POLITEKNIK MALAYSIA
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

COMMERCE DEPARTMENT

SESSION I: 2024/2025

ECO SORT BIN

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A project report submitted in partial fulfilment of the requirements for the award of Diploma in Business Studies

DECLARATION OF ORIGINALITY

TITLE: ECO SORT BIN

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We verify this project's intellectual properties are our original work without any plagiarism from any sources.

We agree to release the project's intellectual properties to the above-mentioned polytechnic to fulfil the requirement of being awarded a **Diploma in Business Studies.**

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LETTER OF AUTHORIZATION

We declared that the work in this final year project paper was carried out in accordance with the regulation of Politeknik. It is original and is the result of our own work, unless otherwise indicated or acknowledged as referenced work. This business project report has not been submitted to any other academic institution or non-academic institution for any diploma or qualification.

We, hereby, acknowledge that we have been supplied with the Academic Rules and Regulations for Undergraduate, Politeknik, regulating the conduct of our study and research.

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ABSTRACT

The growing global waste crisis poses a major threat to health and sustainability in Malaysia. This is caused by improper waste disposal, especially waste materials such as cooking oil, paper, cans, glass and plastic. The study shows that community awareness about the separation of solid waste materials is still at a positive level. (Mamat, Mohamad, Mohd Najib, Sumayyah. (2020). Pendidikan Amalan Kitar Semula Sisa Pepejal kepada Masyarakat. Jurnal Geografi, p.43-69.). Meanwhile, the study also shows that the public lacks awareness of the importance of disposing of cooking oil waste in the right way. (Satinah, Ria Arianti, Noor Hidayah, Noor Sairah, Mazni, Tearuselvi & Zanaton. (2015), p.45-52). This is an initiative to produce recycling bins that provide a special component which is the used cooking oil filtration chamber. The purpose of creating a used cooking oil separation chamber is to avoid the habit of often throwing used cooking oil waste in the sink and drain which results in clogging the drainage system. The research found that existing recycling bins require a large space, different color bins separate prices, and there is no room for filtering used cooking oil. These innovative products empower individuals to actively participate in sustainable practices, fostering a more responsible and environmentally conscious society. Through this research and development, it aims to contribute to a cleaner and healthier earth by providing practical and effective solutions to the pressing challenges of waste management.

ABSTRAK

Krisis sisa global yang semakin meningkat menimbulkan ancaman besar kepada kesihatan dan kemampan di Malaysia. Hal ini disebabkan oleh pembuangan sisa yang tidak betul, terutamanya bahan buangan seperti minyak masak, kertas, tin, kaca dan plastik. Kajian menunjukkan kesedaran masyarakat tentang pengasingan bahan sisa pepejal masih di tahap yang positif. (Mamat, Mohamad, Mohd Najib, Sumayyah. (2020). Pendidikan Amalan Kitar Semula Sisa Pepejal kepada Masyarakat. Jurnal Geografi, p.43-69). Manakala, kajian juga menunjukkan masyarakat kurang kesedaran terhadap kepentingan melupuskan sisa minyak masak dengan cara yang betul. (Satinah, Ria Arianti, Noor Hidayah, Noor Sairah, Mazni, Tearuselvi & Zanaton. (2015), p.45-52). Ini merupakan satu inisiatif untuk menghasilkan tong kitar semula yang menyediakan komponen yang istimewa iaitu ruang penapisan minyak masak terpakai. Tujuan menghasilkan ruang pengasingan minyak masak terpakai adalah untuk mengelakkan tabiat sering membuang sisa minyak masak terpakai di sinki dan longkang yang mengakibatkan sistem perparitan tersumbat. Penelitian mendapati tong sampah kitar semula yang sedia ada memerlukan ruang yang besar, berlainan warna tong sampah berasingan harga, dan tiada ruang penapisan minyak masak terpakai. Produk inovatif ini memperkasakan individu untuk mengambil bahagian secara aktif dalam amalan mampan, memupuk masyarakat yang lebih bertanggungjawab dan mementingkan alam sekitar. Melalui penyelidikan dan pembangunan ini, berhasrat untuk menyumbang kepada bumi yang lebih bersih dan sihat dengan menyediakan penyelesaian yang praktikal dan berkesan kepada cabaran mendesak pengurusan sisa.

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Garbage, or waste, is a ubiquitous by product of human activity. It covers a wide range of materials, from food waste and paper to hazardous materials and electronic equipment. Effective waste management is essential to maintaining a clean and healthy environment, protecting public health, and conserving natural resources.

Waste generation has increased significantly in recent decades, mainly due to population growth, urbanization, and rising living standards. This surge has put enormous pressure on waste management systems, leading to environmental pollution, public health concerns and resource depletion. To address this challenge, it is important to understand the different types of waste, their sources, and their impact on the environment.

There are several categories of waste, each with unique characteristics and disposal requirements. Municipal solid waste is the most common type, consisting of household waste, commercial waste, and construction debris. Hazardous waste is a subset of municipal solid waste that poses a significant risk to human health and the environment due to its toxicity, flammability or reactivity.

In recent years, there has been an increased emphasis on sustainable waste management practices. This includes reducing waste generation through recycling, reuse and composting. In addition, there is a need for better waste collection systems to ensure efficient and effective waste management.

By understanding the challenges and opportunities associated with waste management, we can work towards developing sustainable solutions that protect our environment and promote a healthier future for all.

1.2 PROJECT BACKGROUND

The issue of waste management is increasingly critical in Malaysia, where improper disposal practices contribute to significant environmental and public health challenges. One of the primary culprits is used cooking oil, which is often discarded incorrectly, leading to clogged drainage systems and increased pollution. While there is a growing awareness of the importance of recycling and waste separation, many existing solutions fall short in effectively addressing the specific disposal needs of various waste types.

Current recycling bins typically follow the principles of Reduce, Reuse, and Recycle (the 3Rs), but they often lack functionality in terms of specialized waste segregation. Many designs do not provide adequate space for filtering used cooking oil, nor do they allow for efficient classification of waste materials. This deficiency limits their effectiveness and fails to promote sustainable disposal habits among users.

Our research proposes the development of an innovative dustbin equipped with a dedicated chamber for filtering used cooking oil, alongside compartments designed for the classification of different types of waste, such as plastics, glass, and paper. This dual functionality not only addresses the specific disposal needs of cooking oil but also enhances overall waste management by encouraging proper segregation at the source.

Conducting this research is essential to bridge the gap between current waste management practices and the growing demand for more effective, user-friendly solutions. By providing a practical tool that fosters responsible disposal behaviors, our project aims to contribute to a cleaner, healthier environment while promoting sustainability within communities. This initiative not only targets the immediate waste crisis but also strives to instill long-term environmental consciousness among individuals.

1.3 PROBLEM STATEMENT

Existing recycling bins are much more expensive than Eco Sort Bin. With individual units priced at RM169 and sets of three priced at RM507. This high-cost limits accessibility for the average user, especially for households and businesses that require multiple bins. The Eco Sort Bin design aims to be more affordable, reduce financial barriers and make waste management accessible to a wider audience. This affordability can encourage the use of more effective recycling practices and encourage wider efforts to reduce waste.

Another major issue with traditional recycling bins is their large size, which makes them impractical for smaller spaces such as apartments, compact offices or kitchens with limited rooms. This size limit discourages individuals living or working in confined environments from implementing proper recycling habits. By creating a more compact and modular product, Eco Sort Bin can enable users to effectively separate and recycle waste without sacrificing valuable space.

Additionally, existing recycling bins do not have an oil filtration system, which is essential for managing used cooking oil. This absence creates challenges in kitchens and workspaces where oily waste is generated, often resulting in contamination of recycled materials. Eco Sort Bin addresses this shortcoming by integrating an oil filter, facilitating the separation and recycling of waste oil and ultimately improving overall waste management practices.
By addressing these key issues of cost, space efficiency and the need for oil filtration the Eco Sort Bin project aims to provide a comprehensive solution that improves waste management and promotes sustainable practices in a variety of settings.

1.4 OBJECTIVES

i. To develop the Eco Sort Bin's ability to effectively separate and contain various waste (paper, cans, plastic and food waste) and can filter used cooking oil.
ii. To evaluate the durability and lifespan of trash cans under prolonged use.
iii. To evaluate the overall design and usability of the Eco Sort Bin through user testing.

1.5 PROJECT QUESTIONS

i. How can the Eco Sort Bin's design be optimized to improve its efficiency in separating and containing various waste types, including used cooking oil?
ii. What materials and manufacturing processes can be employed to enhance the durability and lifespan of the Eco Sort Bin, ensuring its long-term functionality under various environmental conditions?
iii. How can user testing be conducted to assess the overall design and usability of the Eco Sort Bin, identifying any potential ergonomic issues or user interface challenges that may hinder its adoption?

