

Bachelor Degree Project



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THE SUSTAINABLE MODULAR JEWELLERY BOX

for Pablo Joyería Relojería and Olby Design

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Certificate of Originality

This project report was submitted on 31 May 2023 by Eva Moreno Castillo to the University of Skövde as a part of obtaining credits on basic level G2E within Product Design Engineering.

I hereby confirm that for all the material included in this report, which is not our own, I have reported a source and that I have not – for obtaining credits – included any material that I have earlier obtained credits for within my academic studies.

A handwritten signature in black ink, appearing to read 'E. Moreno Castillo', with a large, stylized flourish above the name.

Eva Moreno Castillo

Abstract

Small shops in small villages are facing the threat of extinction, leading to the loss of traditional craftsmanship and cultural heritage. Simultaneously, the rise of fast fashion has introduced a culture of disposable products, resulting in unsustainable environmental consequences. Addressing these issues, this thesis, conducted at the University of Skövde by Eva Moreno Castillo in collaboration with two artisan companies, Pablo Joyería Relojería and Olby Design AB, aims to repurpose jewellery packaging to promote awareness in society and mitigate the growing problem of waste.

The initial phase of the research involved a preliminary study that explored the current market and existing solutions for jewellery packaging, as well as the needs and preferences of jewellers. Additionally, the study focused on understanding the processes involved in producing jewellery boxes and how sustainable and ethical practices could be implemented. Building on this foundation, methods were explored to engage users in the design process, an approach referred to as Collaborative Design.

Throughout the research, creative methods inspired by design thinking were employed. Collaborative workshops, brainstorming sessions, various sketching forms, mockups, and a morphological matrix were utilised, involving users in designing and evaluating three proposed concepts. Close collaboration with Olby Design AB and Pablo Joyería Relojería facilitated the final concept selection through comprehensive assessment.

The culmination of this thesis is the proposal of a concept that effectively addresses customer demands, product requirements, and sustainable processes. A life cycle analysis of the chosen concept will be conducted to validate these claims, providing further evidence of its environmental and social benefits.

In conclusion, this thesis presents a viable solution to repurpose jewellery packaging and offers product and process enhancement recommendations. These findings contribute to the larger discourse on sustainable design and encourage further exploration and innovation in the field.

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PREFACE

First of all, I would like to start by introducing myself. My name is Eva, and I grew up in Alhama de Granada, a small town in Spain. It is here that my grandfather 1970 started an artisan watch and jewellery company that my family continues. Before I started my thesis, I began my search for companies. I visited big companies, where I learnt a lot but missed a personal and dedicated approach. It was not by chance that I decided to change direction, looking for small, handcrafted companies, where I found Olby Design, a. This handcrafted furniture company has been working and producing handmade furniture in Skövde since 1980. The first contact I had with the company was more than pleasant. Tina, the owner of Olby Design, showed me how much experience she has in this sector. Here, I realised the remarkable similarities between the two companies, as they both wanted to convey the same values: Craftsmanship and dedication. Thus, I decided to start to take a closer look at these companies, looking at the problems they are facing today. Moreover, this is where this project, this adventure, began.

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1 INTRODUCTION

In this part of the report, an overview of the process will be explained, including an explanation of the companies and their backgrounds, the problem that is going to be faced in the design process with these companies, the goals that are going to be achieved, the stakeholders and the strategy that is going to be followed.

1.1 OLBY DESIGN AND PABLO JOYERÍA RELOJERÍA

Two companies carry out the project; Pablo Joyería Relojería and Olby Design. Firstly, the company Pablo Joyería Relojería is a family business of jewellery and handmade watches since 1970, founded in Spain, where the student has experience working in it and knows it perfectly well, as it is her family's company. Secondly, Olby Design was a Swedish handcrafted furniture design company in 1980, which no longer manufactures more than small furniture units as the owner Tina Olby is retired. However, the latter accepted the challenge of creating a product hand in hand with Pablo Joyería Relojería. Both have in common the craftsmanship and experience of years of work in the jewellery and furniture sectors.

All of this is a collaboration of professionals with a student of industrial design engineering, where the experiences of companies and design initiatives of a novice designer are shared to develop a common project: A design to create a New Concept of Sustainable Modular Jewellery Box, trying and exploring ways for the user to be part of each process.

