its details edited.

2. Fill out the required entries such as the name, phone number, country, city, ZIP code, and the address. The email may be updated, but it is an optional entry to update.
3. Click on the *Update* button to update the address to the recently updated details.

The screenshot shows the APPCYCLE e-commerce platform's user interface. On the left, there is a sidebar with various navigation options: Dashboard, Home Page, Messages, Orders, My Profile, Request To Be A Seller, Addresses (which is highlighted with a red box), and Log Out. The main content area is titled "Address" and contains two tables under the heading "Billing Address". The first table has the following data:

Name :	Chastity Rose
Phone :	+1 (589) 884-8027
Email :	Hidup@Mailinator.Com
Country :	Philippines
City :	Blandititis Molestiae
Zip Code :	51056
Address :	Facere Harum Deserunt

Below this table are two buttons: "Edit" and "Delete" (which is highlighted with a red box). At the bottom of the table is a blue button labeled "+ Add New Address". The second table in the background has similar columns and data, with its own "Edit" and "Delete" buttons.

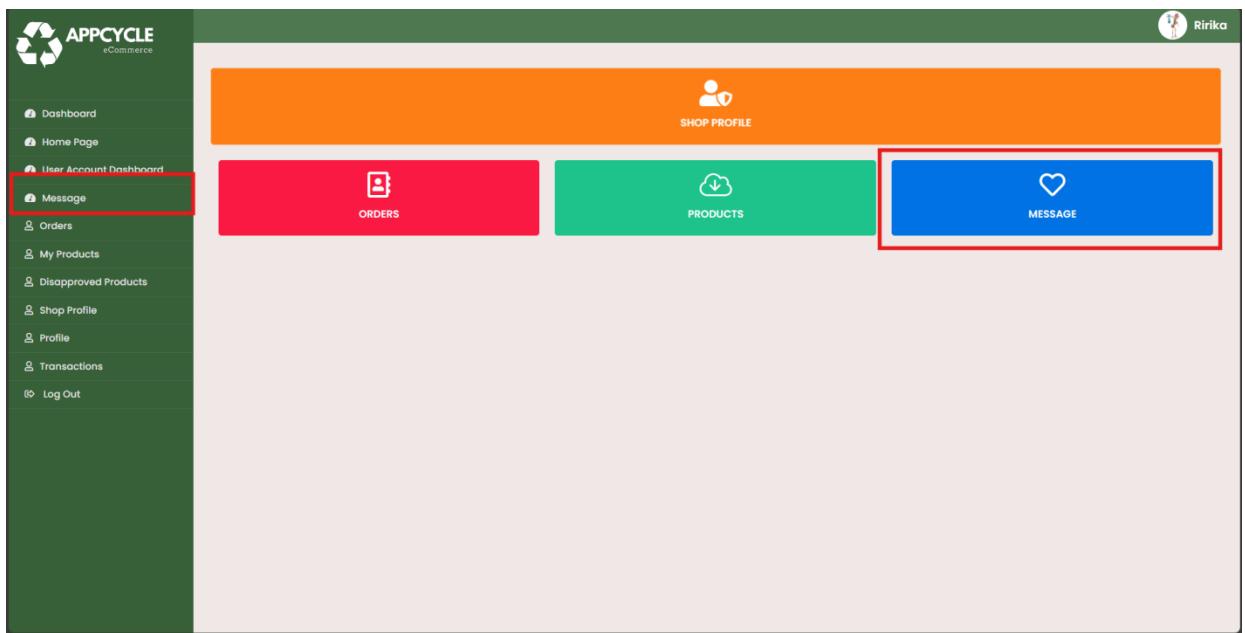
#### 2.2.17.4 Delete Address

1. Following the step in 2.2.17.1, click on the *Delete* button associated with the address to have its entry deleted.
2. A prompt will pop up asking to confirm the deletion as the action is irreversible. Select the “Yes, delete it!” button to delete the address and “Cancel” to cancel the deletion.

## 2.3 Seller Module

### 2.3.1 Prerequisites

In order to access the seller dashboard, the user must first request to be a seller in the system by selecting the Request to be a Seller option in the customer dashboard and filling out the required details before submitting the request. Once the request is successful, the user must log in to the system using the user's email and password, which will lead to the seller dashboard upon loading.



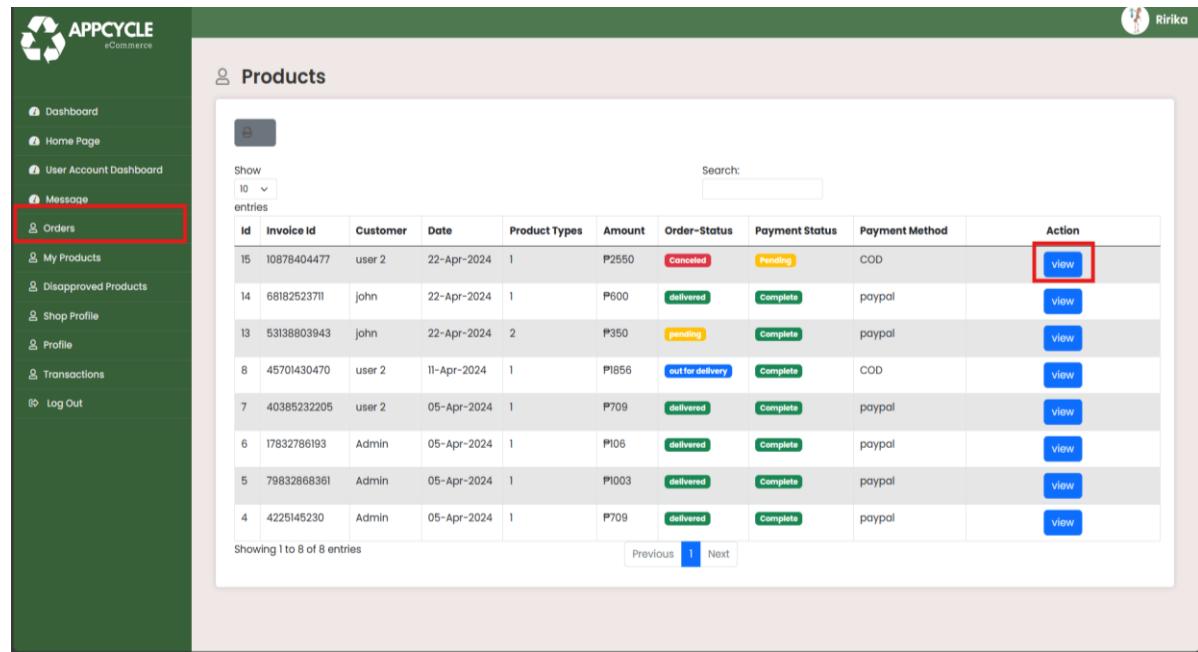
### 2.3.2 Message User

1. In the seller dashboard, select the *blue Message option*. Alternatively, select the *Message* option in the sidebar to the page's left.
2. Select a user from the message list.

3. Enter the message to be sent to the selected user at the bottom of the loaded message logs.
  
4. Submit the message by clicking on the submit button to the right of the message bar or pressing the enter keypad.

### 2.3.3 Orders

#### 2.3.3.1 View Order



The screenshot shows the APPCYCLE eCommerce seller dashboard. On the left, there is a sidebar with the following menu items:

- Dashboard
- Home Page
- User Account Dashboard
- Message
- Orders** (highlighted with a red box)
- My Products
- Disapproved Products
- Shop Profile
- Profile
- Transactions
- Log Out

The main content area is titled "Products" and displays a table of orders. The table has the following columns:

ID	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
15	I0878404477	user 2	22-Apr-2024	1	₹2550	Canceled	Pending	COD	<b>view</b>
14	68182523711	john	22-Apr-2024	1	₹600	delivered	Complete	paypal	<b>view</b>
13	53138803943	john	22-Apr-2024	2	₹350	pending	Complete	paypal	<b>view</b>
8	45701430470	user 2	11-Apr-2024	1	₹1856	out for delivery	Complete	COD	<b>view</b>
7	40385232205	user 2	05-Apr-2024	1	₹709	delivered	Complete	paypal	<b>view</b>
6	I7832786193	Admin	05-Apr-2024	1	₹106	delivered	Complete	paypal	<b>view</b>
5	79832868361	Admin	05-Apr-2024	1	₹1003	delivered	Complete	paypal	<b>view</b>
4	4225145230	Admin	05-Apr-2024	1	₹709	delivered	Complete	paypal	<b>view</b>

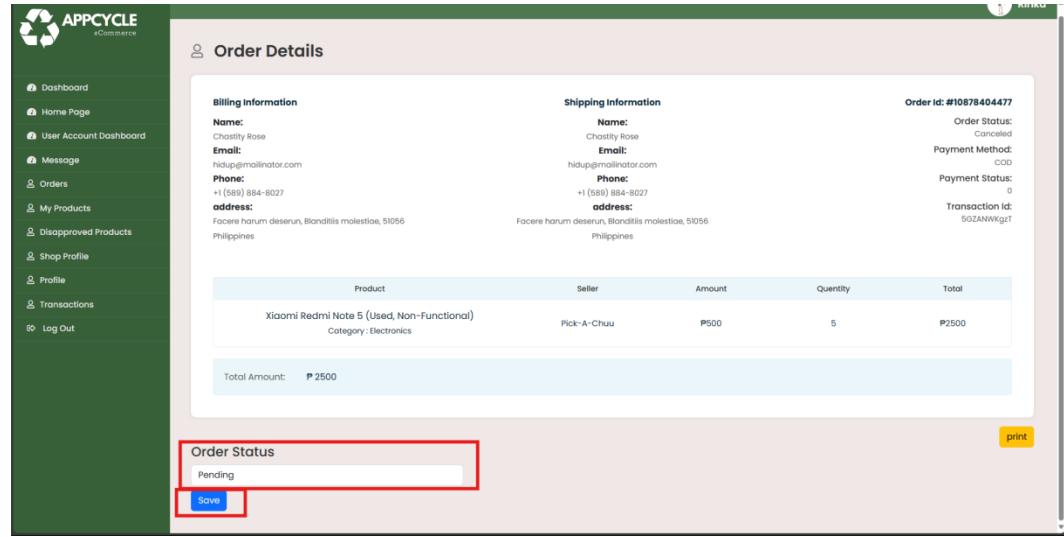
At the bottom of the table, it says "Showing 1 to 8 of 8 entries". There are "Previous" and "Next" navigation buttons.

1. On the seller dashboard, select the *Orders* option, which is *red*.

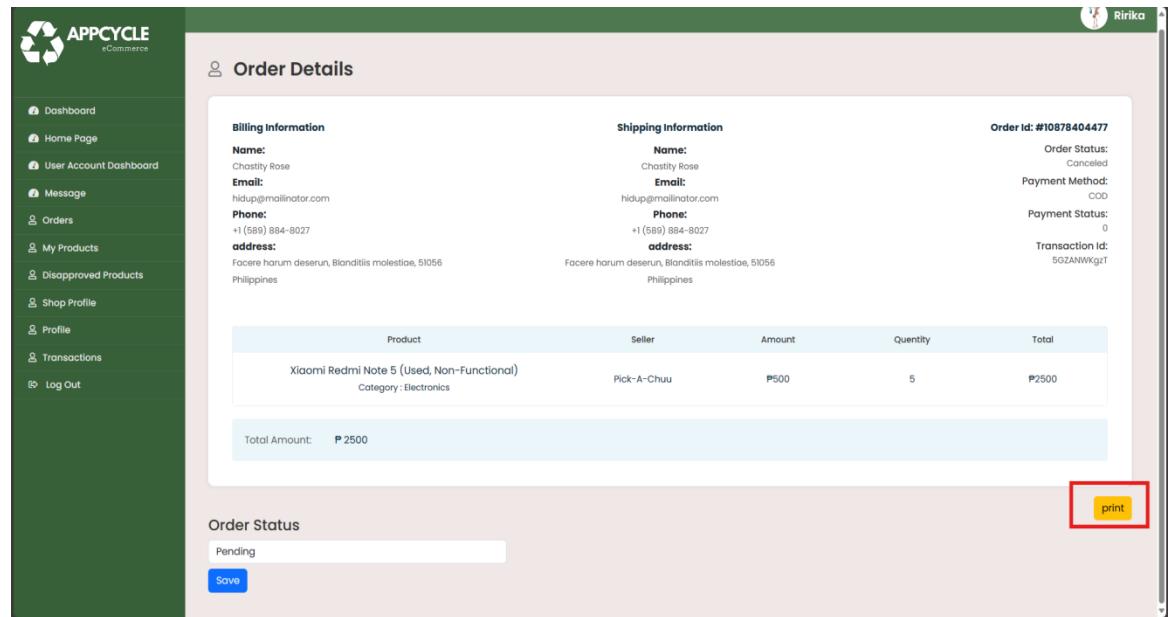
Alternatively, select the Orders option in the sidebar to the page's left.

2. To view a specific order, click on the *View* button associated with the order to load a detailed view of the order.

### 2.3.3.2 Change Order Status



- Following the steps in 2.3.3.1, change the order status by clicking the dropdown option and selecting the status the order is currently in. The current options are pending, processed, and ready to ship.



### 2.3.3.3 Print Order

- Following the steps in 2.3.3.1, print the order by selecting the Print option, which will open a prompt in the settings where the order should be printed.
- Once set, print the order by selecting the *Print* option. If not, select the *Cancel* option.