1.6 PROJECT SCOPE

Our proposed project aims to create a multifunctional waste bin equipped with multiple compartments to accommodate various types of waste, including recyclables, organics, oil filtration system and general waste. This feature encourages users to sort their waste at the source and improving recycling efficiency.

By combining efficient waste segregation, recycling capabilities, and oil used filtering, the Eco Sort Bin offers a sustainable and environmentally friendly solution for both residential and commercial settings. The project aims to contribute to a cleaner and healthier planet by reducing waste disposal costs, conserving natural resources, and promoting a circular economy.

1.7 IMPORTANCE OF THE PROJECT

The Eco Sort Bin project holds significant potential in addressing the pressing environmental challenges of waste management and resource conservation. By classifying waste into four distinct categories such as paper, can, plastic, and food waste and filtering used cooking oil, this innovative bin offers a comprehensive solution for efficient recycling.

Its compact and modular design ensures seamless integration into diverse living and working spaces, making it accessible to a wide range of individuals and businesses. Moreover, the project's emphasis on cost-effectiveness eliminates financial barriers, promoting greater accessibility and adoption.

Beyond its core functionalities, the Eco Sort Bin can also contribute to community engagement and environmental education. By incorporating features such as a user-friendly interface, educational displays, the bin can encourage users to become more mindful of their consumption habits and participate actively in waste reduction efforts.

Furthermore, the Eco Sort Bin's ability to streamline waste segregation and facilitate proper disposal can have a positive impact on public health and sanitation. By reducing the presence of unsorted waste in public areas, the bin can help prevent the spread of diseases and pests, creating a cleaner and more hygienic environment for all.

In conclusion, the Eco Sort Bin project represents a promising step towards a more sustainable future. By combining efficient waste classification, compact design, and affordability, this innovative solution has the potential to revolutionize waste management practices, empower individuals and communities to make a positive impact on the environment, and contribute to a healthier and more sustainable planet.

1.7.1 SWOT ANALYSIS

STRENGTHS	WEAKNESS
- Reduces oil pollution in landfills and waterways, contributing to a cleaner environment. - Prevents oil spills and odors, improving sanitation in kitchens and other areas. - Offers a distinct feature that differentiates it from traditional dustbins.	- May be more expensive to manufacture and purchase compared to standard dustbins. - Requires regular cleaning and maintenance of the filter to ensure effective oil separation. - May need to educate consumers about the benefits and proper use of these dustbins.
OPPORTUNITIES	**THREATS**
- Increasing awareness of environmental issues can drive demand for eco-friendly products like oil-filtering dustbins. - Restaurants, hotels, and industrial facilities can benefit from these dustbins to manage oil waste efficiently.	- Existing dustbin manufacturers may introduce similar products or focus on price competition. - Reduced consumer spending can impact on demand for premium products like oil-filtering dustbins.

1.8 OPERATIONAL DEFINITION

Eco Sort Bin is used for the fact that it has compartment where waste will sort to its types such as food waste, plastics, cans and paper. Eco Sort Bin also has unique features that allows separation of used cooking to helps users collect used cooking oil easily. Thus, the words ‘Eco’ ‘Sort’ ‘Bin’ is a great indicator of the product because it describes how and what are the bin functions.

1.9 SUMMARY

In conclusion, at the end of this project Eco Sort Bin will deliver as the as the compact and modular recycling bin that has its own uniqueness.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The escalating global waste crisis necessitates innovative solutions to promote sustainable practices and minimize environmental impact. The Eco Sort Bin, a proposed recycling system designed to classify waste and filter used cooking oil, aligns with this pressing need. This literature review explores the existing research and developments in the field of waste management, recycling technologies, and smart bin systems, providing a foundation for the proposed Eco Sort Bin project.

By examining the current state of knowledge, this review aims to identify gaps in the existing literature, highlight potential challenges, and offer insights into the feasibility and potential impact of the Eco Sort Bin. This comprehensive understanding will inform the development of a robust business proposal that addresses the pressing environmental concerns and contributes to a more sustainable future.

2.2 PREVIOUS STUDIES/COMMENTS/INQUIRIES

I. WASTE RECYCLING IN MALAYSIA

Malaysia, like many other countries, faces the growing challenge of waste management due to increasing urbanization and consumption patterns. Recycling has emerged as a crucial strategy to reduce waste and conserve resources. However, despite its potential benefits, the recycling rate in Malaysia remains relatively low, hindered by various challenges.

According to studies by (Yiing Chiee Moh, Latifah Abd Manaf, Overview of household solid waste recycling policy status and challenges in Malaysia, Resources, Conservation and Recycling, Volume (2014), p.50-61), the underdevelopment of information and research on solid waste recovery and recycling is a significant issue. The lack of comprehensive data and understanding limits the ability to implement effective policies and strategies. Moreover, the existing recycling practices are often limited and fragmented, hindering the overall efficiency of the system.

The study from (Mohd Nasir, Rakmi Abdul Rahman, Theng Lee Chong, Zakaria Z, Awang M. Waste recycling in Malaysia: problems and prospects. Waste Management & Research. (2000) p.320-328). Have highlighted the importance of waste recycling in Malaysia, emphasizing its potential environmental and economic benefits. They argue that recycling can contribute to reducing landfill waste, conserving resources, and generating revenue. However, the study also identifies several obstacles that need to be addressed, including the lack of regulations and guidelines, inadequate public awareness, and limited participation in recycling programs.

To overcome these challenges and promote recycling in Malaysia, there is a need for policy directions and strategies at the municipal level. These initiatives should focus on encouraging consumer participation, improving waste collection and sorting systems, and creating a conducive environment for recycling industries. By addressing these issues, Malaysia can enhance its recycling efforts and move towards a more sustainable waste management system.

II. USED COOKING OIL RECYCLING IN MALAYSIA

Used cooking oil (UCO) is a significant environmental concern in Malaysia, contributing to pollution and clogging of drains. While recycling UCO offers various benefits, including biofuel production and animal feed, public awareness and participation in recycling programs remain low.

A study by (Mimi Suriani, Noor Irdiana, Mohd Saipuddin, The Awareness of Recycling the used cooking oil, (2020), p.30-32), found that most respondents were unaware of the recycling process for UCO and often disposed of it improperly in trash or drains. The study highlighted the need for awareness campaigns to educate the public on proper UCO disposal and the benefits of recycling.

Conducted another study from journal (Ibrahim Kabir, Mohd Rusli, Alias Radam, (Oct. 2014), p.45-51) that revealed the average monthly consumption of cooking oil in surveyed households was 4.68 kg, generating an average of 2.34 kg/month of UCO. Despite positive understanding of the importance of UCO recycling, only 12% of households were engaged in the practice. The study emphasized the role of awareness and attitudes in predicting household participation in UCO recycling.

To address these challenges, Malaysia needs to implement effective awareness campaigns and educational programs to inform the public about the environmental impacts of improper UCO disposal and the benefits of recycling. Additionally, the government should consider enforcing regulations and incentives to encourage households and businesses to participate in UCO recycling programs. By promoting UCO recycling, Malaysia can reduce its environmental footprint and contribute to a more sustainable future.

2.3 DESIGN THINKING PROCESS

Design thinking, a human-centered approach to problem-solving, has emerged as a critical tool for innovation and success in today's rapidly evolving world. This iterative process, characterized by empathy, define, ideate, prototype and testing, fosters creative thinking, empathy, and collaboration. As emphasized by (Razzouk, R., & Shute, V. (2012). What Is Design Thinking and Why Is It Important? Review of Educational Research, p.330-348) design thinking is essential for navigating the complexities of the 21st century, where technological advancements and global competition demand innovative solutions.

I. EMPATHY

In today's increasingly interconnected and complex world, empathy has emerged as a critical factor in successful organizations. Empathy, the ability to understand and share the feelings of others, fosters a more collaborative and innovative work environment. By understanding the needs, perspectives and emotions of Eco Sort Bin's target audience, Eco Sort Bin is a product that truly resonates with them. In the Eco Sort Bin context, empathy will allow designing products that not only meet the practical needs of consumers but also align with their values and motivations, ultimately driving acceptance and positive impact.

II. DEFINE

The define phase is a critical step in the design thinking process where we delve into the problem or challenge at hand. Based on the insights gained in the empathize phase, we aim to define the problem statement in a clear, concise and actionable way. This involves analyzing user research data, identifying key points and formulating specific design challenges that will guide our next efforts in the ideate phase. By establishing a solid foundation in the define phase, we can ensure that design solutions are targeted, relevant and effective in addressing our users' needs.