1.2 PROBLEM DESCRIPTION

The present project draws upon both experiential knowledge acquired through employment at Pablo Joyería Relojería and a study of the challenges companies face, as outlined in Chapter 3.1. The insights gained from these sources have been incorporated into the project's development to add unique value to the product by addressing these issues. While it is acknowledged that specific challenges are universal in nature and cannot be fully resolved, the project's design aims to contribute in a meaningful manner towards their mitigation.

- *Big Cities Offer More Opportunities for Personal and Professional Growth*
Rural-to-urban migration trend of searching for more excellent opportunities has led to a decline in small businesses in rural communities, including enterprises such as Pablo Joyería Relojería. The challenges faced by these entities are exacerbated by the dominant presence and formidable marketing resources of larger corporations, which render it exceedingly difficult for small-scale enterprises to thrive. As a result, the future of small businesses such as Pablo Joyería Relojería remains uncertain.
- *The Phenomenon of Programmed Obsolescence, Coupled with the Prevalence of Fast Fashion, as a result of the Dearth of Durable Goods Over Time*
It is a natural process that exists nowadays where companies design their products to last a certain time, and after this time, they end up breaking, forcing us to buy another one, it is strange that the products of our grandmothers continue working or have

objects from their childhood and nowadays they do not last us more than X time. Along the same lines, the type of market that is forming nowadays is a market called *Fast Fashion*, where much quantity is bought with little quality, as low prices are sought, and as there is no sentimental attachment to the objects, it does not matter if they do not last for a long time as another one can be bought (Papasolomou et al., 2023).

- *Packaging and Perishability: The Double-Edged Sword of Product Sales*

Packaging plays a crucial role in product presentation and promotion, not only within the jewellery industry but also across various other sectors. This phenomenon is evident in the operational practices of Pablo Joyería Relojería, where the packaging employed significantly enhances the perceived value of their products, particularly during the distribution and sales stages. Consequently, the longevity of the packaging is frequently overlooked, leading customers to amass surplus boxes without clear guidance on their proper utilisation, resulting in potential disposal through recycling or disposal channels. Several questions have been raised through these problems, which are intended to provide solutions to address the difficulties discussed above.

- *How could the jewellery packaging be developed to form a modular jewellery box that complies not only with environmental friendliness but also the handicraft values?*

This question serves as a guiding principle for the project, highlighting the importance of uniting the concepts of environment, handicraft, and jewellery-making into a cohesive whole.

- *In what way does a collaborative design process with the user work in a handicraft product development procedure?*

This question aims to explore the potential of collaborative processes with users in design processes.

In conclusion, the questions raised throughout this process have highlighted several key issues that must be addressed. The next step is to refine the project's main objective and purpose, considering the insights gained from these questions. By doing so, the project's implementation can be defined more precisely and effectively. Assuming these conditions are met, the resulting product will be of the highest quality and fully aligned with the project's overall objectives.

1.3 PURPOSE AND GOALS

The aim of this project will not be the absolute solution to these problems but alternatives to try to reduce the problems explained above.

- *Crafting sustainable and enduring products through the reflection of artisanal work*

Therefore, the base of this project will be to be able to transmit through the product the value of it, that is to say, the dedication and the artisan work that has been developed in the production process, without losing the small villages where most of the handicraft work makes it. By this last point, the aim is to create a product that innovates on conventional packaging, which is typically used only once, in order to attract customers to small businesses and promote their growth in a sustainable

manner. Adding to all this, a sustainable and long-lasting result over time, thus avoiding the need to replace it from time to time.

- *Prioritizing a user-centred approach: involving users in every phase of the design process*

Another main base in the process will be the user, who will be part of each design process, as they are the ones who will make use of it.

The present endeavour entails delineating the goals and objectives to be pursued throughout the process. Notably, the aforementioned goals encompass the involvement of both users and designers. Furthermore, the subsequent analysis will elucidate the various profiles implicated in the process, as well as their respective impacts on it.

1.4 STAKEHOLDERS

The main stakeholders have been considered for the final product:

- The product's end user: Characterised by recognising the value of handcrafted products and not agreeing with the consumerist model, or at least being aware of it.
- Sales representative: The people who are responsible for selling the product, in this case, the personnel of Pablo Joyería Relojería.
- Production workers: The workers in charge of manufacturing the product from Olby Design company.
- The person in charge of the design process and the CEO: This would be one person, the student, who will perform both roles.