#### 2.3.3.4 Search Order

The screenshot shows the APPCYCLE eCommerce platform's user interface. On the left is a sidebar with navigation links: Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main area is titled 'Products' and contains a table of order entries. The table has columns: Id, Invoice Id, Customer, Date, Product Types, Amount, Order Status, Payment Status, Payment Method, and Action. The 'Search' input field above the table is highlighted with a red box. The table data is as follows:

ID	Invoice ID	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
15	10878404477	user 2	22-Apr-2024	1	₱2550	Canceled	Pending	COD	<button>view</button>
14	681825237II	john	22-Apr-2024	1	₱600	delivered	Complete	paypal	<button>view</button>
13	53138803943	john	22-Apr-2024	2	₱350	pending	Complete	paypal	<button>view</button>
8	45701430470	user 2	11-Apr-2024	1	₱1856	out for delivery	Complete	COD	<button>view</button>
7	40385232205	user 2	05-Apr-2024	1	₱709	delivered	Complete	paypal	<button>view</button>
6	17832786193	Admin	05-Apr-2024	1	₱106	delivered	Complete	paypal	<button>view</button>
5	7983286836I	Admin	05-Apr-2024	1	₱1003	delivered	Complete	paypal	<button>view</button>
4	4225145230	Admin	05-Apr-2024	1	₱709	delivered	Complete	paypal	<button>view</button>

Showing 1 to 8 of 8 entries

- Search the specified order by entering the invoice ID of the order in the search bar above the orders table and wait for the result to load.

Products									
<input type="button" value="Show"/> <input type="text" value="Search:"/> <input type="button" value="Reset"/>									
<b>Show</b> <input type="button" value="10"/> <input type="button" value="25"/> <input type="button" value="50"/> <input type="button" value="100"/>									
<b>ID</b>	<b>Invoice Id</b>	<b>Customer</b>	<b>Date</b>	<b>Product Types</b>	<b>Amount</b>	<b>Order-Status</b>	<b>Payment Status</b>	<b>Payment Method</b>	<b>Action</b>
15	10878404477	user 2	22-Apr-2024	1	P2550	Canceled	Pending	COD	<input type="button" value="View"/>
14	68182523711	john	22-Apr-2024	1	P600	delivered	Complete	paypal	<input type="button" value="View"/>
13	53138803943	john	22-Apr-2024	2	P350	pending	Complete	paypal	<input type="button" value="View"/>
8	45701430470	user 2	11-Apr-2024	1	P1856	out for delivery	Complete	COD	<input type="button" value="View"/>
7	40385232205	user 2	05-Apr-2024	1	P709	delivered	Complete	paypal	<input type="button" value="View"/>
6	17832786193	Admin	05-Apr-2024	1	P106	delivered	Complete	paypal	<input type="button" value="View"/>
5	79832868361	Admin	05-Apr-2024	1	P1003	delivered	Complete	paypal	<input type="button" value="View"/>
4	4225145230	Admin	05-Apr-2024	1	P709	delivered	Complete	paypal	<input type="button" value="View"/>

Showing 1 to 8 of 8 entries

### 2.3.3.5 Change Orders View

1. Open the dropdown option below to change the order view based on the number of entries. Show and select the requested number. The options are 10, 25, 50, and 100 orders per page.

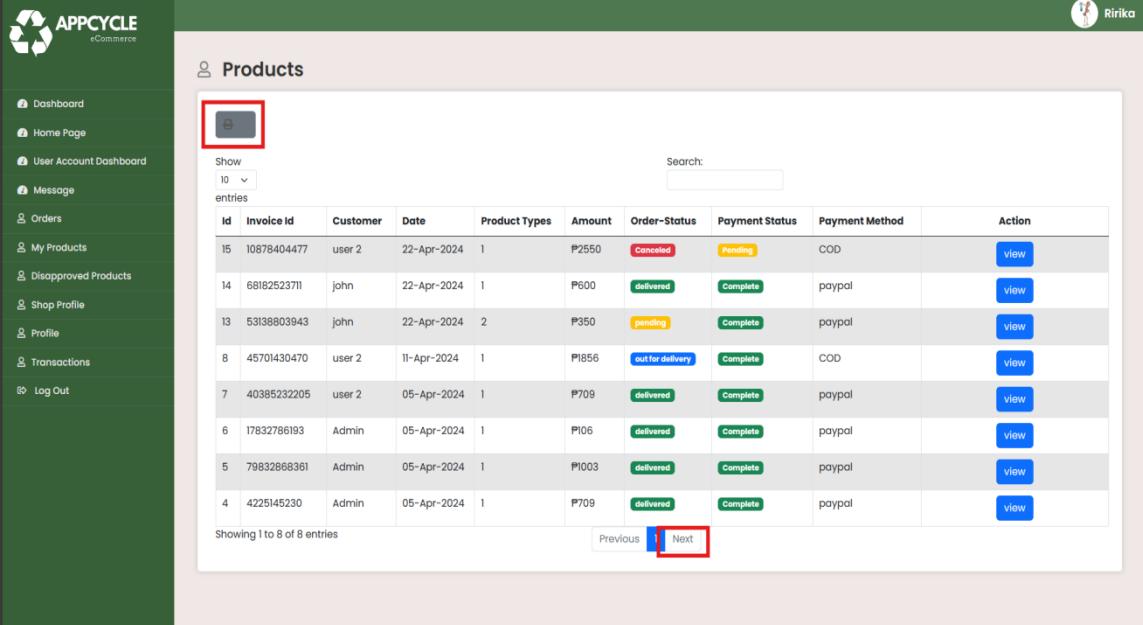
### 2.3.3.6 Browse Orders

Products									
<input type="button" value="Show"/> <input type="text" value="Search:"/> <input type="button" value="Reset"/>									
<b>Show</b> <input type="button" value="10"/> <input type="button" value="25"/> <input type="button" value="50"/> <input type="button" value="100"/>									
<b>ID</b>	<b>Invoice Id</b>	<b>Customer</b>	<b>Date</b>	<b>Product Types</b>	<b>Amount</b>	<b>Order-Status</b>	<b>Payment Status</b>	<b>Payment Method</b>	<b>Action</b>
15	10878404477	user 2	22-Apr-2024	1	P2550	Canceled	Pending	COD	<input type="button" value="View"/>
14	68182523711	john	22-Apr-2024	1	P600	delivered	Complete	paypal	<input type="button" value="View"/>
13	53138803943	john	22-Apr-2024	2	P350	pending	Complete	paypal	<input type="button" value="View"/>
8	45701430470	user 2	11-Apr-2024	1	P1856	out for delivery	Complete	COD	<input type="button" value="View"/>
7	40385232205	user 2	05-Apr-2024	1	P709	delivered	Complete	paypal	<input type="button" value="View"/>
6	17832786193	Admin	05-Apr-2024	1	P106	delivered	Complete	paypal	<input type="button" value="View"/>
5	79832868361	Admin	05-Apr-2024	1	P1003	delivered	Complete	paypal	<input type="button" value="View"/>
4	4225145230	Admin	05-Apr-2024	1	P709	delivered	Complete	paypal	<input type="button" value="View"/>

Showing 1 to 8 of 8 entries

1. To move to the next page of orders, if any, click on the *Next* button located below the orders table.
  
2. To move to the previous page of orders, if any, click the *Previous* button below the orders table.
  
3. To move to a specific orders page, if any, click the page number button below the orders table.

#### 2.3.3.7 View Printed Table



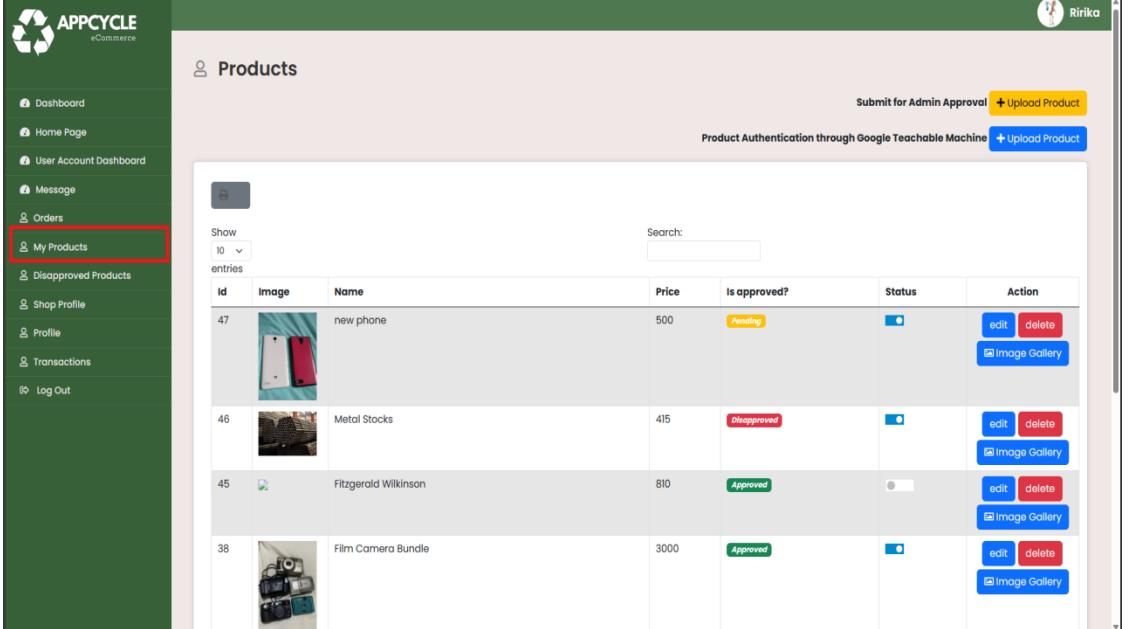
The screenshot shows a user interface for managing orders. On the left is a sidebar with links like Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main area is titled 'Products' and contains a table of order data. The table has columns for Id, Invoice Id, Customer, Date, Product Types, Amount, Order Status, Payment Status, Payment Method, and Action. The first few rows of data are:

ID	Invoice Id	Customer	Date	Product Types	Amount	Order Status	Payment Status	Payment Method	Action
15	I0878404477	user 2	22-Apr-2024	1	₱2550	Cancelled	Pending	COD	<button>view</button>
14	6818252371	john	22-Apr-2024	1	₱600	delivered	Complete	paypal	<button>view</button>
13	53138803943	john	22-Apr-2024	2	₱350	pending	Complete	paypal	<button>view</button>
8	45701430470	user 2	11-Apr-2024	1	₱1856	out for delivery	Complete	COD	<button>view</button>
7	40385232205	user 2	05-Apr-2024	1	₱709	delivered	Complete	paypal	<button>view</button>
6	I7832786193	Admin	05-Apr-2024	1	₱106	delivered	Complete	paypal	<button>view</button>
5	79832868361	Admin	05-Apr-2024	1	₱1003	delivered	Complete	paypal	<button>view</button>
4	4225145230	Admin	05-Apr-2024	1	₱709	delivered	Complete	paypal	<button>view</button>

At the bottom of the table, it says 'Showing 1 to 8 of 8 entries' and has 'Previous' and 'Next' buttons. The 'Next' button is highlighted with a red box.

1. To view a printed version of the table, click the *Print* button on the top left of the table above the Change Orders View option.

## 2.3.4 Products



The screenshot shows the APPCYCLE eCommerce seller dashboard. On the left, a sidebar menu lists various options: Dashboard, Home Page, User Account Dashboard, Message, Orders, **My Products** (which is highlighted with a red box), Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main content area is titled "Products". It features a search bar at the top right and two buttons: "Submit for Admin Approval" and "+ Upload Product". Below these are two smaller buttons: "Product Authentication through Google Teachable Machine" and "+ Upload Product". The central part of the screen is a table listing four products:

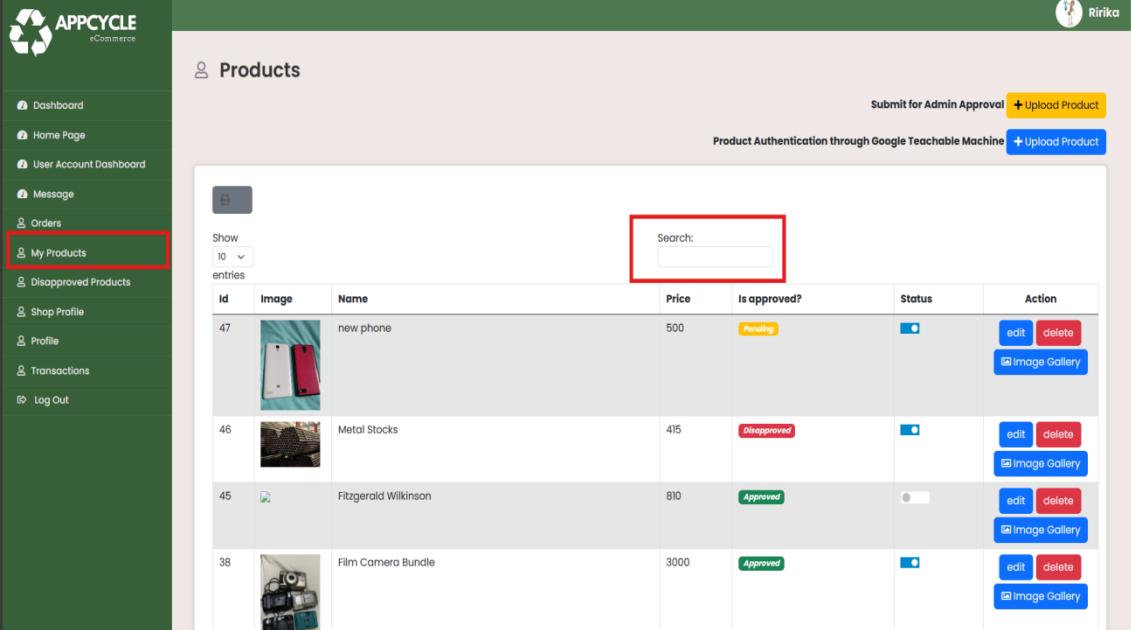
ID	Image	Name	Price	Is approved?	Status	Action
47		new phone	500	Pending	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
46		Metal Stocks	415	Disapproved	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
45		Fitzgerald Wilkinson	810	Approved	<input type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
38		Film Camera Bundle	3000	Approved	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>

### 2.3.4.1 View Products

1. On the seller dashboard, select the *Products* option colored green.

Alternatively, select the *My Products* option in the sidebar to the page's left.