III. IDEATE

The ideate phase is a creative and brainstorming stage where we generate various potential solutions to the defined problem. Inspired by our understanding of user needs, pain points and insights gathered in the empathize and define phases, we aim to think creatively and unconventionally. Techniques such as brainstorming, mind mapping, and role playing can be used to encourage divergent thinking and explore multiple possibilities. It is important to foster a collaborative and open-minded environment where team members feel comfortable sharing their ideas without fear of judgment. The goal is to generate a diverse pool of potential solutions that can be evaluated and refined in the next stage. By encouraging diverse ideas, we increase our chances of finding innovative and effective solutions for our eco sort bin products.

IV. PROTOTYPE

In the prototype phase, we will transform our innovative ideas for the eco sort bin into tangible, testable models. This stage involves creating physical or digital representations of our designs, allowing us to experience and evaluate them firsthand. By building prototypes, we can identify potential issues, gather feedback from users, and refine our concepts to ensure they meet the desired functionality, usability, and aesthetic appeal.

We employ prototyping methods; it is rough representations that help us explore different design concepts and gather initial feedback. Examples include sketches, storyboards, or simple models made from cardboard or other materials.

By iteratively creating and testing prototypes, we can refine our designs, identify areas for improvement, and ensure that the eco sort bin meets the needs and expectations of our target users. The goal of the prototype phase is to create a product that is not only functional but also enjoyable and intuitive to use.

V. TEST

The test phase is the final stage of the design thinking process where we bring our eco sort bin design to life and gather feedback from potential users. This involves creating prototypes, conducting user testing, and iterating on the design based on the insights gained. By testing our eco sort bin with real users, we can identify any usability issues, gather feedback on its effectiveness and appeal, and make necessary adjustments to ensure it meets the needs and preferences of our target audience.

We will employ a variety of testing methods, including usability testing, contextual inquiry, and surveys, to gather comprehensive feedback. Usability testing will involve observing users as they interact with the eco sort bin to identify any challenges or frustrations they may encounter. Contextual inquiry will allow us to understand how the eco sort bin fits into users' daily routines and identify any potential barriers to adoption. Surveys will provide quantitative data on user satisfaction, preferences, and willingness to use the product.

Through the test phase, we aim to validate our design assumptions and identify any areas for improvement. By incorporating user feedback into our design, we can create an Eco Sort Bin that is not only functional but also enjoyable and easy to use. The insights gained from testing will also inform our go-to-market strategy and help us develop a compelling value proposition for our product.

2.4 SUMMARY

The design thinking process has proven to be a valuable framework for developing innovative and user-centered solutions. Through our Eco Sort Bin project, we have successfully applied this methodology to create a sustainable and effective waste management tool. By empathizing with users, defining the problem clearly, ideating creative solutions, prototyping our design, and testing with real users, we have developed a product that addresses the challenges of waste sorting and promotes environmental sustainability.

The Eco Sort Bin is designed to be user-friendly, visually appealing, and easy to integrate into various environments. It features a clear and intuitive interface that guides users through the sorting process, while its compact design makes it suitable for both residential and commercial settings. By encouraging proper waste segregation and reducing contamination, the Eco Sort Bin contributes to more efficient waste collection and recycling efforts, ultimately benefiting the environment and communities.

As we move forward, we will continue to refine and improve the Eco Sort Bin based on user feedback and evolving market needs. We believe that this innovative product has the potential to make a significant impact on waste management practices and promote a more sustainable future.

CHAPTER 3: METHODOLOGY

3.1 INTRODUCTION

The purpose of methodology is to establish an underlying paradigm that supports the chosen research. Certain data collection procedures are covered under the research methods. The study, the participants, the methods (questionnaires, interviews, observations, etc.) used to gather research data from participants, as well as how to assess the information gathered from participants, will all be covered in this chapter. Any requirement to analyse the process to gain insights consequently. The technique also requires a systematic process to satisfy the requirements of scientific, scientific methodology, and quality. In this chapter, the term "methodology" refers to the process of putting a research or piece of knowledge into practice to achieve its goals. The study will be more meticulous and organized overall.

3.2 PROJECT DESIGN

The Eco Sort Bin project focuses on creating a smart and efficient waste management system that can automatically sort different types of waste into appropriate categories, such as recyclables, organic waste, and general trash. This system aims to promote sustainability by reducing human error in waste sorting, increasing recycling rates, and minimizing the environmental impact of waste.

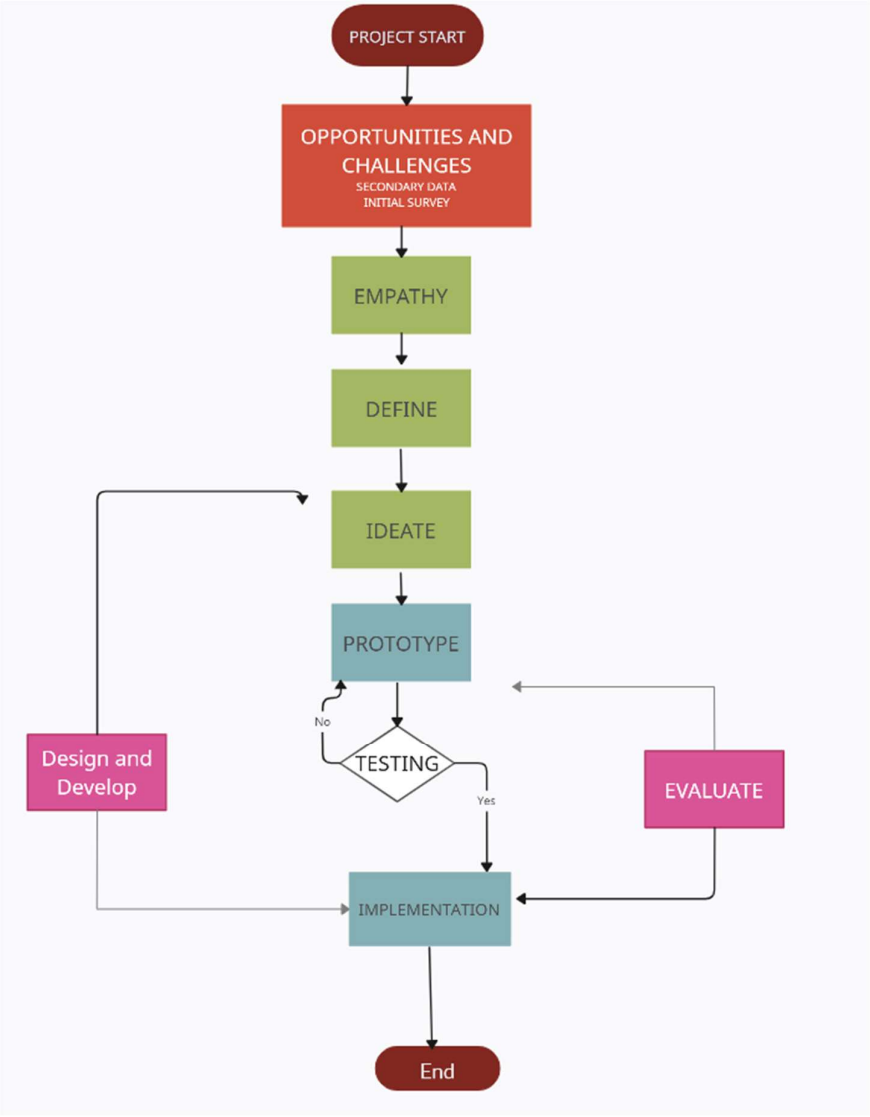


Figure 3.2.1: Project Design Framework

3.3 PROJECT PRODUCTION METHODS/PROCEDURES/TECHNIQUES

The Design Thinking Process was used to design the product in this project. It takes a significant amount of time to Empathize, Define, Ideate, Prototype and Test to guarantee that the product development process follows all the necessary procedures. Aside from that, this strategy is extremely beneficial to our project because having clearly defined stages makes it easier to create great Eco Sort Bin, which in turn helps our product follow all the aspects necessary to achieve the objective of creation Eco Sort Bin.

DESIGN THINKING PROCESS

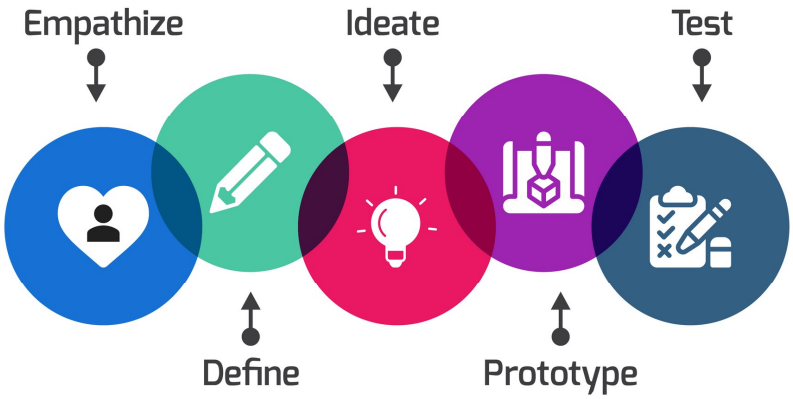


Figure 3.3.1: Design Thinking Process from (www.vrogue.co)

I. EMPATHY

Empathy is the ability to understand and share the feelings of another person. It involves putting yourself in someone else's shoes and experiencing their emotions as if they were your own. Empathy is a crucial human trait that helps us connect with others, build relationships, and foster compassion.