1.5 STRATEGY AND APPROACH

The strategy, User Centred Design approach, is based on collaborative design with the user, represented as the fishbone, the central part of the animal and, therefore, of the design process,

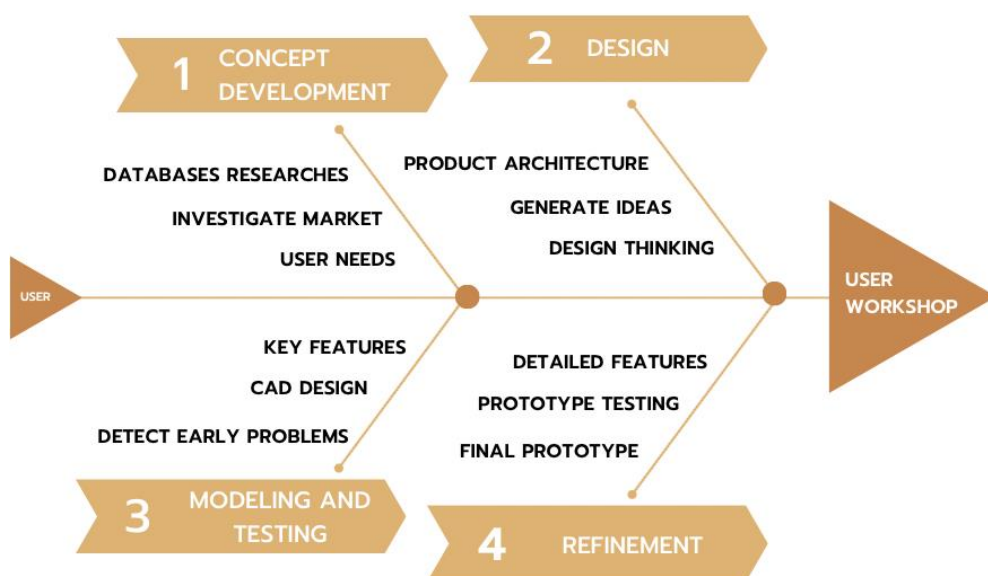


Figure 1: Strategy through Ishikawa Method

since without it, the product has no final objective that gives meaning to why it has been designed.

The main processes described in the diagram (Analyse, Design, Prototype and Evaluate) will be carried out, this being an iterative process through which it is possible to carry out a task again. The structure has been used as a reference for the Ishikawa diaphragms. One of the salient features of this approach is the ability to present the process in a lucid and succinct manner (Ishikawa, 1986). This is achieved by prioritising indispensable and crucial information. Consequently, the central element of utmost significance is graphically illustrated, with subsequent phases of the process arranged in a formation around it. This methodology provides a focused and comprehensible overview of how the cyclical process will be executed.

2 LITERATURE STUDY

The forthcoming section will establish a foundation through the exploration of analogous products within the jewellery boxes market. Emphasis will be placed on jewellery boxes, specifically with regard to their aesthetic and functional qualities, among other pertinent factors. Subsequently, attention will shift towards the less visible components of the product, such as manufacturing processes, while considering the aspects of ethics and sustainability in a cursory manner. The episode will culminate with an examination of the user's role and how their involvement in a collaborative process can yield positive impacts.

2.1 MARKET ANALYSIS

2.1.1 JEWELRY PACKAGING

Jewellery packaging plays a crucial role in the presentation and sale of jewellery. Research suggests that over 50% of a consumer's attention is focused on the external elements of a jewellery product, indicating the crucial role that packaging plays in capturing consumer attention and driving sales (Juárez-Varón et al., 2021). As such, the packaging design and presentation are critical components of the marketing mix, influencing consumer perceptions and shaping purchasing decisions. Effective packaging design can create a positive emotional response, evoke a sense of quality and luxury, and communicate the brand's values and personality. Consequently, brands invest significant resources in creating packaging that is visually appealing, functional, and aligns with their marketing strategies (Vibhuti et al., 2014).

Moreover, packaging can also serve as a protective layer that prevents the jewellery from getting damaged or scratched during transportation and storage. However, excessive and non-recyclable material use contributes to environmental pollution and waste (Papazolomou et al., 2023). The packaging industry is one of the most significant contributors to plastic waste, and jewellery packaging is no exception. Additionally, over-packaging, which involves the use of layers and unnecessary boxes, contributes to the depletion of natural resources and creates more waste. Therefore, in today's world, sustainable packaging practices are crucial; jewellery brands must take responsibility for their environmental impact and explore eco-friendly alternatives to traditional packaging (Jordan Gatt & Refalo, 2008).

Hence, to extend packaging's lifecycle and its utility, the intention is to repurpose jewellery packaging to construct personalised modular jewellery boxes of varying dimensions to suit individual user needs. Consequently, the next phase of this project involves analysing the jewellery box market.