### 2.3.4.2 Search Product



The screenshot shows the APPCYCLE eCommerce seller dashboard, similar to the previous one but with a red box highlighting the search input field in the top right corner of the main content area. The rest of the interface, including the sidebar menu and product table, is identical to the first screenshot.

- Search the specified product by entering the product name in the search bar above the products table and wait for the result to load.

ID	Image	Name	Price	Is approved?	Status	Action
47		new phone	500	Pending	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
46		Metal Stocks	415	Disapproved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
45		Fitzgerald Wilkinson	810	Approved	<input type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
38		Film Camera Bundle	3000	Approved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>

#### 2.3.4.3 Change Products View

- Change the products view based on the number of entries by opening the dropdown option below Show and select the requested number. Currently, the options are 10, 25, 50, and 100.

#### 2.3.4.4 Browse Products

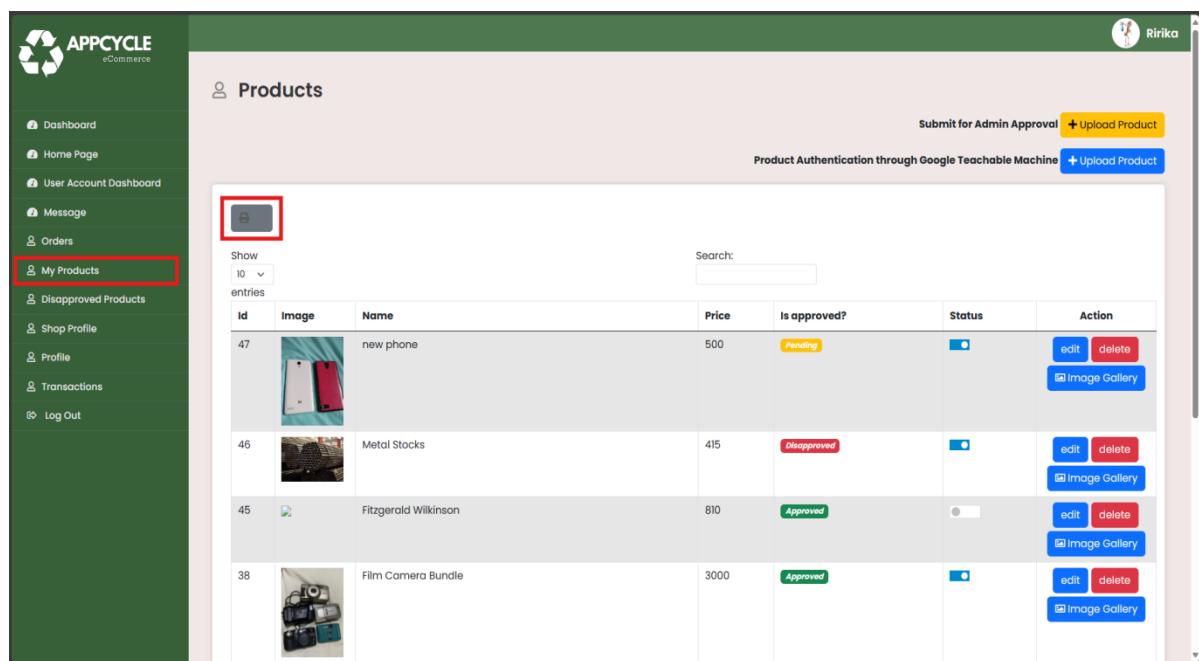
ID	Image	Name	Price	Is approved?	Status	Action
46		Metal Stocks	415	Disapproved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
45		Fitzgerald Wilkinson	810	Approved	<input type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
38		Film Camera Bundle	3000	Approved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
31		Nonfunctional Alcatel Phone	590	Approved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
30		Dakota Hinton	785	Approved	<input type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
26		Curtain Fabrics	100	Approved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
17		Preloved Shorts for Men	50	Approved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>

Showing 1 to 8 of 8 entries

Previous Next

1. To move to the next page of products, if any, click on the *Next* button located below the products table.
2. To move to the previous page of products, if any, click on the *Previous* button below the products table.
3. To move to a specific products page, if any, click on the page number button located below the products table.

#### 2.3.4.5 View Printed Table



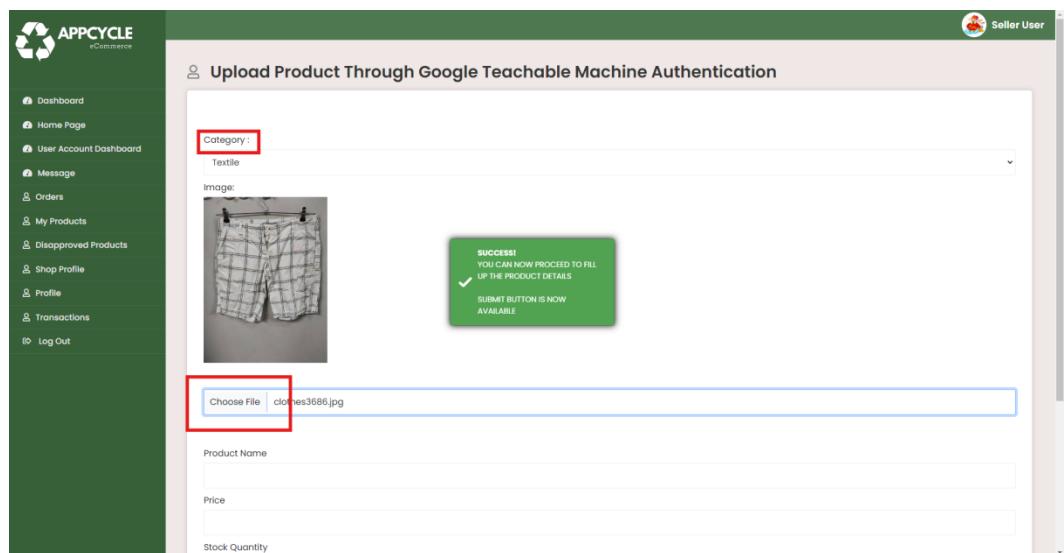
The screenshot shows the APPCYCLE eCommerce platform's user interface. On the left, there is a dark green sidebar with various navigation links: Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products (which is highlighted with a red box), Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main content area has a light gray background and features a title 'Products' with a user icon. Below the title is a search bar labeled 'Search:' and a 'Show' dropdown set to '10 entries'. There is a 'Print' button in the top-left corner of the table area, which is also highlighted with a red box. The table itself has columns for Id, Image, Name, Price, Is approved?, Status, and Action. It contains four rows of product data:

ID	Image	Name	Price	Is approved?	Status	Action
47		new phone	500	Pending	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
46		Metal Stocks	415	Disapproved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
45		Fitzgerald Wilkinson	810	Approved	<input type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>
38		Film Camera Bundle	3000	Approved	<input checked="" type="checkbox"/>	<button>edit</button> <button>delete</button> <button>Image Gallery</button>

1. To view a printed version of the table, click on the *Print* button located on the top left of the table above the Change Products View option

#### 2.3.4.6 Upload Product Via Google Teachable Machine

1. Click on the *Upload Product* button, which is *blue*, which leads to the Upload Product option with Google Teachable Machine as the image validator.
2. Select the category of the product to be uploaded.



3. Select an image of the product to be uploaded and wait for Google Teachable Machine to process and validate the submitted image. If a success prompt appears, continue in filling up the form. If not, submit a clearer image or upload via *Admin Approval* instead.
4. Complete the required entries, such as the product name, price, stock quantity, description, and status.
5. Click on the *Submit* button to submit the product.

#### 2.3.4.7 Upload Product Via Admin Approval

The screenshot shows the APPCYCLE eCommerce platform's 'Products' page. On the left is a dark sidebar with navigation links: Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main area has a title 'Products' with a user icon. It includes a search bar, a 'Submit for Admin Approval' button, and a 'Product Authentication through Google Teachable Machine' button. Below these are two yellow 'Upload Product' buttons. A red box highlights the top yellow 'Upload Product' button. The central part of the screen displays a table of products with columns: Id, Image, Name, Price, Is approved?, Status, and Action. The table contains four rows of data:

Id	Image	Name	Price	Is approved?	Status	Action
47		new phone	500	Pending	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
46		Metal Stocks	415	Disapproved	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
45		Fitzgerald Wilkinson	810	Approved	<input type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
38		Film Camera Bundle	3000	Approved	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>

1. Click on the *Upload Product* button, which is colored *yellow*, which leads to the Upload Product option with Admin Approval as its validator.
2. Select the category of the product to be uploaded.
3. Select an image of the product to be uploaded.
4. Complete the required entries, such as the product name, price, stock quantity, description, and status.

The screenshot shows the 'Create Product' form. The left sidebar is identical to the one in the previous screenshot. The main form area has a title 'Create Product' with a user icon. It contains several input fields: 'Product Image' (with a 'Choose File' button and a note 'No file chosen.'), 'Product Name', 'Category' (set to 'Electronics'), 'Price', 'Stock Quantity', 'Description', 'Status' (set to 'Active'), and an 'Add' button. A red box highlights the 'Add' button.

- Click the *Add* button to submit an upload request to the Admin for approval.

#### 2.3.4.8 Edit Product

ID	Image	Name	Price	Is approved?	Status	Action
47		new phone	500	Pending	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
46		Metal Stocks	415	Disapproved	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
45		Fitzgerald Wilkinson	810	Approved	<input type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
38		Film Camera Bundle	3000	Approved	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>

- Click on the *Edit* button associated with the product to have its details edited.
- Fill up the required entries such as the product category, product image, product name, price, stock quantity, description, and status of the product.

- Click on the *Update* button to update the product details to the recently updated details.

#### 2.3.4.9 Delete Product

Id	Image	Name	Price	Is approved?	Status	Action
47		new phone	500	Pending	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
46		Metal Stocks	415	Disapproved	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
45		Fitzgerald Wilkinson	810	Approved	<input type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>
38		Film Camera Bundle	3000	Approved	<input checked="" type="checkbox"/>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>

- Click on the *Delete* button associated with the product to have its entry deleted.
- A prompt will pop up asking to confirm the deletion as the action is irreversible. Select the “*Yes, delete it!*” button to delete the product and “*Cancel*” to cancel the deletion.

Products							
Submit for Admin Approval <a href="#">+ Upload Product</a>              Product Authentication through Google Teachable Machine <a href="#">+ Upload Product</a>							
Show: 10 entries   Search: <input type="text"/>							
ID	Image	Name	Price	Is approved?	Status	Action	
31		Cheryl Cotton	590	Approved	<span>Up</span>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>	
30		Dakota Hinton	785	Approved	<span>Up</span>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>	
29		Britanni Carroll	253	Disapproved	<span>Up</span>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>	
28		Shellie Garrison	670	Approved	<span>Up</span>	<a href="#">edit</a> <a href="#">delete</a> <a href="#">Image Gallery</a>	

#### 2.3.4.10 Product Image Gallery Upload

1. Click on the *Image Gallery* button associated with the product to add another image to the image gallery of the product.