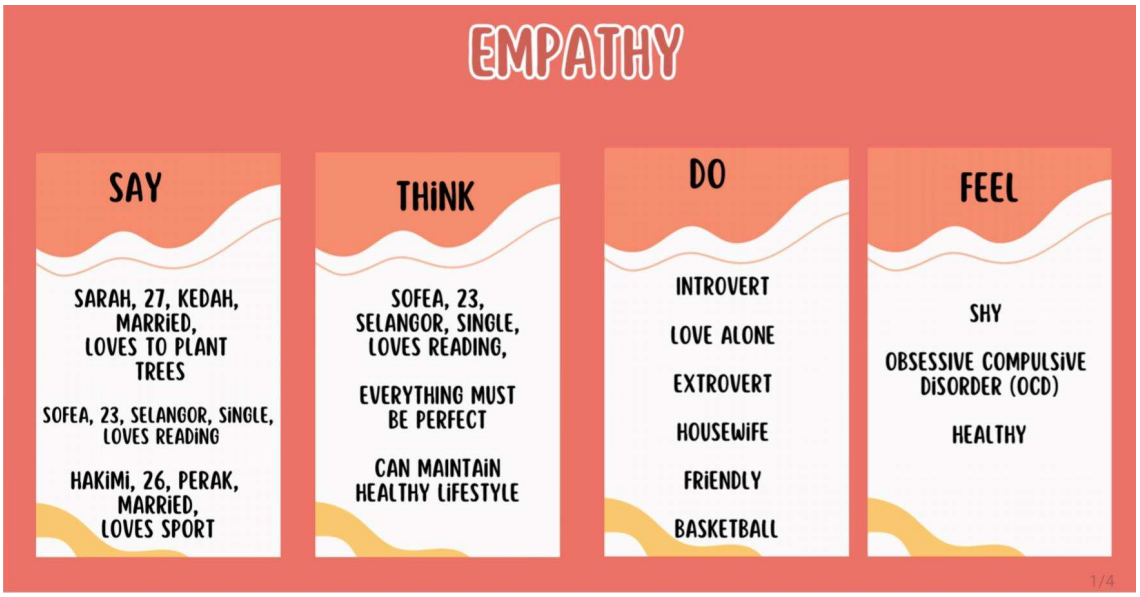


Figure I: Eco Sort Bin empathy

II. DEFINE

This involves gathering information, conducting research, and analysing user needs and pain points. The goal of the define stage is to create a concise and actionable problem statement that will guide the design process and ensure that the final solution effectively addresses the identified need. By clearly defining the problem, designers can focus their efforts on creating innovative and relevant solutions.

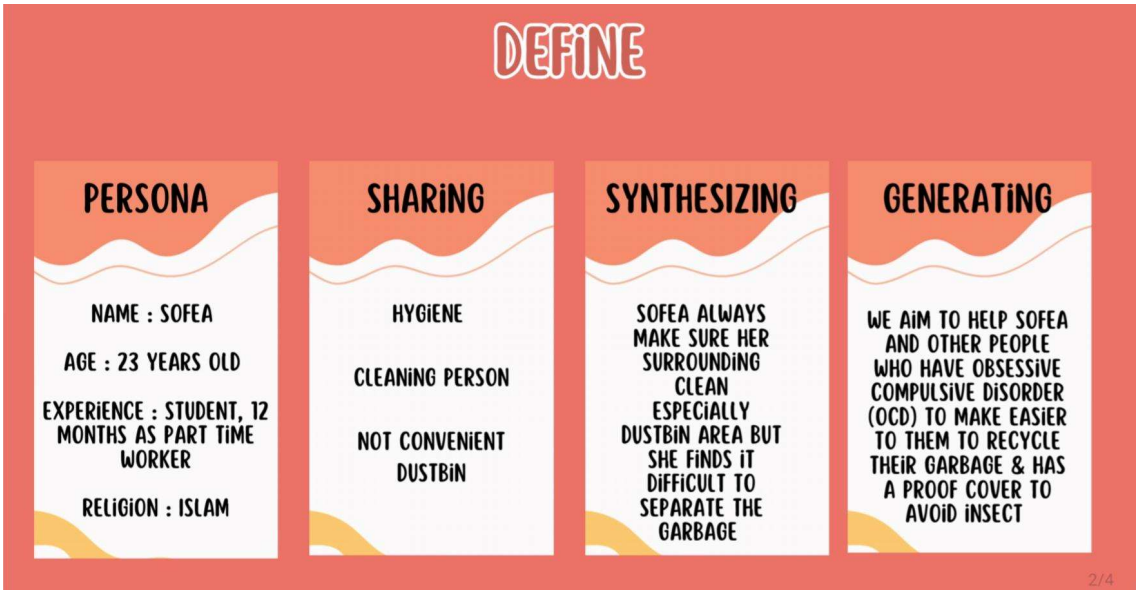


Figure II: Eco Sort Bin define

III. IDEATE

This involves brainstorming, sketching, and exploring various possibilities without judgment. The goal is to generate a wide range of ideas, both conventional and unconventional, that can potentially solve the problem. Ideation is a key stage in design thinking as it sparks creativity and encourages innovative solutions. By generating a diverse set of ideas, designers can increase their chances of finding a solution that is both effective and desirable.

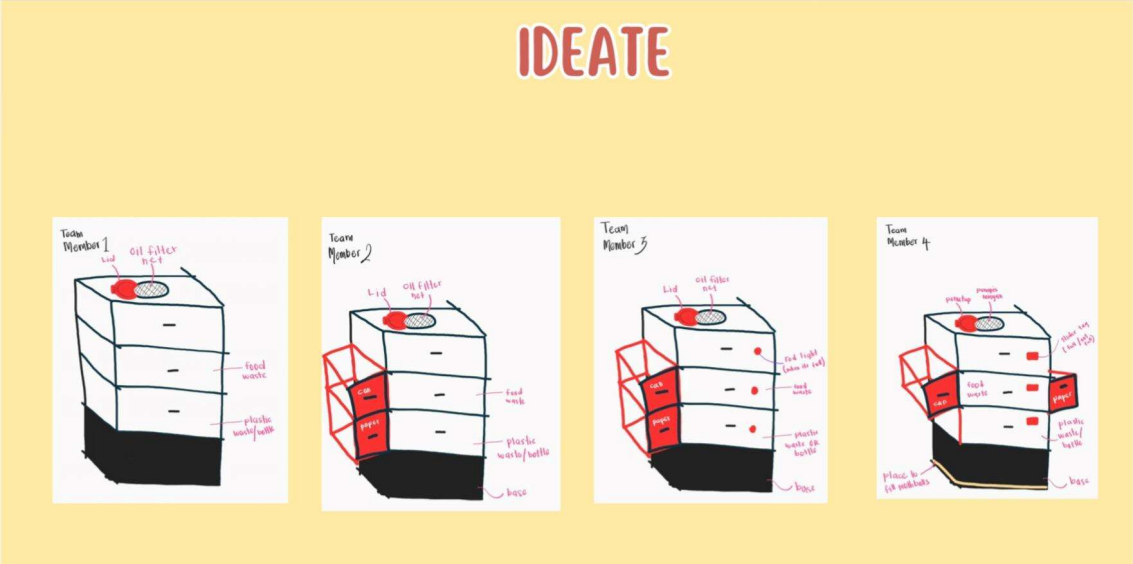


Figure III: Eco Sort Bin ideate

IV. PROTOTYPE

This allows designers to test and refine their ideas before investing significant resources into development. Prototypes can be low fidelity, such as sketches or paper models, or high-fidelity, such as working models or digital mock-ups. The goal of prototyping is to gather feedback from users and identify areas for improvement. By testing prototypes early in the design process, designers can ensure that the final solution meets the needs and preferences of the target audience.