2.1.2 JEWELRY BOXES

The exploration of new market trends provides valuable insights into the changing interests of the public and the subsequent evolution of design responses (Morris, 2007). In this context, our research has focused on repurposing jewellery packaging to create modular jewellery boxes.

To inform our design process, it has investigated existing jewellery boxes, which can be broadly classified into two categories: those that allow the jewellery to be in contact with the outside environment and those that are closed. Through user observations (Wikberg-Nilsson et al., 2021), it has been found that some users prefer jewellery that is easily accessible, while others prioritise keeping their jewellery in a closed environment for reasons such as conservation or safety. Consequently, an analysis has been conducted to examine how the market addresses issues such as accessibility, visibility, and jewellery care in both cases. While we will seek further insights through questionnaires, we have already identified the advantages and disadvantages associated with each approach.

General Jewellery Boxes		
	Outside Jewellery	Inside Jewellery
		
Access	Direct Access.	Access through the lid opening.
Visibility	Quick display of jewellery.	The visibility of jewellery within a given jewellery box can vary depending on the box's design.
Jewellery Care	In general, jewellery is subject to degradation due to the oxidative action of air, resulting in an accelerated rate of spoilage.	It is generally advisable to store jewellery indoors to mitigate the effects of oxidation caused by exposure to air.

Table 1: General Analysis of the Jewelry Boxes Market

Furthermore, a classification has been conducted to investigate the organisation of compartments for different types of jewellery, such as earrings, rings, bracelets, and pendants, in order to examine existing solutions (or lack thereof) in the market; watches have not been taken into account from the outset, as the aim is to design a versatile space for small objects.

The research on jewellery boxes has provided general insights into the solutions being offered by the market, such as the differences in design between outside and inside jewellery boxes. Outside jewellery boxes have fewer specific spaces for each jewel and tend to use hanging mechanisms. In comparison, inside jewellery boxes have more spaces created specifically for each type of jewel and utilise dividers with fewer spaces for hanging.

Specific Spaces	
Neckles	Brazalet
	
Rings	Earrings
	

Table 2: Market analysis to examine the organisational aspects of the jewellery box market, with a specific focus on different types of jewellery.

Users value both functionality and appearance when it comes to design. However, research on jewellery boxes has shown that other aspects, such as the materials and processes involved in bringing the product to the market, are also important to users (Juárez-Varón et al., 2021). This means that users are increasingly considering these factors when determining the overall value of a product.

As a result, it is crucial to examine these processes and the ethical considerations behind them. Prioritising ethics in the production of jewellery is essential. This can be done by seeking certifications, investigating brand practices, and using sustainable materials to promote social responsibility and ensure worker safety (F. Slaper, 2013). The upcoming chapter will delve into the incorporation of ethics not only in the production process but also in the creation of an ethical prototype.

2.2 ETHICS AND SUSTAINABILITY

An ethical product refers to a product that respects ethical principles and values during its production, marketing and sale (F. Slaper, 2013). There is no universal definition of an ethical product, as different people and organisations have different perspectives on what constitutes ethical practices, but according to not only the Sustainable Development Goals (*United Nations General Assembly*, 2015) but also authors such as Savitz (W.Savitz, 2006), there are three main groups of measures; environmental, economic and social. That is, firstly, to be produced with sustainable materials, manufactured in an environmentally friendly way, and not contribute to harmful practices or behaviour (*United Nations General Assembly*, 2015). Next, the product must be marketed transparently and honestly, with clear information about its impact on people and the planet (*United Nations General Assembly*, 2015). Ultimately, an

ethical product must be align the values and beliefs of the consumers who buy it (W.Savitz, 2006).

For example, it will be studied one of the most sold jewellers by Amazon (Benevolence LA, 2023), one of the world's best-selling multinationals, highlighting this pattern that can be observed in many other jewellers. In Table 3, we can observe the information provided by the company and the information that the customer can easily have.