Choose File: 434846246\_3907840270728\_845257489313847774\_n.jpg

**Upload**

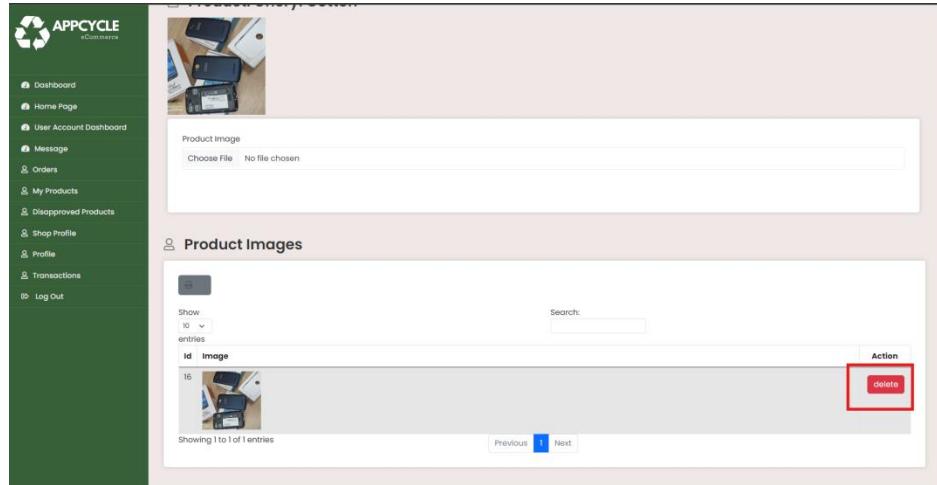
SUCCESS! UPLOAD BUTTON IS NOW AVAILABLE

Product Images							
Show: 10 entries   Search: <input type="text"/>							
ID	Image	Action					
No data available in table							
Showing 0 to 0 of 0 entries							

2. Upload an image of the product and wait for Google Teachable Machine to process and validate the image. If a success prompt appears,

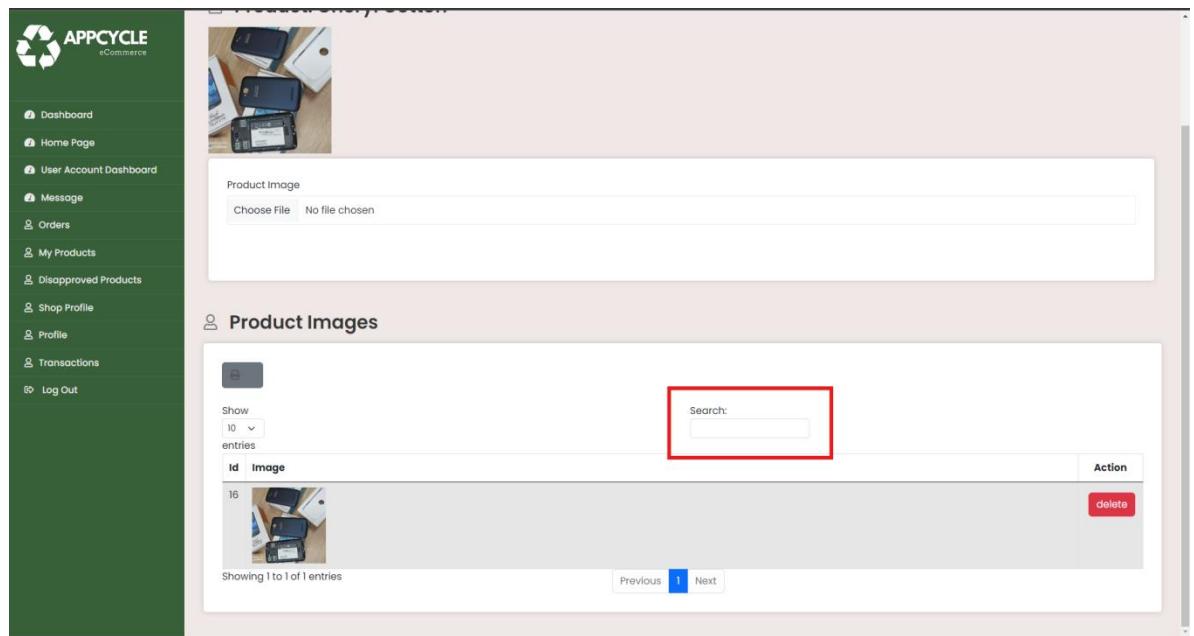
the *Upload* button may be clicked to add the image. If not, submit a clearer image of the product.

3. If you choose not to upload, click on the *Return* button at the top left of the page to return to the products page.



#### 2.3.4.11 Product Image Gallery Delete

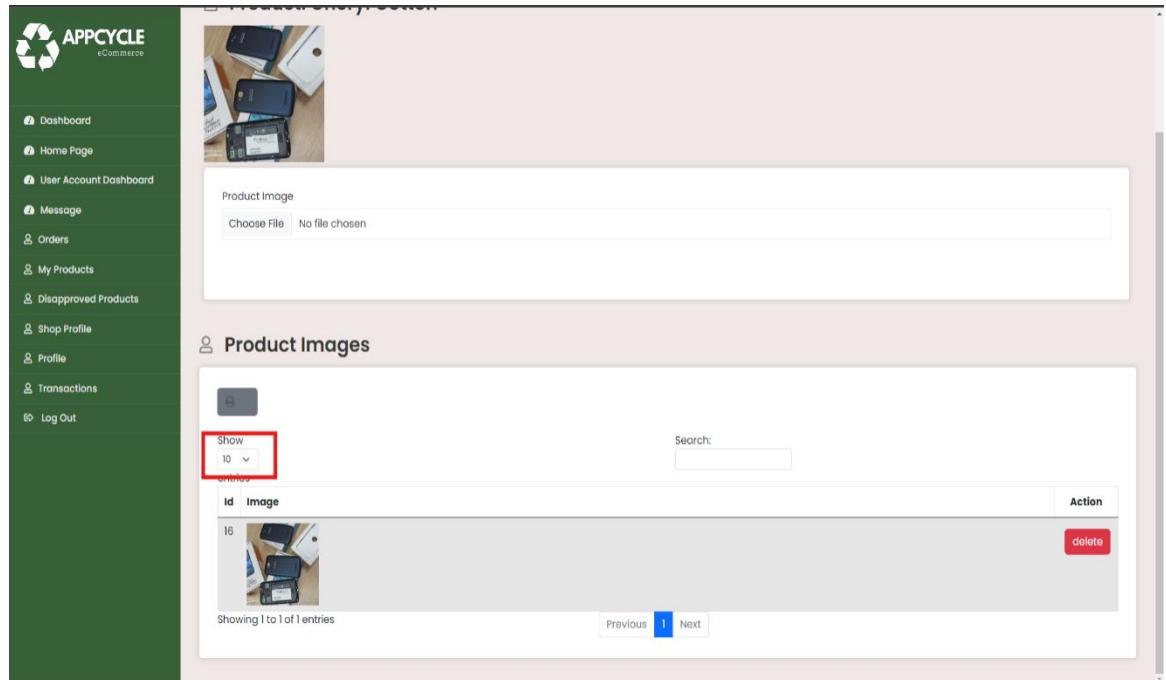
1. Following the steps in 2.3.4.10, instead of uploading an image, scroll down and click on the *Delete* button associated with the image to have the image deleted.
2. A prompt will pop up asking to confirm the deletion as the action is irreversible. Select the “*Yes, delete it!*” button to delete the image and “*Cancel*” to cancel the deletion.



#### 2.3.4.12 Product Image Gallery Search

1. Following the steps in 2.3.4.10, instead of uploading an image, scroll down and search the specified image by entering the image ID in the search bar above the image gallery table and waiting for the result to load.

#### 2.3.4.13 Product Image Gallery Change View

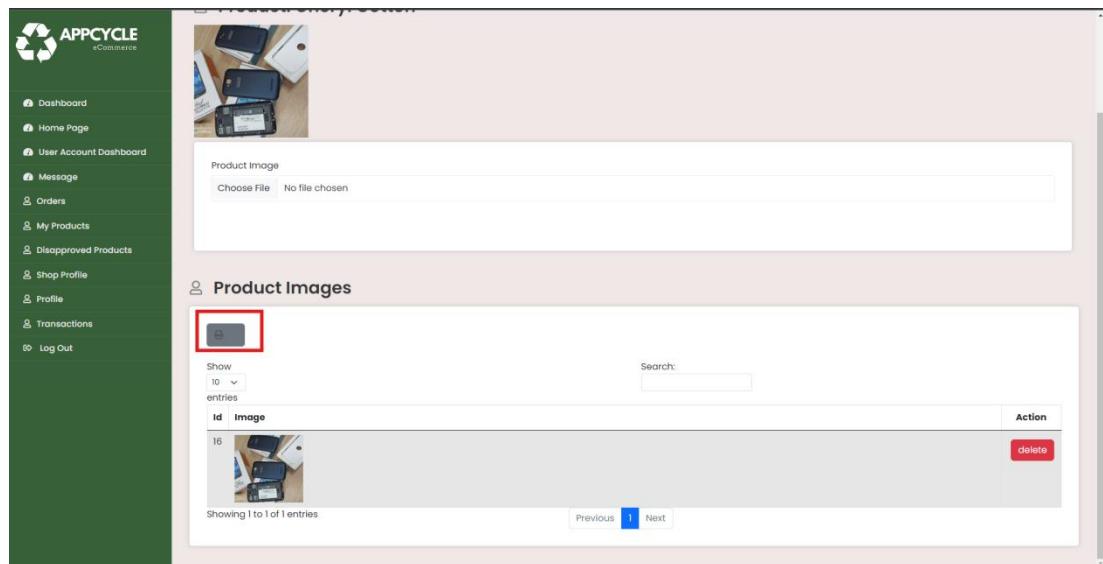


1. Following the steps in 2.3.4.10, instead of uploading an image, scroll down and open the dropdown menu below Show and select the requested number. Currently, the options are 10, 25, 50, and 100.

#### 2.3.4.14 Product Image Gallery Browse

The screenshot shows the APPCYCLE eCommerce platform's user interface. On the left is a dark green sidebar with white text and icons, listing navigation options: Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, Transactions, and Log Out. The main content area has a light gray background. At the top, there is a placeholder image of three smartphones. Below it is a "Product Image" section with a "Choose File" button and a message stating "No file chosen". Underneath is a table titled "Product Images". The table has columns for "Id" and "Image". A single row is visible, showing an image of three smartphones. To the right of the table are buttons for "Action" (with a red "delete" button) and "Next". Above the table, there is a search bar labeled "Search:" and a "Show" dropdown set to "10 entries". At the bottom of the table, it says "Showing 1 to 1 of 1 entries". A blue "Next" button is highlighted with a red box.

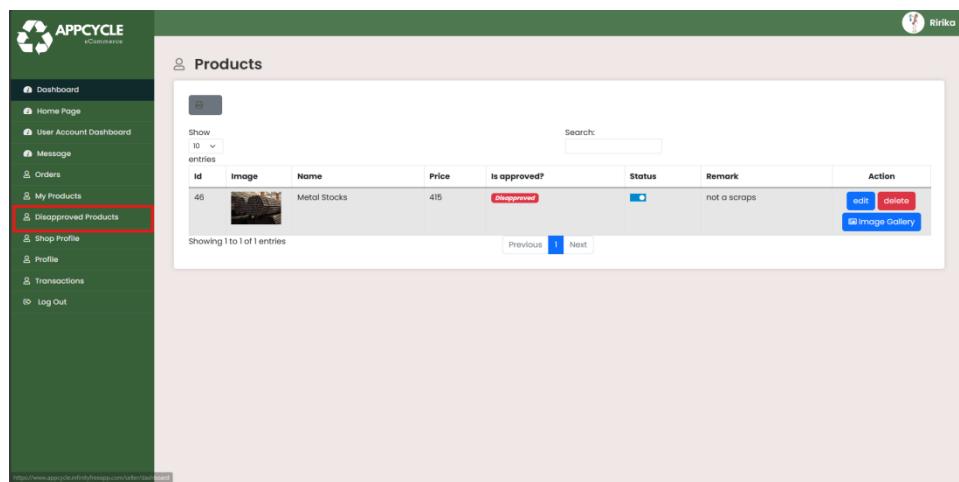
1. Following the steps in 2.3.4.10, instead of uploading an image, scroll down and click on the *Next* button below the image gallery table to move to the next page of images, if any.
2. To move to the previous page of images, if any, click on the *Previous* button located below the image gallery table.
3. To move to a specific image gallery page, if any, click on the page number button located below the image gallery table.



#### 2.3.4.15 Product Image Gallery View Printed Table

- Following the steps in 2.3.4.10, instead of uploading an image, scroll down and click on the print button on the top left of the table above the Product Image Gallery Change View option.

#### 2.3.5 Disapproved Products



##### 2.3.5.1 View Disapproved Products

1. On the seller dashboard, select the *Disapproved Products* option in the sidebar located to the left of the page.

### 2.3.5.2 Search Disapproved Product

The screenshot shows the APPCYCLE seller dashboard. The sidebar on the left has a dark green background with white text. The 'Disapproved Products' link is highlighted with a red box. The main content area has a light gray background. At the top, there's a header with the APPCYCLE logo and a user profile icon. Below the header is a search bar with the placeholder 'Search:' and a red box around it. Underneath is a table titled 'Products' with columns: Id, Image, Name, Price, Is approved?, Status, Remark, and Action. There is one entry: Id 46, Name Metal Stocks, Price 415, Is approved? (button labeled 'Disapproved'), Status (blue button), Remark 'not a scraps', and Action buttons for 'edit', 'delete', and 'Image Gallery'. Below the table, it says 'Showing 1 to 1 of 1 entries' and has 'Previous' and 'Next' buttons.

1. Search the specified disapproved product by entering the product name of the product in the search bar found above the disapproved products table and wait for the result to load.

### 2.3.5.3 Change Disapproved Products View

This screenshot is similar to the previous one but shows a change in the 'Show' dropdown in the sidebar from '10 entries' to '100 entries'. The main content area shows the same product table as before, but the 'Is approved?' column now shows a blue button labeled 'Approved' instead of 'Disapproved'. All other elements remain the same, including the search bar, the single product entry, and the pagination buttons.

1. Change the disapproved products view based on the number of entries by opening the dropdown menu below Show and selecting the requested number.