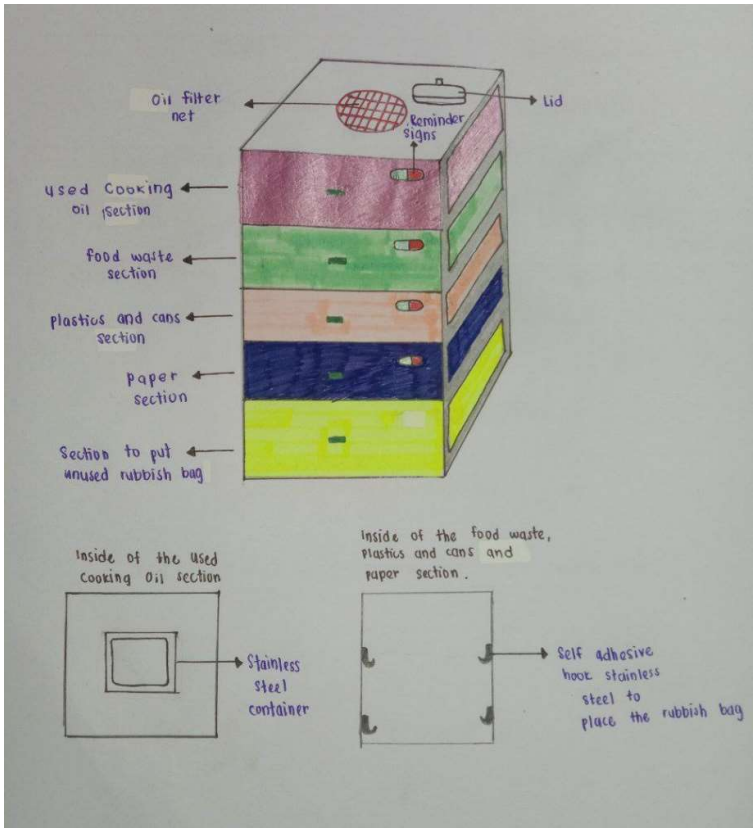


Figure IV: Eco Sort Bin prototype

V. TESTING

The Eco Sort Bin effectively addresses a common household and commercial waste management problem the need for efficient oil filtration and waste segregation. Its novel design with an integrated oil filter compartment sets it apart from traditional recycling bins. However, several aspects require further consideration. Questions remain about the bin's odour prevention capabilities, the durability of its materials, and effective user education strategies. To enhance the bin's functionality, incorporating smart technology for real-time monitoring and waste level alerts could be beneficial. Additionally, clear labelling and instructions can optimize user interaction. To further improve sustainability, exploring energy-saving features like LED lighting or solar-powered sensors could be considered. Partnerships with recycling facilities can provide incentives for proper waste disposal and ensure the efficient recycling of collected materials. By addressing these areas and continuing to innovate, the Eco Sort Bin has the potential to revolutionize waste management practices and contribute to a more sustainable future.

3.4 MATERIALS AND EQUIPMENT

Figure 3.4.1: Plastic rack

This plastic rack come with multiple drawers that allow users to separate and classify the waste. Users also can classify the waste according to the bin's colour. Such as, pink section is for used cooking oil, green section is for food waste, orange section is for plastics and cans, blue section is for paper and yellow section is for to put unused rubbish bag. The reason we choose this plastic rack because of the compact design of the rack makes it suitable for various space without taking up too much space. It is durability because made from plastic, the rack is generally durable and long-lasting, ensuring its effectiveness for waste sorting and storage over time.

Figure 3.4.2: Oil filter and container

It traps any remaining oil droplets or particles that may have slipped through the lid. By capturing oil and other debris. The strainer can be easily removed and emptied into the eco sort bin, making it convenient to dispose of the collected oil waste.

Figure 3.4.3: Status indicator slider

A status indicator slider can be used to visually represent the fullness of the bin.

3.5 DATA ANALYSIS METHOD

A Google Form survey was created to collect structured data from a target audience. The survey included likert scale options, allowing for efficient data collection and analysis. By distributing the survey through various channels, such as social media, and online communities, we were able to reach a wide range of potential customers and gather valuable insights into their preferences, needs, and willingness to pay.

In-depth interviews were conducted with key stakeholders, including potential customers, industry experts, and competitors. These interviews provided valuable qualitative data, such as detailed feedback, opinions, and perspectives. By engaging in open-ended conversations, we were able to gain a deeper understanding of the market dynamics, identify potential challenges, and uncover opportunities for our business.

The combination of these two methods allowed us to collect both quantitative and qualitative data, providing a more comprehensive and nuanced understanding of the market and our target audience. The survey data provided valuable insights into customer preferences and market trends, while the interviews offered a deeper understanding of the underlying motivations and challenges faced by potential customers. This combined approach strengthened the validity and reliability of our research findings, enabling us to make informed decisions and develop a robust business proposal.

3.6 SUMMARY

The design thinking process has proven to be a valuable framework for developing innovative and user-centered solutions. Through our Eco Sort Bin project, we have successfully applied this methodology to create a sustainable and effective waste management tool. By empathizing with users, defining the problem clearly, ideating creative solutions, prototyping our design, and testing with real users, we have developed a product that addresses the challenges of waste sorting and promotes environmental sustainability.

The Eco Sort Bin is designed to be user-friendly, visually appealing, and easy to integrate into various environments. It features a clear and intuitive interface that guides users through the sorting process, while its compact design makes it suitable for both residential and commercial settings. By encouraging proper waste segregation and reducing contamination, the Eco Sort Bin contributes to more efficient waste collection and recycling efforts, ultimately benefiting the environment and communities.

As we move forward, we will continue to refine and improve the Eco Sort Bin based off user feedback and evolving market needs. We believe that this innovative product has the potential to make a significant impact on waste management practices and promote a more sustainable future.

CHAPTER 4: RESEARCH FINDINGS AND DISCUSSION

4.1 INTRODUCTION

Through a rigorous data collection and analysis process, this chapter delves into the performance, user acceptance, and potential environmental impact of the Eco Sort Bin product. The research methodology, rooted in the principles of Design Thinking, enabled the collection of comprehensive data from a diverse sample of participants. The investigation explored various aspects of the product, including its ease of use, durability, aesthetic appeal, and effectiveness in reducing waste contamination.

By examining these key factors, this study aims to gain a profound understanding of how well the Eco Sort Bin product aligns with the needs and expectations of its users, while also making a substantial contribution to a more sustainable future. The findings presented in this chapter offer valuable insights into the product's strengths, weaknesses, and areas for improvement. Ultimately, this research serves as a foundation for informed decision-making and future product development, with the goal of creating innovative solutions that promote environmental sustainability and enhance user experiences.

4.2 RESPONDENTS DEMOGRAPHIC PROFILES

In social science research, demographic profiling is a fundamental technique for understanding the context of respondent's opinions and experiences. By collecting data on gender, occupation, and marital status, researchers can gain valuable insights into the diverse perspectives represented within their sample. These demographic variables serve as a framework for analysing how social and cultural factors may influence respondents' attitudes and behaviours, contributing to a more nuanced interpretation of the study's findings.

Respondents Demographic		Frequency	Percentage %
Gender	Male	14	37.8
	Female	23	62.2
Marital status	Single	9	24.3
	Married	23	62.2
	Others	5	13.5
Occupation	Employed	21	56.8
	Retired	4	10.8
	Others	12	32.4

Table 4.2.1: Profile of respondents

Table 1 provides a breakdown of the demographic characteristics of the respondents who participated in the study. Out of the 37 respondents, 14 (37.8%) were male and 23 (62.2%) were female. In terms of marital status, 9 respondents (24.3%) were single, 23 (62.2%) were married, and 5 (13.5%) belonged to the "Others" category. Regarding occupation, 21 respondents (56.8%) were employed, 4 (10.8%) were retired, and 12 (32.4%) fell under the "Others" category. These demographic details offer a glimpse into the characteristics of the sample population and can be considered when interpreting the study findings.

4.3 DESCRIPTIVE STATISTICS

Descriptive statistics, a fundamental tool in data analysis, provides a comprehensive overview of data by calculating measures of central tendency (mean, median, mode) and dispersion (standard deviation, variance). SPSS, a powerful statistical software, facilitates this process by generating these statistics efficiently. By analysing data through descriptive statistics, researchers can gain valuable insights into the data's central value, variability, and distribution. This knowledge forms the foundation for more advanced statistical analyses, enabling data-driven decision-making and informed conclusions.

No.	Items	N	Minimum	Maximum	Mean	Standard deviation
SA1	The Eco Sort Bin is easy to use and understand	37	3	5	4.86	419
SA2	The oil filter compartment is effective in separating oil from other waste	37	3	5	4.86	419
SA3	The Eco Sort Bin helps me to recycle more effectively	37	3	5	4.81	518
SA4	The Eco Sort Bin is aesthetically pleasing	37	3	5	4.84	501

Table 4.3.1: Descriptive statistics for section A

The descriptive statistics in Table 1 provide a comprehensive overview of the responses to the four items in Section B. Each item was rated on a Likert scale ranging from 3 to 5, with 37 respondents participating. The mean score for each item indicates the average rating, with SB1 and SB2 receiving the highest mean scores of 4.86, suggesting that respondents found the Eco Sort Bin's space-saving design appealing and the oil filter compartment a valuable feature. SB3, with a mean score of 4.81, reveals that respondents believe the Eco Sort Bin is environmentally friendly. Finally, SB4, with a mean score of 4.84, indicates that respondents are interested in purchasing the Eco Sort Bin. The standard deviation for each item provides information about the variability in responses. The relatively low standard deviations for all items suggest that the responses were consistent across respondents.