Technical Data		More Information	
Material	Velvet	Designed for	Jewellery packaging
Style	Modern	Material Feeling	"soft and "luxurious."
Dimensions	95.2mmx95.2mmx95.2mm	Prevent	Knots and knotting through its organisers.
Shape	Cubic		Jewellery does not get lost during transport
Type of Finish	Textured	Mission	Every purchase donates to Water Mission, an organisation helping to build sustainable clean water supply systems around the world
Target Audience	Women		
Manufacture Country	China	Price	190 SEK
Product Weight	1,26kg		
Type of closure	Zip		

Table 3: Technical information proving the company Benevolence LA sells Amazon's best-selling jewellery box

The product in question needs more information regarding its manufacturing process, with the only known detail being its place of origin, China, a significant global power. This lack of transparency hinders the ability to assess the sustainability of the production, including its environmental impact and responsible use of raw materials. Additionally, the absence of information regarding the manufacturing process complicates confirmation of adherence to ethical labour practices, such as equitable compensation, safe working conditions, and prohibition of child labour, as well as the use of sustainable sourcing practices for materials.

Notably, the product claims to support an organisation dedicated to cleaning water treatment worldwide. However, there remains a lack of transparency and information regarding the product's manufacturing process, impeding any evaluation of its sustainability and ethical production. Furthermore, the target group is advertised as exclusive women, disregarding the reality that men also consume jewellery, which raises concerns about gender equality. In light of these issues, it is challenging to deem the product as ethical or sustainable.

In conclusion, to establish a product as ethical, it is imperative to maintain transparency throughout every stage of its production process. Additionally, it is essential to add value to the product by prioritising the social, economic, and environmental considerations that inform its creation (*United Nations General Assembly*, 2015). As designers, our primary objective is to

address the problems and concerns of potential users while ensuring that we uphold our values throughout the design process (Anastas & Zimmerman, 2003). This is becoming increasingly important as technology and design penetrate various aspects of human life. Unfortunately, the current landscape of venture capital-backed start-ups and the ever-increasing pace of design and iteration can sometimes conflict with ethical considerations, which include responsibility towards the environment and society. However, there is a silver lining in that an increasing number of consumers are showing greater awareness of the ethical implications of the products they use. Hence, we must remember that the user is at the core of the design process, as they are the driving force behind the need for product design. As such, including the user from the outset of the design process is a logical next step towards evaluating how this approach may impact product ethics (Riley, 2018).

2.3 COLLABORATIVE DESIGN APPROACHES

Incorporating user input and collaboration within the design process represents a pivotal component of product development. Through such collaboration, designers and developers gain a more understanding of the expectations and requirements of the target audience, thereby enabling the creation of products that effectively address their needs. Additionally, by actively involving users in each stage of the product development cycle, designers and developers can heighten user awareness of the implications and consequences of product development (Kristensson et al., 2004). Consequently, the process of engaging users within product development constitutes a crucial aspect of creating products that are more effective, user-oriented, and reflective of user preferences (Kristensson et al., 2004). This is reflected in a growing number of studies suggesting that consumer researchers could stop looking backwards to understand consumers and take them into account by including them in the process, i.e. looking forward (Kristensson et al., 2004). However, what methods can be employed to engage users in the product development process effectively?

Numerous methodologies exist for engaging users in the design process; however, this study concentrates on creative workshops due to the versatility of the various techniques that can be employed in these settings, dependent upon the specific stage of the design process and the intended outcomes (Morris, 2007).

Research has explored the potential benefits of incorporating workshops involving "non-expert" consumers as a valuable method in the design process (Füller et al., 2012). Such workshops can prove advantageous as they do not require participants to possess specific sectoral expertise or skill sets. Instead, the combination of user workshops with the support of professional designers has been found to yield an interesting and enriching combination that can enhance the outcome (Kristensson et al., 2004). While "non-expert" consumers may lack specialised skills, they can contribute to more creative and innovative solutions (Kristensson et al., 2004). On the other hand, professional designers may be better equipped to provide more realistic solutions, including the creation of prototypes (Kristensson et al., 2004). Consequently, the absence of specialised knowledge among consumers can be compensated for by professional designers, resulting in unexpected and valuable outcomes for the design process (Füller et al., 2012). By including this method in the design process, not only are users

engaged in the process, but the potential for novel and valuable results is increased (Füller et al., 2012). It is important to note that all the results undergo review by the main designer to ensure their compatibility with the overall design vision (Füller et al., 2012).

In the context of workshops, the attitude of participants is a critical aspect that needs to be considered. Specifically, the interest and motivation of the participants for the activity at hand are essential factors that contribute to the optimal resolution of the activity. The ability of participants to become wholly absorbed in the activity and lose track of time and space, also known as "flow," is an important indicator of their engagement with the activity (Csikszentmihalyi, 2002).