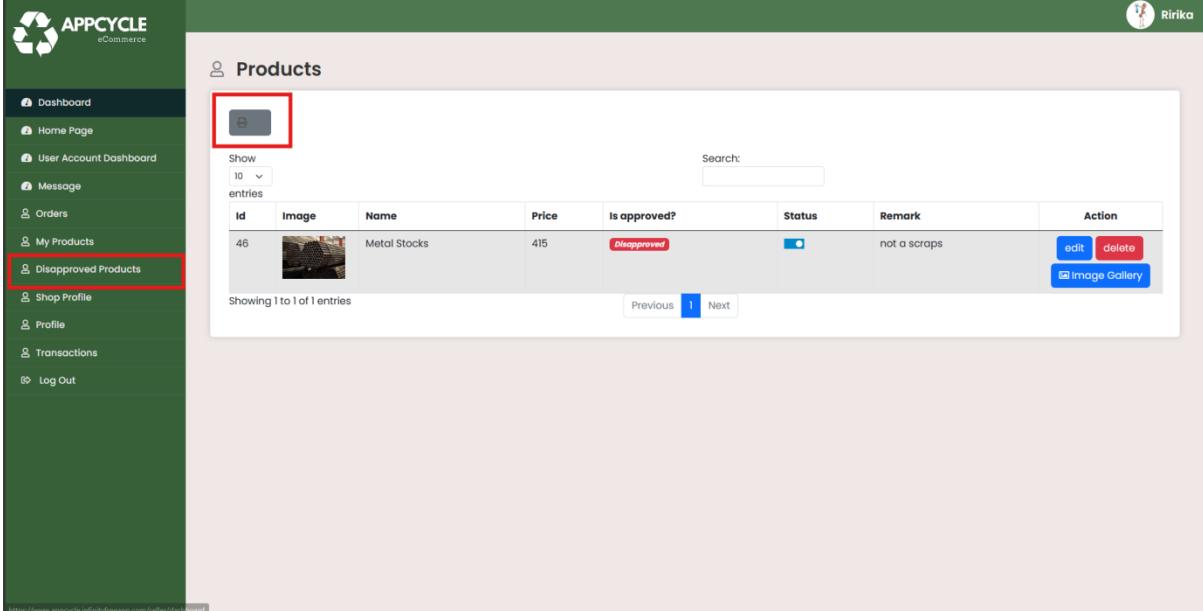
Currently, the options are 10, 25, 50 and 100.

#### 2.3.5.4 Browse Disapproved Products

The screenshot shows the APPCYCLE eCommerce platform's user interface. On the left, there is a sidebar with various navigation options: Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, and Disapproved Products. The 'Disapproved Products' option is highlighted with a red box. The main content area is titled 'Products' and displays a table of disapproved products. The table has columns for Id, Image, Name, Price, Is approved?, Status, Remark, and Action. There is one entry: Id 46, Name 'Metal Stocks', Price 415, Is approved? (red button labeled 'Disapproved'), Status (blue icon), Remark 'not a scraps', and Action buttons for 'edit', 'delete', and 'Image Gallery'. Below the table, it says 'Showing 1 to 1 of 1 entries' and has 'Previous' and 'Next' buttons, with '1' in the middle. The URL at the bottom is https://www.appcyclesoftwaresapp.com/seller/dashboard.

1. To move to the next page of disapproved products, if any, click on the *Next* button located below the disapproved products table.
2. To move to the previous page of disapproved products, if any, click on the *Previous* button located below the disapproved products table.
3. To move to a specific disapproved products page, if any, click on the page number button located below the disapproved products table.

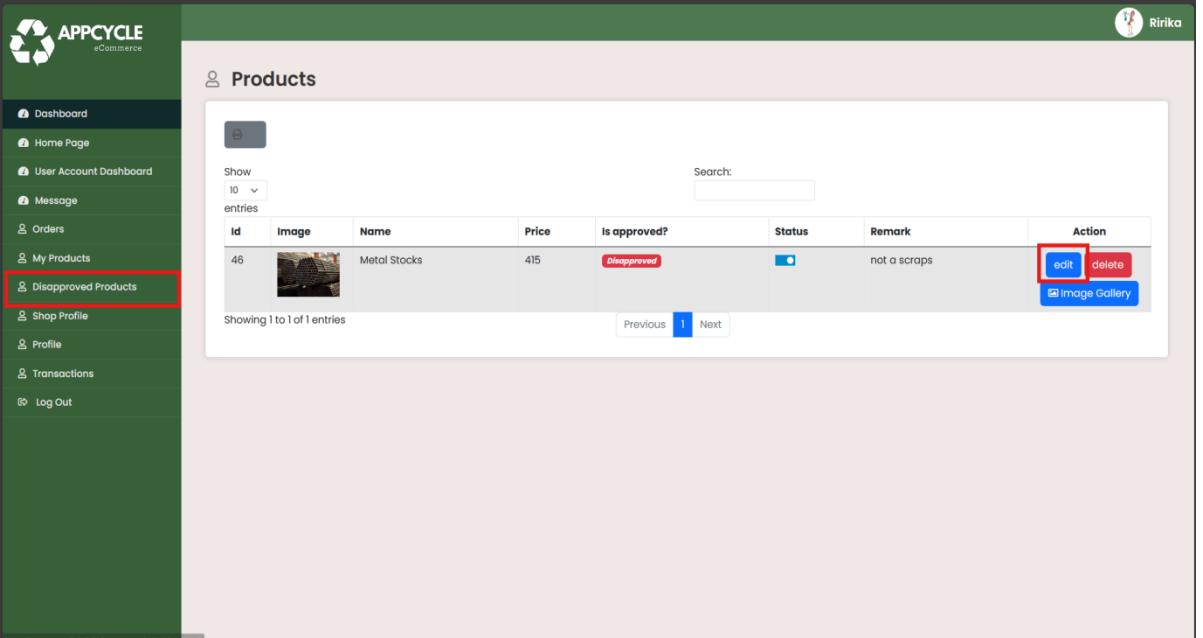
### 2.3.5.5 View Printed Table



The screenshot shows the APPCYCLE e-commerce seller dashboard. On the left, a sidebar menu includes options like Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products (which is highlighted with a red box), Shop Profile, Profile, Transactions, and Log Out. The main content area is titled 'Products' and displays a table of disapproved products. The table has columns for Id, Image, Name, Price, Is approved?, Status, Remark, and Action. One entry is shown: Id 46, Name Metal Stocks, Price 415, Is approved? Disapproved (button is red), Status (blue button), Remark not a scraps, and Action buttons for edit, delete, and Image Gallery. A print icon is also visible at the top left of the table.

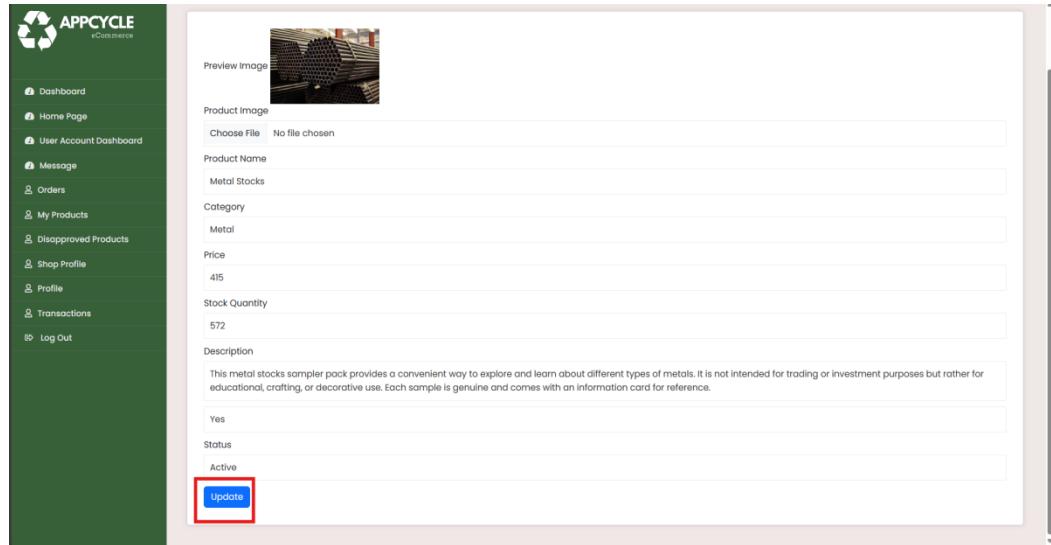
1. To view a printed version of the table, click on the *Print* button on the top left above the Change Disapproved Products View option.

### 2.3.5.6 Edit Disapproved Product



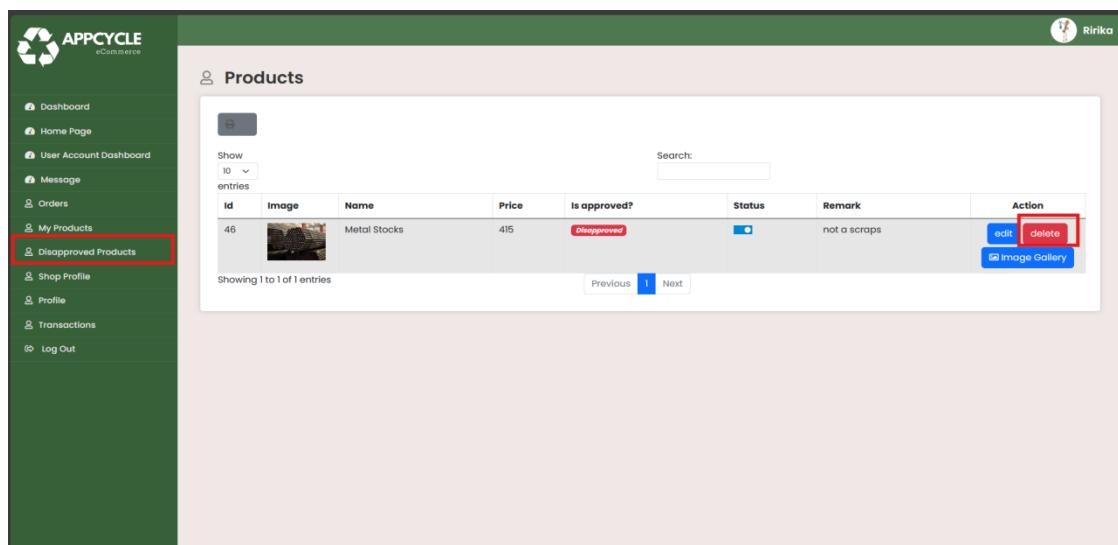
The screenshot shows the APPCYCLE e-commerce seller dashboard, similar to the previous one but with a different focus. The 'Disapproved Products' option in the sidebar is highlighted with a red box. In the main content area, the 'Edit' button in the 'Action' column of the product table is highlighted with a red box. The table structure is identical to the previous screenshot, showing one entry for Metal Stocks with the 'Edit' button now being the focal point.

1. Click on the *Edit* button associated with the product to have its details edited.
2. Fill up the required entries such as the product category, product image, product name, price, stock quantity, description, and status of the product.



3. Click on the *Update* button to update the product details to the recently updated details

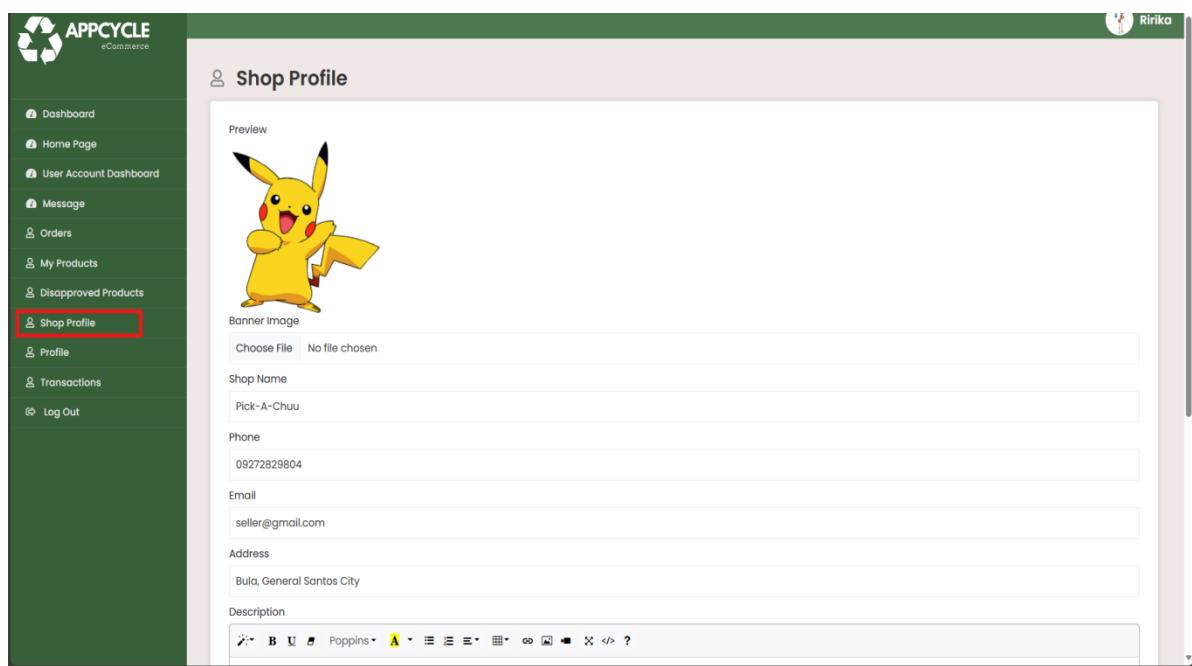
### 2.3.5.7 Delete Disapproved Product



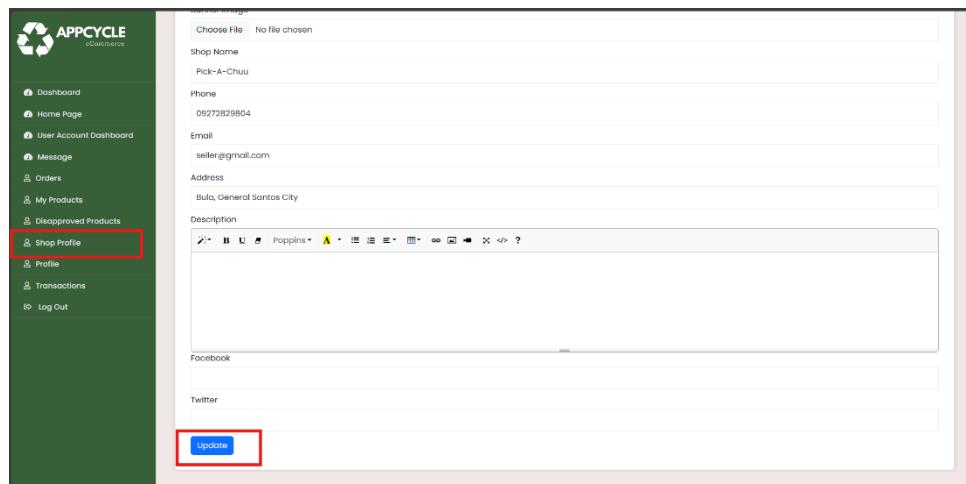
1. Click on the *Delete* button associated with the disapproved product to have its entry deleted.
2. A prompt will pop up asking to confirm the deletion as the action is irreversible. Select the “Yes, *delete it!*” button to delete the disapproved product and “*Cancel*” to cancel the deletion.