No.	Items	N	Minimum	Maximum	Mean	Standard deviation
SB1	The space-saving design of the Eco Sort Bin is appealing	37	3	5	4.86	419
SB2	The oil filter compartment is a valuable feature	37	3	5	4.86	419
SB3	The Eco Sort Bin is environmentally friendly	37	3	5	4.81	518
SB4	I would be interested in purchasing this Eco Sort Bin	37	3	5	4.84	501

Table 4.3.2: Descriptive statistics for section B

The descriptive statistics in Table 1 provide a comprehensive overview of the responses to the four items in Section A. Each item was rated on a Likert scale ranging from 3 to 5, with 37 respondents participating. The mean score for each item indicates the average rating, with SA1 and SA2 receiving the highest mean scores of 4.86, suggesting that respondents found the Eco Sort Bin easy to use and understand, and effective in separating oil from other waste. SA3, with a mean score of 4.81, reveals that respondents believe the Eco Sort Bin helps them recycle more effectively. Finally, SA4, with a mean score of 4.84, indicates that respondents find the Eco Sort Bin aesthetically pleasing. The standard deviation for each item provides information about the variability in responses. The relatively low standard deviations for all items suggest that the responses were consistent across respondents.

4.3 TESTING

A feedback grid is a powerful tool for organizing and analysing feedback, whether it's for a product, service, or process. By categorizing feedback into four distinct quadrants, it provides a structured approach to understanding both strengths and weaknesses. The first quadrant, "Things that worked," highlights the positive aspects of the subject matter. By identifying what's been successful, we can leverage these strengths in future iterations and build upon them to further enhance the product or service. The second quadrant, "Needs improvement/change," focuses on areas that require modification or enhancement. Pinpointing specific weaknesses or shortcomings allows us to prioritize improvements and allocate resources effectively. The third quadrant, "Unanswered questions," captures any uncertainties or ambiguities that arise during the feedback process. By addressing these questions, we can gain a deeper understanding of the subject matter and make informed decisions about future actions. The fourth quadrant, "New ideas moving forward," is where innovative ideas and suggestions for future development are captured. This quadrant encourages creative thinking and fosters a culture of continuous improvement. By exploring these new ideas, we can identify potential opportunities for growth and innovation. By systematically categorizing feedback using a feedback grid, we can streamline the analysis process, identify key insights, and prioritize actions. This collaborative and constructive approach to feedback fosters a culture of learning and improvement, ultimately leading to better outcomes.

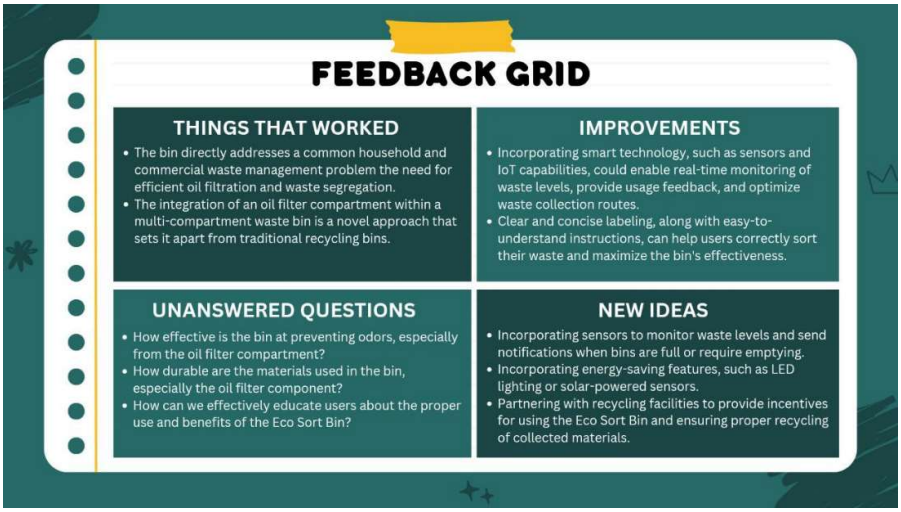


Figure 4.3.1: Feedback grid

4.4 DISCUSSION

The findings of this study demonstrate that the Eco Sort Bin is perceived as a user-friendly and effective waste management solution. Respondents expressed high levels of satisfaction with the bin's ease of use and understanding, highlighting its intuitive design and straightforward operation. The oil filter compartment, a unique feature of the Eco Sort Bin, was particularly well-received, as it effectively separates oil from other waste, contributing to improved recycling efficiency and reduced environmental impact. Moreover, the bin's aesthetically pleasing design and space-saving features were recognized as positive attributes, making it a desirable addition to homes and businesses. These findings align with the growing consumer trend towards sustainable products and practices, indicating a strong market potential for the Eco Sort Bin. The high level of purchase intent expressed by respondents further reinforces this notion, suggesting that there is a significant demand for innovative and user-friendly waste management solutions like the Eco Sort Bin.

4.4. SUMMARY

This study aimed to evaluate the Eco Sort Bin's performance, user acceptance, and potential environmental impact. By employing a Design Thinking approach and conducting a survey, the research gathered insights into user perceptions of the bin's ease of use, effectiveness, and aesthetic appeal.

The demographic analysis of respondents provided a foundation for understanding the diverse perspectives represented in the sample. The survey results indicated high levels of satisfaction with the bin's usability, oil filtration capabilities, and overall design. Respondents also expressed a strong interest in purchasing the Eco Sort Bin, suggesting a promising market potential for this innovative waste management solution.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter delves into the findings of the study, interpreting the results in light of relevant theories and prior research. The discussion is structured around the research objectives and questions, examining how the findings align with or diverge from existing knowledge. The analysis aims to identify significant trends and patterns, drawing conclusions that contribute to the understanding of user perceptions and behaviours related to the Eco Sort Bin.

By exploring the implications of the findings, this chapter seeks to highlight the potential impact of the Eco Sort Bin on sustainable waste management practices. It may also propose innovative ideas or recommendations for future research and development, such as exploring additional features or targeting specific user segments. Ultimately, the goal is to leverage the insights gained from this study to drive positive environmental change.

5.2 CONCLUSION

The escalating global waste crisis, coupled with increasing environmental concerns, necessitates innovative solutions to promote sustainable waste management practices. The Eco Sort Bin emerges as a promising response to these challenges, offering a practical and efficient approach to waste segregation and disposal. By addressing the limitations of traditional recycling bins, such as high cost, bulky size, and lack of oil filtration capabilities, the Eco Sort Bin aims to empower individuals to adopt responsible waste management habits.

This research project underscores the significance of affordable, compact, and multifunctional waste management solutions. By providing a dedicated space for used cooking oil filtration and multiple compartments for various waste types, the Eco Sort Bin encourages proper waste segregation and reduces contamination. This, in turn, contributes to improved recycling efficiency and a cleaner environment.

The potential impact of the Eco Sort Bin extends beyond individual households and businesses. By promoting sustainable practices at the source, it can contribute to broader environmental goals and reduce the burden on waste management infrastructure. As consumer awareness of sustainability grows, the demand for innovative products like the Eco Sort Bin is likely to increase. By addressing the specific needs of users and offering a practical solution to a pressing environmental problem, the Eco Sort Bin has the potential to make a significant positive impact on communities and the planet.

5.3 RECOMMENDATIONS

To maximize the impact and adoption of the Eco Sort Bin, several strategic recommendations can be considered. Firstly, expanding the product range to cater to diverse needs is crucial. By offering larger capacity bins for commercial settings, compact models for smaller households, and specialized versions for specific industries, the Eco Sort Bin can reach a wider market and address a variety of waste management challenges.

Secondly, robust marketing and awareness campaigns are essential to promote the benefits of the Eco Sort Bin and encourage its widespread adoption. Leveraging social media platforms, digital advertising, and public relations can effectively reach target audiences and generate excitement around the product. Additionally, organizing educational workshops and partnering with local authorities can help raise awareness about the importance of waste segregation and the role of the Eco Sort Bin in sustainable waste management.

Furthermore, exploring opportunities for customization can enhance the product's appeal and tailor it to individual preferences. Offering personalized labels, colours, or additional features can create a sense of ownership and encourage user engagement.

Finally, continuous research and development efforts are vital to ensure the long-term relevance and sustainability of the Eco Sort Bin. By investing in innovative technologies, such as advanced filtration systems or smart sensors, the product can stay ahead of the curve and adapt to evolving waste management challenges. Additionally, exploring eco-friendly materials and sustainable manufacturing processes can further reduce the environmental impact of the bin's production and disposal.