### 2.3.6 Shop Profile

#### 2.3.6.1 View Shop Profile



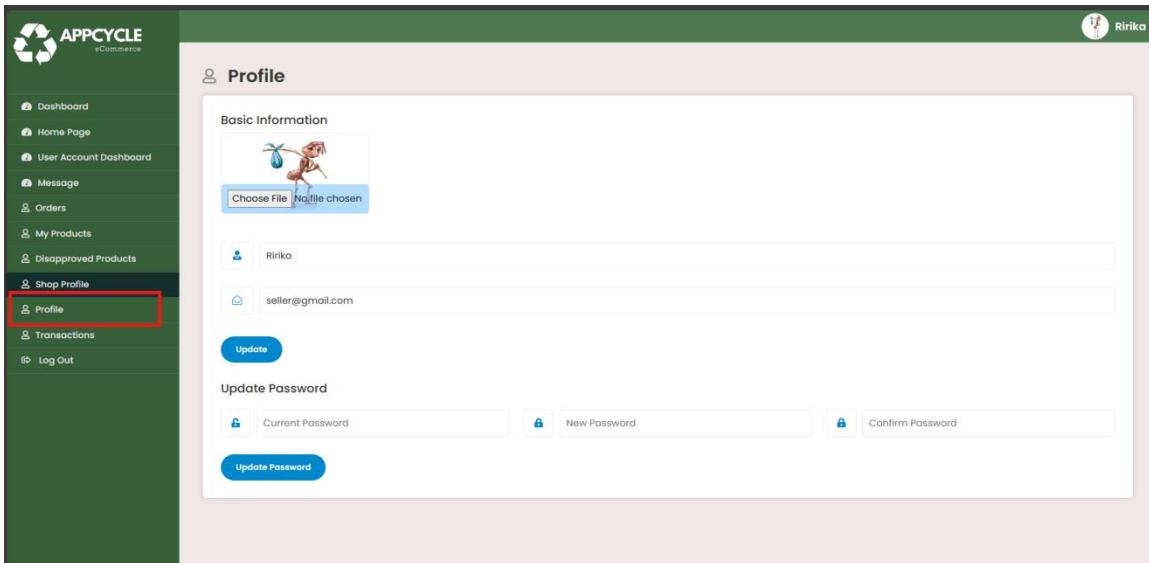
1. On the seller dashboard, select the *Shop Profile* option, which is *orange*. Alternatively, select the *Shop Profile* option in the sidebar to the left of the page.



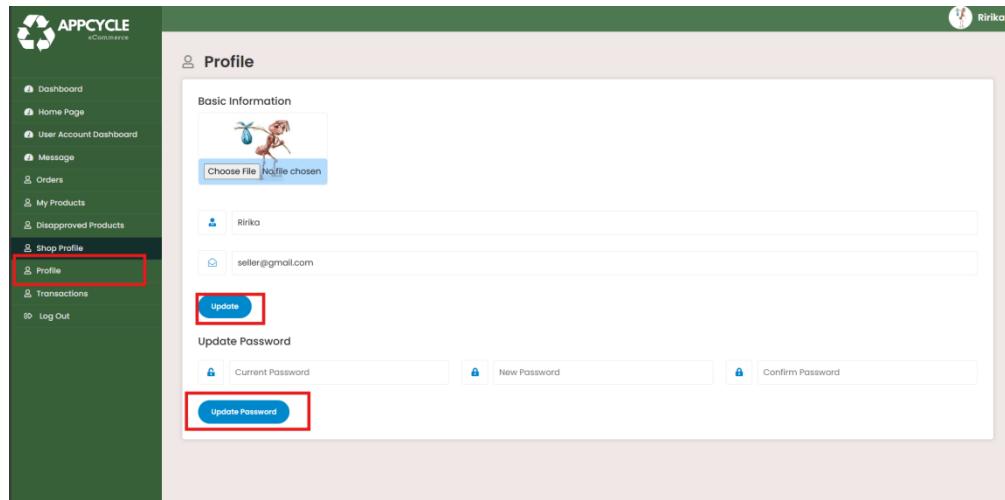
### 2.3.6.2 Update Shop Profile

1. Following the step in 2.3.6.1, complete the required entries, such as the banner image, shop name, phone number, email, address, description of the shop, Facebook link, and Twitter link.
2. Click on the *Update* button below the form to update the shop profile details to the recently updated ones.

### 2.3.7 Profile



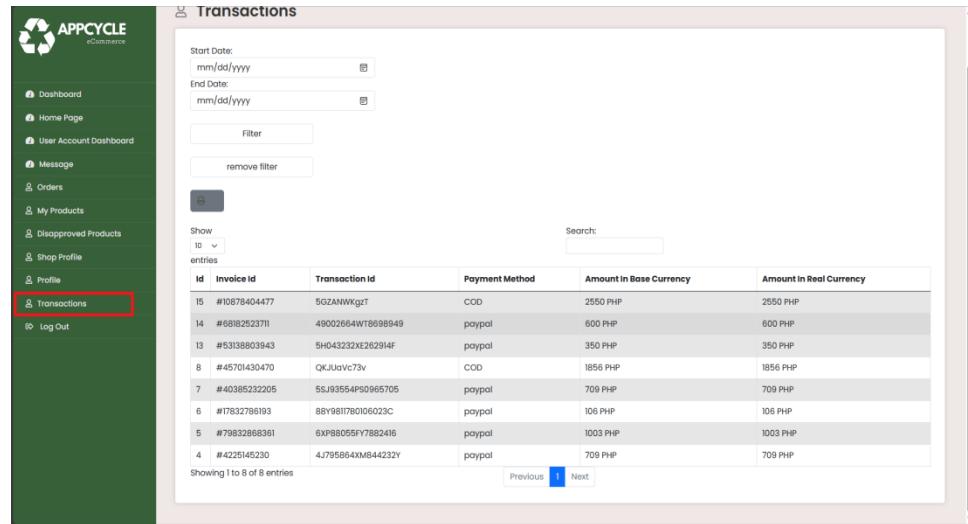
1. On the seller dashboard, select the *Profile* option in the sidebar to the page's left.



### 2.3.7.2 Update Seller Profile

1. Following the step in 2.3.7.1, fill out the required entries, such as the profile image, profile name, email, and password. In the case of the password, the current password, the new password, and a confirmation of the new password are required.
2. Click the *Update* button below the form to update the profile to the recently updated details. In the case of the password, an “*Update Password*” button is provided to update the account password.

## 2.3.8 Transactions



The screenshot shows the APPCYCLE eCommerce seller dashboard. On the left, a sidebar menu lists various options: Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, and Transactions. The 'Transactions' option is highlighted with a red box. The main content area is titled 'Transactions' and contains a table of transaction history. The table has columns for Id, Invoice Id, Transaction Id, Payment Method, Amount in Base Currency, and Amount in Real Currency. The transactions listed are:

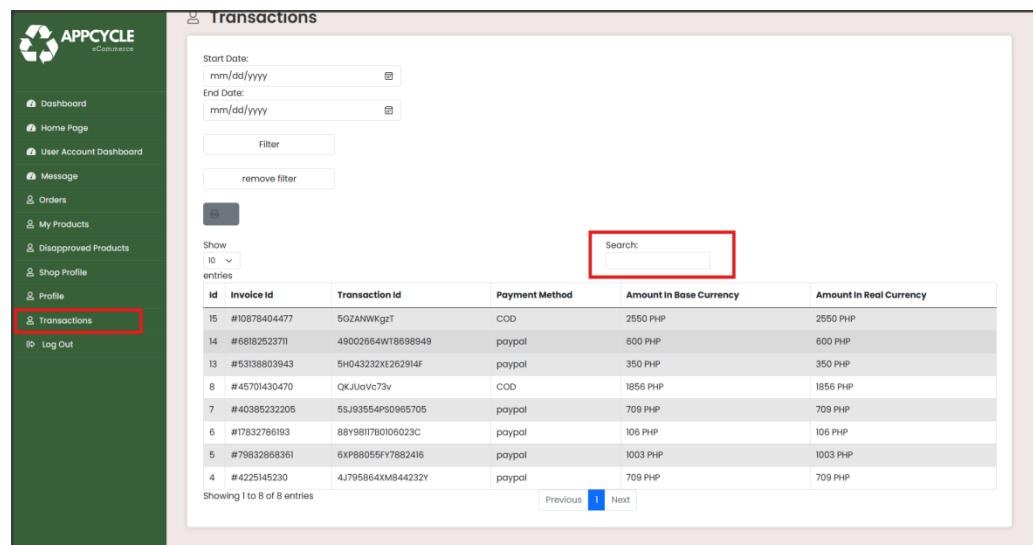
Id	Invoice Id	Transaction Id	Payment Method	Amount in Base Currency	Amount in Real Currency
15	#10878404477	5GZANWKgT	COD	2550 PHP	2550 PHP
14	#68182523711	49002664W7B698949	paypal	600 PHP	600 PHP
13	#53138803943	5H043232X262914F	paypal	350 PHP	350 PHP
8	#45701430470	QKJUuVc73v	COD	1856 PHP	1856 PHP
7	#403885232205	5SJ93554P9S0965705	paypal	709 PHP	709 PHP
6	#17832786193	88Y9817B0106023C	paypal	106 PHP	106 PHP
5	#79832868361	6XP88055F7882416	paypal	1003 PHP	1003 PHP
4	#4225145230	4J795864XM844232Y	paypal	709 PHP	709 PHP

Showing 1 to 8 of 8 entries.

### 2.3.8.1 View Transactions

1. On the seller dashboard, select the *Transactions* option in the sidebar to the page's left.

### 2.3.8.2 Search Transaction



The screenshot shows the same seller dashboard and transactions page as the previous image. However, the search bar in the top right of the transactions table is now highlighted with a red box. The rest of the interface and data are identical to the first screenshot.

- Search the specified transaction by entering the transaction ID of the transaction in the search bar found above the transactions table and wait for the result to load

### 2.3.8.3 Change Transactions View

ID	Invoice ID	Transaction ID	Payment Method	Amount in Base Currency	Amount in Real Currency
15	#10878404477	5GZANWKgT	COD	2550 PHP	2550 PHP
14	#6818252371I	49002664WT8698949	paypal	600 PHP	600 PHP
13	#53138803943	5h043232Xe262914F	paypal	350 PHP	350 PHP
8	#45701430470	QKJuUvc73v	COD	1856 PHP	1856 PHP
7	#40385232205	5SJ93554PS0965705	paypal	709 PHP	709 PHP
6	#17832786193	88Y9817B0I06023C	paypal	106 PHP	106 PHP
5	#79832868361	6XPB8055FY7882416	paypal	1003 PHP	1003 PHP
4	#4225145230	4J79584XMB44232Y	paypal	709 PHP	709 PHP

- Change the transactions view based on the number of entries by opening the dropdown menu below Show and select the requested number.
- Currently, the options are 10, 25, 50, and 100.

ID	Invoice ID	Transaction ID	Payment Method	Amount in Base Currency	Amount in Real Currency
15	#10878404477	5GZANWKgT	COD	2550 PHP	2550 PHP
14	#6818252371I	49002664WT8698949	paypal	600 PHP	600 PHP
13	#53138803943	5h043232Xe262914F	paypal	350 PHP	350 PHP
8	#45701430470	QKJuUvc73v	COD	1856 PHP	1856 PHP
7	#40385232205	5SJ93554PS0965705	paypal	709 PHP	709 PHP
6	#17832786193	88Y9817B0I06023C	paypal	106 PHP	106 PHP
5	#79832868361	6XPB8055FY7882416	paypal	1003 PHP	1003 PHP
4	#4225145230	4J79584XMB44232Y	paypal	709 PHP	709 PHP

#### 2.3.8.4 Browse Transactions

1. To move to the next page of transactions, if any, click on the “*Next*” button below the transactions table.
2. To move to the previous page of transactions, if any, click on the *Previous* button below the transactions table.
3. To move to a specified transactions page, if any, click the page number button below the transactions table.

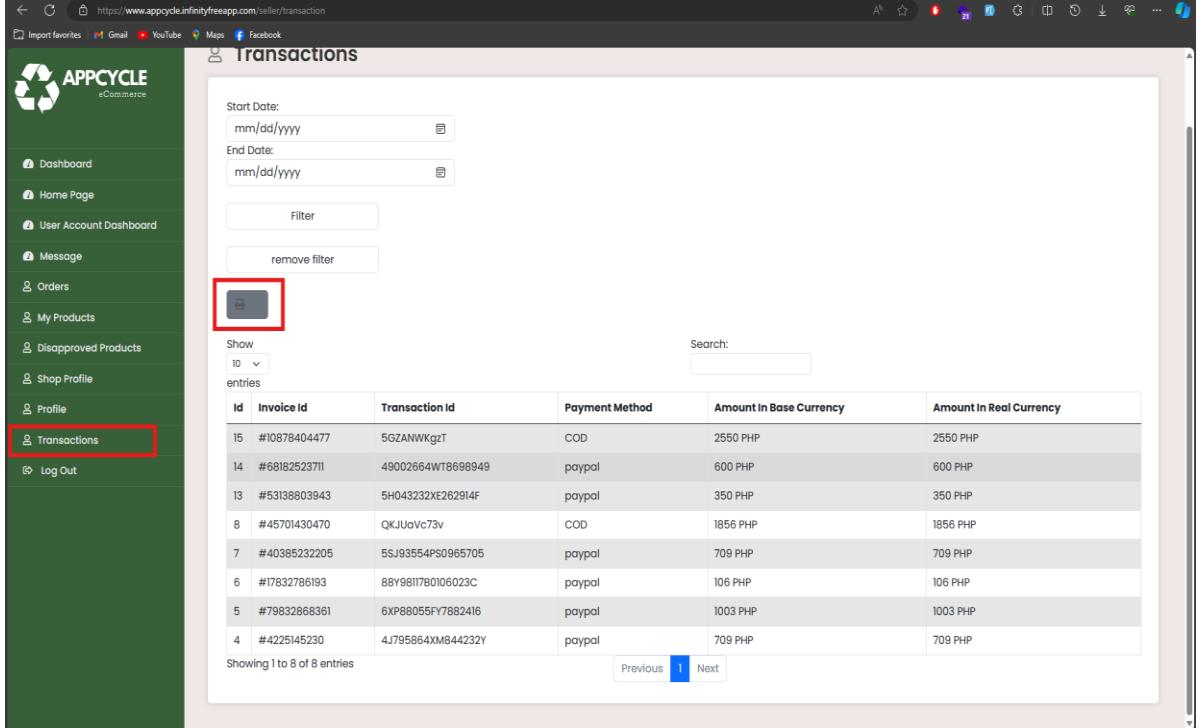
ID	Invoice ID	Transaction ID	Payment Method	Amount in Base Currency	Amount in Real Currency
15	#10878404477	5GZANWkgzT	COD	2550 PHP	2550 PHP
14	#6818252371	49002664W1889949	paypal	600 PHP	600 PHP
13	#53138803943	5HO43232X1262914F	paypal	350 PHP	350 PHP
8	#4570430470	QKJuUvC73v	COD	1856 PHP	1856 PHP
7	#403885232205	5SJ93554PS0985705	paypal	709 PHP	709 PHP
6	#17832786193	88Y981TB0106023C	paypal	106 PHP	106 PHP
5	#798832868361	6XP88055FY7882416	paypal	1003 PHP	1003 PHP
4	#4225145230	4J795864XM844232Y	paypal	709 PHP	709 PHP

#### 2.3.8.5 Filter Transactions by Date

1. To set a filter on the transactions by date, select a start date and an end date found at the top left of the page. The end date must be beyond the set start date.
2. Click the *Filter* button to filter the transactions table based on the start and end date.

- Click the *Remove Filter* button to remove the filter from the transactions table.

### 2.3.8.6 View Printed Table



The screenshot shows the APPCYCLE eCommerce platform's transaction management interface. On the left, a sidebar menu lists various options: Dashboard, Home Page, User Account Dashboard, Message, Orders, My Products, Disapproved Products, Shop Profile, Profile, and Transactions. The 'Transactions' option is selected and highlighted with a red box. The main content area is titled 'Transactions' and contains a table of transaction data. At the top of this section, there are input fields for 'Start Date' and 'End Date', a 'Filter' button, and a 'remove filter' button. Below these is a 'Print' button, which is also highlighted with a red box. The table has columns for Id, Invoice Id, Transaction Id, Payment Method, Amount In Base Currency, and Amount In Real Currency. The data in the table is as follows:

Id	Invoice Id	Transaction Id	Payment Method	Amount In Base Currency	Amount In Real Currency
15	#10878404477	5GZANWKgzT	COD	2550 PHP	2550 PHP
14	#681825237I	49002664WT8698949	paypal	600 PHP	600 PHP
13	#53138803943	5H043232XE2629I4F	paypal	350 PHP	350 PHP
8	#45701430470	QKJUoVc73v	COD	1856 PHP	1856 PHP
7	#40385232205	5SJ93554P50965705	paypal	709 PHP	709 PHP
6	#17832786193	88Y98II7B0106023C	paypal	106 PHP	106 PHP
5	#79832868361	6XP88055FY7882416	paypal	1003 PHP	1003 PHP
4	#4225145230	4J795864XM844232Y	paypal	709 PHP	709 PHP

At the bottom of the table, it says 'Showing 1 to 8 of 8 entries' and includes 'Previous' and 'Next' navigation buttons.

- To view a printed version of the table, click the *Print* button on the top left of the table above the Change Transactions View option.

## AUTHORS' BIO NOTE

Felmer John B. Araña is a Bachelor of Science in Information Technology student majoring in networking and a full-stack developer. With a focus on utilizing the Laravel framework, Felmer John has developed the web application and integrated key features such as PayPal for payment processing, Pusher API for real-time notifications, and Mailtrap for email testing. As a cyber security enthusiast with experience in vulnerability assessment and penetration testing, Felmer has ensured the project's security by minimizing data input requirements and implementing middleware to safeguard the confidentiality, integrity, and availability of data.

Stephanie Kate B. Ledesma is a Bachelor of Science in Information Technology student majoring in database systems. She played a pivotal role in their capstone project, titled APPCycle: AI-Assisted Web Application for the Sale and Purchase of Scrap Materials in Support of the Circular Economy. Stephanie Kate led the project and was responsible for the comprehensive documentation, covering all chapters from 1 to 5. Her contributions extended beyond documentation; she conducted multiple user tests, carried out usability testing, and distributed questionnaires to gather user feedback. Additionally, Stephanie Kate meticulously proofread the document, ensuring accuracy and consistency throughout. She also assisted in designing the UI/UX of the system, contributing significantly to both the front end and the system's functionalities.

Carl Gian B. Ursabia is a Bachelor of Science in Information Technology student majoring in database systems and a back-end developer. Focusing on developing the AI aspect of the system, Carl Gian has trained the AI model used in the system for image classification according to the three defined classes of recyclable waste which are e-waste, metal, and textile. Taking an interest

in machine learning, Carl Gian studied the process of how an AI model is being trained to recognize the images being passed to the model and prepared the AI model to be able to accurately recognize and classify the type of recyclable waste being submitted to the system.

## **END NOTE**

APPCycle is a web application developed by the team as a culmination of the Capstone Requirement for the Bachelor of Science in Information Technology (BSIT) degree program at Mindanao State University – General Santos City (MSU – GSC) during the academic year 2023-2024. Under the guidance and supervision of Dr. Lumer Jude P. Doce, the project gave way to the exploration of possible solutions to waste production with a technological approach, such as artificial intelligence (AI), to mitigate its effects on the environment and maximize the usage of produced goods through repurposing and recycling.

The development team which comprised of BSIT students Felmer John Araña, Stephanie Kate Ledesma, and Carl Gian Ursabia devoted their experience, effort, and time to conceptualize, design, and implement APPCycle for their capstone project. Their combined commitment and passion for the development of the system as a potential solution to minimize the production of waste pushed the project to completion. With their collaborative efforts in their respective tasks, they overcame hardships, applied innovative development methods, and eventually delivered a management system that serves as a cornerstone for the exploration of responding to the waste production crisis with technology.

The developers are proud to present APPCycle and are confident in its functionality as a system whose AI integration allows it to provide a possible entryway to creating solutions to reduce the production of reusable waste. As they proceed through their professional journeys as an IT professional, the gained knowledge and experience from their project will leave a mark in the field of technological advancements and ecological solid waste management.

## **Appendix H**

### **DEPLOYMENT PLAN**

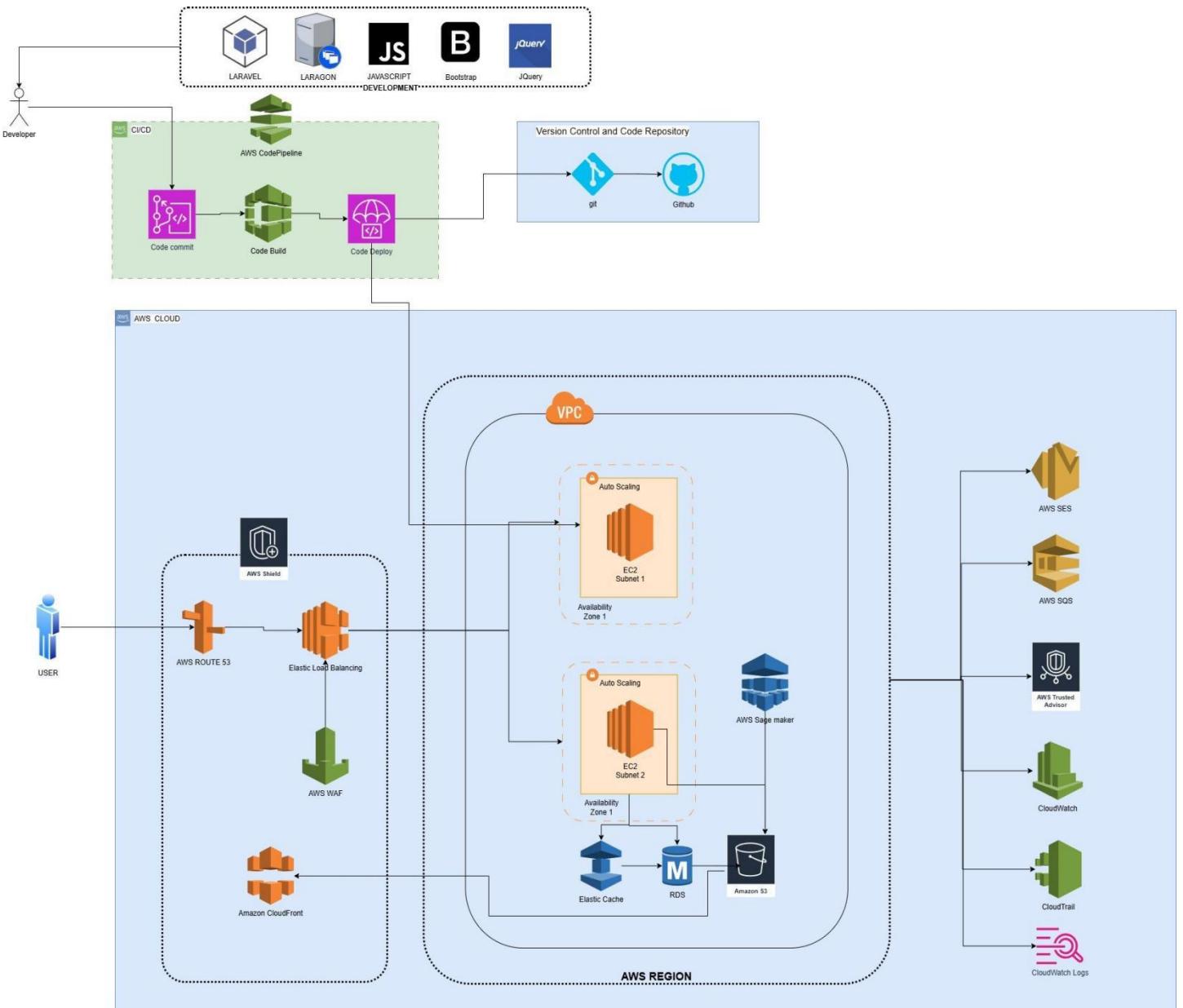
#### **Project Overview**

APPCycle is a web-based application that aims to provide a platform for users to buy and sell reusable goods. The web application allows users to buy a listed product, list a product for sale, add an image gallery of the listed product to provide more visual information, chat with other users in the system as a buyer and/or a seller, view and print their transaction history and set up a shop profile in the system as a seller. The product listing feature has an artificial intelligence (AI) integration in its image submission as a way to verify whether the system falls into one of the three provided categories of reusable goods: electronic waste (e-waste), metal, and textile.

#### **Technical Specification of the Project**

APPCycle is a web application constructed using Laravel, Blade, HTML, CSS Bootstrap, and JavaScript as the framework for the webpages of the application with phpMyAdmin and Laragon as the database management tools for the application. The messaging feature and email capture for contacting the system administrator are handled using Pusher API and Mailtrap. The online payment method uses the PayPal API to allow payments via credit or debit card. Yajra Datatables were used for the definition of the constructed tables for the system's database. Currently, the system is hosted using cPanel and InfinityFree for the website management such as the website files and application URL used for connection. Google Teachable Machine is used as the machine learning tool to generate the AI model for image validation in the product listing option. Visual Studio Code is used as the code editor of the web application.

## Deployment Plan



Deploying an e-commerce web application using AWS provides a comprehensive, scalable, and secure environment that addresses all critical aspects of modern web application deployment. By utilizing services like Amazon EC2 for scalable compute power, Auto Scaling for handling traffic variations, and Elastic Load Balancer for distributing traffic, the application ensures high availability and fault tolerance. Amazon RDS offers a managed database solution,

while Amazon S3 and EFS handle storage needs efficiently. CloudFront serves content globally with low latency, enhancing user experience. AI capabilities are integrated through Amazon SageMaker.

For deployment and continuous integration, AWS CodePipeline and CodeBuild automate the build, test, and deployment processes, ensuring fast and reliable updates. Security and environment configuration are managed using AWS Systems Manager Parameter Store, AWS Secrets Manager, AWS WAF, and AWS Shield for DDoS protection. Monitoring and logging are handled by AWS CloudWatch and CloudTrail, providing real-time insights and security tracking. The use of Amazon SES for email, Amazon API Gateway for real-time communication, Amazon SQS for SMS notifications, and Amazon VPC for network isolation further strengthens the infrastructure. Overall, this deployment plan leverages AWS's robust ecosystem to ensure a resilient, efficient, and secure e-commerce platform.