By implementing these recommendations, the Eco Sort Bin can position itself as a leading solution in sustainable waste management, driving positive environmental change and contributing to a cleaner and healthier future.

5.4 PROJECT LIMITATIONS

The Eco Sort Bin project, while a promising initiative, faces several limitations that could potentially hinder its effectiveness. One significant challenge lies in the potential for user error, as incorrect waste disposal can compromise the recycling process. To address this issue, clear and concise labelling, along with user-friendly instructions, is crucial. Additionally, regular public awareness campaigns can help educate users about proper waste segregation and the benefits of using the Eco Sort Bin.

Another limitation relates to the durability of the bin's components, particularly the oil filter. Factors such as usage frequency, maintenance practices, and the quality of the materials used can influence the long-term performance of these components. To mitigate this, regular inspection and replacement of worn parts are essential. Moreover, the development of durable and efficient oil filtration technologies can further enhance the bin's functionality.

The widespread adoption of the Eco Sort Bin is contingent upon various factors, including its affordability, accessibility, and perceived value. While the project aims to make the bin affordable and accessible to a wide range of users, economic constraints and logistical challenges may limit its distribution and adoption. Furthermore, public awareness campaigns and government policies that promote sustainable waste management practices can significantly influence the success of the Eco Sort Bin. By addressing these limitations and implementing effective strategies, the Eco Sort Bin project can contribute to a more sustainable future.

5.5 SUMMARY

The Eco Sort Bin project represents a significant step towards sustainable waste management. By addressing the limitations of traditional recycling bins, such as high cost, bulky size, and lack of oil filtration, the Eco Sort Bin offers a practical and effective solution. The research findings demonstrate the bin's potential to significantly reduce waste, conserve resources, and promote environmental consciousness.

However, the project is not without its limitations. User error, the durability of components, and widespread adoption are key challenges that need to be addressed. To mitigate these issues, clear labelling, user education, and regular maintenance are crucial. Additionally, continuous research and development efforts are necessary to improve the bin's design, functionality, and materials.

To maximize the impact of the Eco Sort Bin, several recommendations are proposed. Expanding the product range, implementing robust marketing campaigns, exploring customization options, and investing in ongoing research and development are essential steps to ensure the bin's long-term success. By addressing these limitations and implementing these recommendations, the Eco Sort Bin can become a leading solution in sustainable waste management, contributing to a cleaner and healthier future.

REFERENCES

Barsalou, L. W. (n.d.). *Defne Design Thinking.* Retrieved from https://eprints.gla.ac.uk/148305/7/148305.pdf

Mamat, M. &. (2020). Pendidikan Amalan Kitar Semula Sisa Pepejal kepada Masyarakat. *Jurnal Geografi*, 43-69.

Mimi Suriani, N. I. (2020). *The Awareness Of Recycling The Used Of Cooking Oil.* Retrieved from https://www.jcreview.com/admin/Uploads/Files/61b9976ef31be2.64921685.pdf

Mohd Nasir Hassan, R. A. (2000). *Waste recycling in Malaysia: problems and prospects*. Retrieved from SageJournals: https://journals.sagepub.com/doi/abs/10.1177/0734242x0001800404

Rim Razzouk, V. S. (September , 2012). *What Is Design Thinking and Why Is It.* Retrieved from file:///C:/Users/Faiz/Pictures/What_Is_Design_Thinking_and_Why_Is_It_Im.pdf

Satinah Binti Awang, R. A. (2015). *Kesedaran Kitar Semula Sisa Minyak Masak dalam Kalangan Pelajar Sarjana Pendidikan Sains.* Retrieved from https://journalarticle.ukm.my/10868/1/Satinah-Awang.pdf

Yiing Chiee Moh, L. A. (2014). Retrieved from ScienceDirect: (https://www.sciencedirect.com/science/article/pii/S0921344913002498)

APPENDICES

I. GANTT CHART

Activities	Weeks															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Briefing about Business Project with lecturer																
Meeting and consult with supervisor																
Proposal report introduction																
Proposal presentation																
Proposal report literature review																
Proposal report methodology																
Collect data &preparation																
Product development																
Product testing																
Logbook submission																
Final report submission																
Final presentation submission																

II. COST OF PROJECT

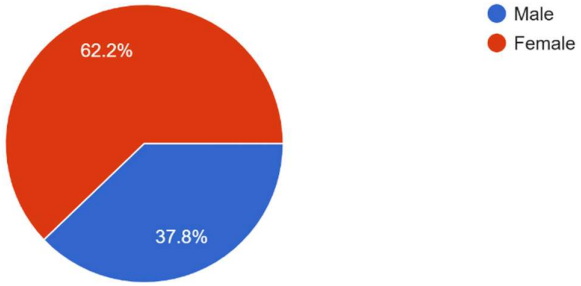
Item	Unit	Price per unit (RM)	Price (RM)
Plastic rack	1	50.00	50.00
Spray paint (Gold colour)	1	6.90	6.90
Spray paint (Blue colour)	1	6.90	6.90
Spray paint (Green colour)	1	7.50	7.50
Spray paint (Orange colour)	1	7.90	7.90
Plastic primer spray	1	27.90	27.90
Sandpaper	4	1.00	4.00
Oil filter container	1	10.80	10.80
Status indicator slider	5	6.00	30.00
Aluminium oil container	1	25.00	25.00
Total (RM)			**179.90**

III. PIE CHART & GRAPH FROM SURVEY

Section A: demographics of respondents

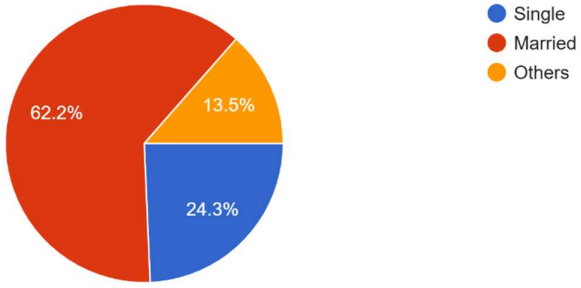
Gender

37 responses



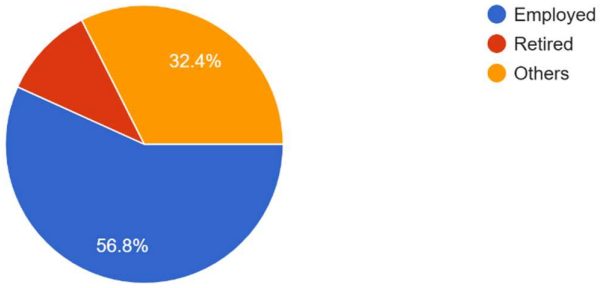
Marital status

37 responses



Occupation

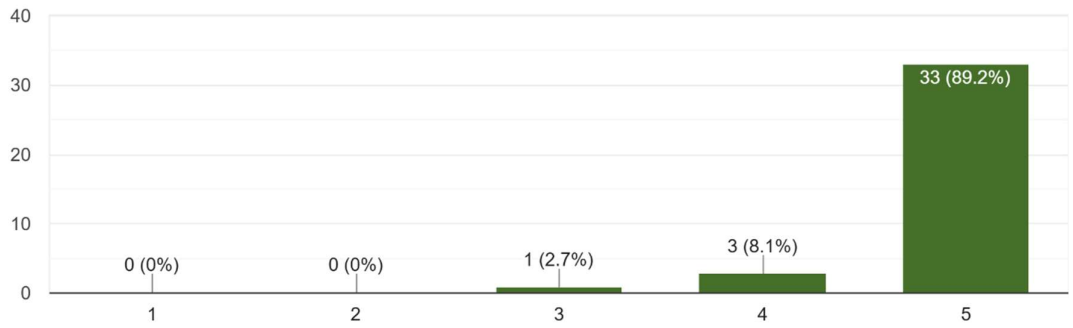
37 responses



Section B: Effectiveness of the Eco Sort Bin

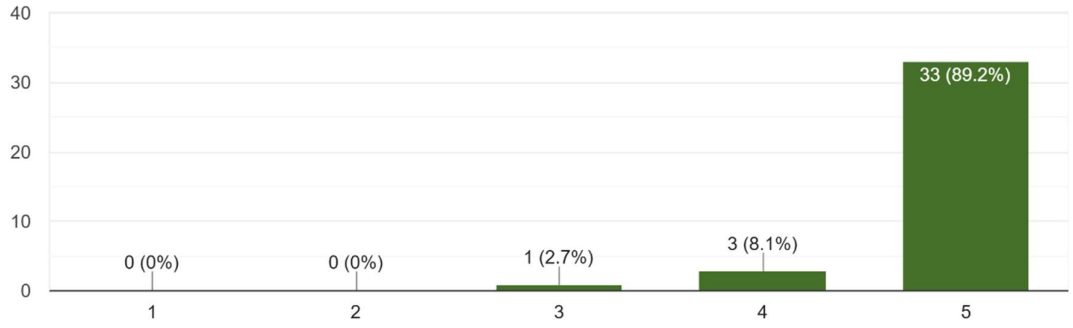
1. The Eco Sort Bin is easy to use and understand.