## Tools and Technologies

By leveraging the extensive suite of AWS services, this deployment plan ensures a robust, scalable, and secure deployment of your e-commerce web application. AWS provides comprehensive tools for managing and automating the deployment process, making it ideal for handling production environments.

### 1. Preparation Phase

#### Review Code and Dependencies

- Codebase Review: Ensure the codebase is thoroughly reviewed and all dependencies are up-to-date.

## Local Environment Setup

- Development Tools: Set up Laravel with Laragon for local development.

## 2. Version Control and Code Repository

### Version Control

- Git: Use Git for version control.

### Code Repository

- GitHub: Host your code on GitHub.

## 3. Infrastructure Setup

### Compute

- Amazon EC2: Use EC2 to host the web application.
- Auto Scaling: Configure Auto Scaling to handle varying levels of traffic.
- Elastic Load Balancer (ELB): Distribute incoming application traffic across multiple EC2 instances for better fault tolerance.

### Database

- Amazon RDS: Use RDS for a managed MySQL or PostgreSQL database.

### Storage

- Amazon S3: Store images and other static assets.
- Amazon EFS: Use for shared file storage if needed.

### Content Delivery Network (CDN)

- Amazon CloudFront: Distribute content globally with low latency.

## AI Training

- Amazon SageMaker: Use SageMaker for AI model training and deployment.

## 4. Continuous Integration and Deployment (CI/CD)

### CI/CD Setup

- AWS CodePipeline: Automate testing, building, and deployment processes.
- AWS CodeBuild: Integrate for building and testing the application.

## 5. Environment Configuration

### Environment Variables

- Secrets Management: Use AWS Systems Manager Parameter Store or AWS Secrets Manager to manage sensitive environment variables.

### Email Service

- Amazon SES: Use SES for sending emails in production.

### Real-Time Communication

- Amazon API Gateway: Manage real-time communication and API management.

### SMS Service

- Amazon SQS: Use SQS for sending SMS notifications.

## 6. Networking

### Amazon VPC (Virtual Private Cloud):

- Isolate your application resources within a virtual network to enhance security and control over network configurations.

- Details: A VPC with public and private subnets, security groups, and network access control lists (ACLs).

Amazon Route 53:

- Domain Name System (DNS) web service.

## 7. Monitoring and Logging

Application Monitoring

- AWS CloudWatch: Monitor application performance and server health.

Logging

- CloudWatch Logs: Use for logging and monitoring.

Security Monitoring

- AWS CloudTrail: Track API calls and account activity.

## 8. Security Measures

Web Application Firewall (WAF)

- AWS WAF: Protect against common web exploits.

DDoS Protection

- AWS Shield: Protect against DDoS attacks.

Security Best Practices

- AWS Trusted Advisor: Follow best practices for security, cost optimization, and performance.

Penetration Testing

- Regular Testing: Perform penetration testing (both cloud and application) to identify and mitigate vulnerabilities.

**Appendix I**  
**CURRICULUM VITAE**

## **FELMER JOHN B. ARAÑA**

Bachelor of Science in Information Technology

+6399567007177

[johnfelmer4@gmail.com](mailto:johnfelmer4@gmail.com)

Brgy, Baluan, General Santos, South Cotabato

General Santos City 9500, Philippines



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## SUMMARY

An enthusiastic learner who enjoys learning something new. Like to attend seminars and training sessions to learn from experts. Additionally, A CTF player and is known for his technical skills in networking and dedication to his work.

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## SKILLS

- Kali Linux
- VAPT
- OWASP Top 10
- Programming - Laravel, HTML, CSS, Bootstrap
- Computer Networking
- Fiber Installation
- Mikrotik
- Network Box Installation
- Dedicated
- Discipline
- Time Management

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## EXPERIENCE

### **OJT (On-the-Job Training) – January-April 2024**

Company: KPMG Philippines

Location: Makati City, Metro Manila, Philippines

Description:

Fulfilled the role of Technology Consultant in Cybersecurity for the Offensive Security team. Conducted a 2-day Vulnerability Assessment and Penetration Testing (VAPT) for the pre-test and identified vulnerabilities using the OWASP Top 10 list. Conducted a dry run presentation and demonstration on Information Security and OWASP security standards to another school in General Santos via virtual meeting. Rendered a total of 486 on-site hours during the internship.

---

## EDUCATION

## **PRIMARY EDUCATION**

Balite Elementary School

2009 – 2014

## **SECONDARY EDUCATION**

Lagao National High School

2014 – 2018

Notre Dame of Dadiangas University

2018 – 2020

## **TERTIARY EDUCATION**

Mindanao State University – General Santos City

2020 – 2024

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## ACHIEVEMENTS/CERTIFICATIONS

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- **AWS Cloud Practitioner Essentials**
  - May 2024 (AWS)
- **ISC2 CC Online Self-Paced Training - 1M**
  - December 2023 (TryHackMe Cybersecurity Training)
- **Jr Penetration Tester Learning Path**
  - November 2023 (TryHackMe Cybersecurity Training)
- **Top 10 Finalist TREND MICRO: Trend University CTF 2023**
  - November 2023 Hosted by Trend Micro Careers Philippines
- **H4G 2 National Finalist (HACK FOR GOV)**
  - October 2023 Hosted by Department of Information and Communication Technology.
- **Intramurals HipHop Dance Competition**
  - October 2023, Mindanao State University - General Santos
- **H4G 2 Regional Champion (HACK FOR GOV)**
  - September 2023 Hosted by Department of Information and Communication Technology.
- **Basic Mikrotik and Fiber Optic Training (2-day Workshop)**
  - July 2023 Hosted by Wireless Link Technologies, Inc.
- **Intramurals HipHop Dance Competition**
  - November 2023, Mindanao State University - General Santos
- **Networking Essentials Certificate**
  - June 2022 by CISCO
- **Math Club Secretary SY 2019-2020**
  - Notre Dame of Dadiangas University
- **SSG Officer SY 2017-2018**
  - Lagao National Highschool
- **Dean's Lister**
  - 2020-2024, Mindanao State University - General Santos
- **Best Capstone Project – IT Research Colloquium 2024**

- IT & Physics Department
- Mindanao State University – General Santos
- **Best Presenter – IT Research Colloquium 2024**
  - IT & Physics Department
  - Mindanao State University – General Santos

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#### PERSONAL INFORMATION

---

Address Prk. Masagana, Brgy. Baluan, General Santos City, South Cotabato  
Date of Birth March 16, 2000  
Gender Male  
Nationality Filipino  
Marital Status Single

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#### REFERENCE

---

**LUMER JUDE P. DOCE, DIT**  
IT/PHYSICS PROFESSOR  
Mindanao State University – General Santos City

**CHRISTINE JAN B. DELA VEGA, MS**  
CHAIRPERSON, IT/PHYSICS  
Mindanao State University – General Santos City

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#### DECLARATION

---

I hereby declare that all the details furnished here are true to the best of my knowledge and belief.



**FELMER JOHN ARAÑA**

**STEPHANIE KATE B. LEDESMA**  
Bachelor of Science in Information Technology

+639957220171  
[skledesma27@gmail.com](mailto:skledesma27@gmail.com)  
007 Daproza Avenue, Osmeña Street, General Santos City



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## SUMMARY

Specialized in database administration with extensive hands-on experience in network management. Demonstrated excellence in project management, particularly in system documentation, ensuring efficient and organized project execution. Passionate about continuous improvement, eager to acquire new skills, and dedicated to lifelong learning in the IT field.

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## SKILLS

- Database Management
- Network Configuration
- Project Documentation
- Operating System Knowledge in Linux & Windows
- Communication
- Adaptability
- Collaboration and Teamwork

---

## EXPERIENCE

- **SPES (Special Program of Employment for Students) – Summer 2017**  
Company: HRMO (Human Resources Management Office)  
Location: LGU - General Santos City  
Position: Former SPES Grantee  
Description: Front Desk Assistant & Data Entry Clerk
- **SPES (Special Program of Employment for Students) – July-August 2023**  
Company: ICTD (Information and Communications Technology Division)  
Location: LGU - General Santos City  
Position: Former SPES Grantee  
Description: IT Systems & Network Assistant
- **OJT (On-the-Job Training) – January-May 2024**  
Company: ICTD (Information and Communications Technology Division)  
Location: LGU - General Santos City  
Description: Student Intern (IT Systems & Network Assistant)

## EDUCATION

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### TERTIARY EDUCATION

Bachelor of Information Science Technology  
Mindanao State University – General Santos  
Fatima, General Santos City, South Cotabato  
2020 – Present

### SECONDARY EDUCATION

Science, Technology, Engineering, Mathematics (STEM)  
Notre Dame of Dadiangas University  
Marist Avenue, General Santos City  
2018 – 2020

### JUNIOR HIGH SCHOOL

Holy Trinity College of General Santos City  
Fiscal Daproza Avenue, General Santos City  
2014 – 2018

### ELEMENTARY EDUCATION

Holy Trinity College of General Santos City  
Fiscal Daproza Avenue, General Santos City  
2008 – 2014

## ACHIEVEMENTS/CERTIFICATIONS

---

- **Bracket C Recipient – With Honors (2014-2018)**  
Junior High School  
Holy Trinity College of General Santos City
- **Dean's Lister (2020-2024)**  
Mindanao State University – General Santos
- **Best Capstone Project – IT Research Colloquium 2024**  
IT & Physics Department  
Mindanao State University – General Santos
- **Best Presenter – IT Research Colloquium 2024**  
IT & Physics Department  
Mindanao State University – General Santos
- **Cisco: Networking Essentials Badge Earner**  
Issued by Cisco [Networking Essentials - Credly](#)  
June 16, 2022
- **Intel® OpenVINO Online Training (2022)**  
Certificate
- **Campus Developers Connect (DEVCON) 2023:**  
Birds of Feather (AI Debate Competition)

- Champion
- **AWS (Amazon Web Services) Community Day Davao Roadshow 2023**  
Participant
  - **11<sup>th</sup> PSITS (Philippine Society of Information Technology Students) Regional Convention 2023**  
Participant
  - **ICEBOX Unboxing Kick-off: A Journey to Technopreneurship 2024**  
Participant

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#### PERSONAL INFORMATION

---

Address	007 Daproza Avenue, Osmeña Street, General Santos City
Date of Birth	June 27, 2001
Gender	Female
Nationality	Filipino
Marital Status	Single

---

#### REFERENCE

---

**LUMER JUDE P. DOCE, DIT**  
IT/PHYSICS PROFESSOR  
Mindanao State University – General Santos City

**CHRISTINE JAN B. DELA VEGA, MS**  
CHAIRPERSON, IT/PHYSICS  
Mindanao State University – General Santos City

---

#### DECLARATION

---

I hereby declare that all the details furnished here are true to the best of my knowledge and belief.

  
**STEPHANIE KATE B. LEDESMA**

**CARL GIAN B. URSABIA**

Bachelor of Science in Information Technology

+639074367466

[ursabiacg@gmail.com](mailto:ursabiacg@gmail.com)

Brgy. Cannery Site, Polomolok, South Cotabato



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**SUMMARY**

An aspiring back-end developer eager to expand on skills related to back-end development while also having various knowledge on back-end technologies. Seeking opportunities that may expand on my knowledge and strengthen my skills from gathered experiences.

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**SKILLS**

- Technical Skill – Programming, Databases
- Adaptability
- Quick Learning
- Collaborative Skill
- Analytical Thinking
- Communication Skill

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**EXPERIENCE**

- **OJT (On-the-Job Training) – January-May 2024**

Company: General Santos City Water District

Location: E. Fernandez St., Brgy. Lagao, General Santos City

Description:

- Back-end development via API Endpoint Setup
- Project Maintenance
- Network Connection to Project

---

**EDUCATION****PRIMARY EDUCATION**

Dole Philippines School

2008-2015

**SECONDARY EDUCATION**

Dole Philippines School

2015-2020

## **TERTIARY EDUCATION**

Mindanao State University – General Santos City  
2020-2024

### **ACHIEVEMENT**

---

- **With Honors (2018-2020)**  
Senior High School  
Dole Philippines School
- **Dean's Lister (2020-2024)**  
Mindanao State University – General Santos
- **Best Capstone Project – IT Research Colloquium 2024**  
IT & Physics Department  
Mindanao State University – General Santos
- **Best Presenter – IT Research Colloquium 2024**  
IT & Physics Department  
Mindanao State University – General Santos
- **Intel® OpenVINO Online Training (2022)**
- **Cisco Networking Essentials Badge (2022)**

### **PERSONAL INFORMATION**

---

Address	21 Dole Cannery Housing, Brgy. Cannery Site, Polomolok, South Cotabato
Date of Birth	November 10, 2001
Gender	Male
Nationality	Filipino
Marital Status	Single

### **REFERENCE**

---

#### **LUMER JUDE P. DOCE, DIT**

IT/PHYSICS PROFESSOR

Mindanao State University – General Santos City

#### **CHRISTINE JAN B. DELA VEGA, MS**

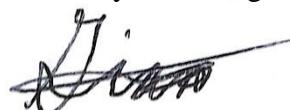
CHAIRPERSON, IT/PHYSICS

Mindanao State University – General Santos City

### **DECLARATION**

---

I hereby declare that all the details furnished here are true to the best of my knowledge and belief.



**CARL GIAN B. URSABIA**