37 responses



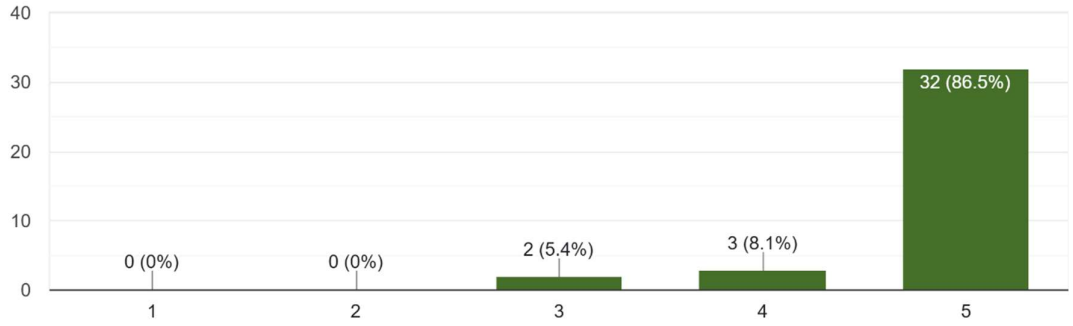
2. The oil filter compartment is effective in separating oil from other waste.

37 responses



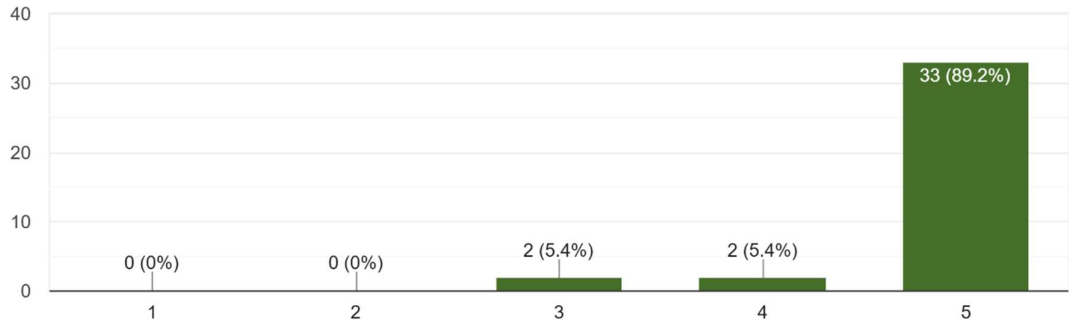
3. The Eco Sort Bin helps me to recycle more effectively.

37 responses



4. The Eco Sort Bin is aesthetically pleasing.

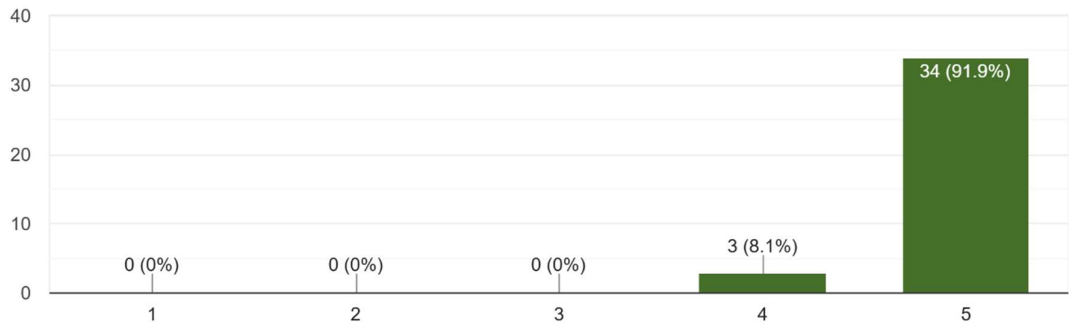
37 responses



Section C: Characteristics, features, and purchase intent.

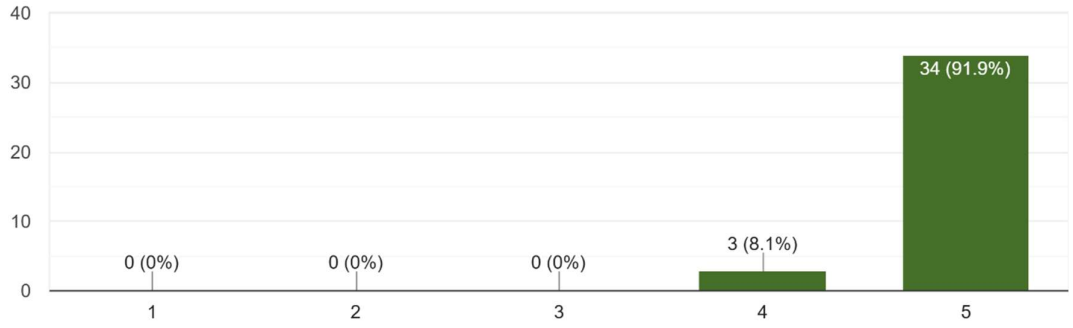
1. The space-saving design of the Eco Sort Bin is appealing.

37 responses



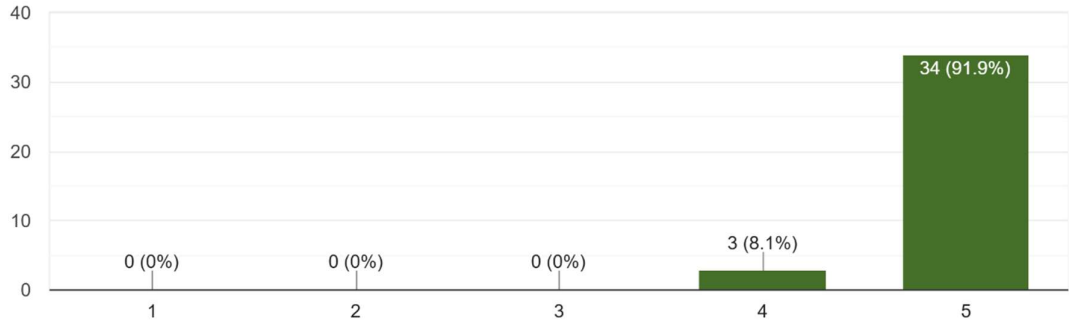
2. The oil filter compartment is a valuable feature.

37 responses



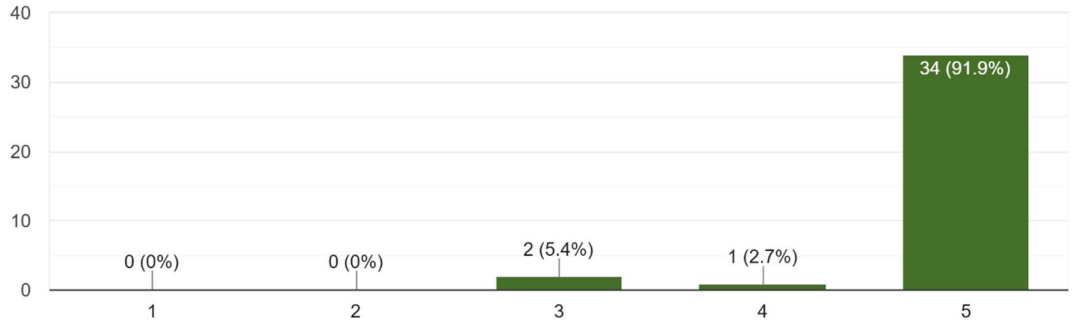
3. The Eco Sort Bin is environmentally friendly.

37 responses



4. I would be interested in purchasing this Eco Sort Bin.

37 responses



IV. RAW DESCRIPTIVE STATISTICS DATA FROM SPSS

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
@1. TheEcoSortBiniseasytouseandunderstand	37	3	5	4.86	.419
@2. Theoilfiltercompartmentiseffectiveinseparatingoilfro	37	3	5	4.86	.419
@3. TheEcoSortBinhelpsmetorecyclemoreeffectively	37	3	5	4.81	.518
@4. TheEcoSortBinisaestheticallypleasing	37	3	5	4.84	.501
@1. Thespacesavingdesignofthe EcoSortBinisappealing	37	4	5	4.92	.277
@2. Theoilfiltercompartmentisavaluablefeature	37	4	5	4.92	.277
@3. TheEcoSortBinisenvironmentallyfriendly	37	4	5	4.92	.277
@4. Iwouldbeinterestedinpurchasingthis EcoSortBin	37	3	5	4.86	.481
Valid N (listwise)	37				