Another critical factor in the success of a workshop is the role of the moderator, who is responsible for organising and guiding the process (Stickdorn, 2014). Product design thinking emphasises the importance of the moderator in facilitating an efficient group idea-generation process. Research has shown that group idea-sharing can be an inefficient process (Paulus & Yang, 2000), but with the right conditions and effective moderation, the process can be significantly improved. By studying the conditions for effective group idea-sharing, moderators can develop practical tools that can be useful in the design process (Paulus & Yang, 2000).

To summarise, workshops have been identified as an effective method for exploring new possibilities and gathering diverse perspectives in a given process (Paulus & Yang, 2000). The inspiration generated from these workshops can provide valuable input for the design team, which must subsequently refine and expand upon the gathered information (Paulus & Yang, 2000). Consequently, incorporating workshops into the design process is considered an innovative approach that can yield unexpected and valuable results (Paulus & Yang, 2000).

Thus, a *collaborative process* with the user will be employed, wherein collaborative activities will be carried out with the user in each phase, using a range of methods to bring them as close as possible to the design, based on the specific requirements of each design phase. This collaborative process will be initiated through an analysis of the needs and primary challenges of the companies, which is necessary to identify the issues raised in prior sections. Therefore, the process followed will be described from the outset.

3 PROCEDURE: COLLABORATIVE PROCESS

This section of the report presents a detailed account of the design process, including the rationale behind each stage and the outcomes achieved. Therefore, before identifying which product to focus on, multiple opportunities presented by the companies were investigated. The subsequent stages of the collaborative design process, which involve the identification of user needs, concept creation, and prototype testing, will be discussed in detail. The design process will be implemented in collaboration with the end-users, utilising a range of participatory research methods, such as workshops, observations, surveys, and interviews, among others. Each stage of the design process will be documented, highlighting the approaches and techniques used in conjunction with the user. It is noteworthy that the process described herein is iterative in nature, despite its presence in a linear fashion, which was deliberately chosen to enhance its comprehensibility for the reader. For instance, the activity of sketching was conducted throughout the majority of the process, albeit with some dedicated sessions for this purpose. Similarly, the design layout was not a one-time event but rather an ongoing aspect of the process.

PHASE 0

In Phase 0, the research efforts will initiate by concentrating on conducting a review of the companies. This phase aims to establish a strong foundation for the development of the project. The primary objective of this preliminary phase is to ascertain and recognise the existing business opportunities that will act as a driving force for the project's success. It is important to note that this activity took place before conducting market analysis, as discussed in Chapter 2.1.

3.1 OPPORTUNITY IDENTIFICATION WITHIN COMPANIES

This research aimed to examine the values that companies Pablo Joyería Relojería and Olby Design intend to convey through their products, as well as to investigate the current challenges they are facing. An endeavour was undertaken to identify a design opportunity that could potentially offer companies an innovative solution to communicate their values more effectively (Best, 2015). To accomplish this objective, diverse methods were utilised to acquire a more inclusive comprehension of each company and its intended message to its users. The application of a design opportunity identification process was undertaken to devise an alternative approach that would efficiently communicate the values of the companies to the target audience.

3.1.1 OBSERVATION

The primary undertaking entailed conducting observations in both companies. The first observations were carried out in Pablo Joyería Relojería, where prior knowledge of the

company was available, obtained from previous experience working with them. With this pre-existing information as a foundation, noteworthy aspects that had not yet been considered or given sufficient attention were recorded. The objective of this phase was to acquire a panoramic understanding from the user's perspective. Devoting adequate time to this preliminary phase has the potential to establish a firm groundwork for the project, leading to enhancements in later stages (Plumbre et al., 2010).

The conclusions derived from a day of observation at the company have been documented, with follow-up inquiries made to employees or clients regarding any unclear points. The observations were conducted with objectivity in mind to ensure that the results were not influenced in any way (Plumbre et al., 2010).

Subsequently, an observation was conducted at Olby Design, a company with which the designer was less familiar. Unlike the previous company, Olby Design does not sell products on a regular basis, as the company's owner is retired. However, they operate a workshop where some products are created, which prevents an identical observation process from being conducted. Therefore, in order to supplement the limited information obtained through observation, an interview was conducted with the CEO of the company. Questions related to the observations made at Pablo Joyería Relojería were asked, with the aim of drawing comparisons between the two companies and identifying any similarities.

	Pablo Joyería Relojería	Olby Design
PRODUCTS AND VALUES	The company's product line consists of both well-known national and international brands and customised handmade creations , with a workshop dedicated to personalised products. Handmade jewellery is the main product, but many customers opt for branded products, which account for 50% of the clientele, including many watch brands in this sector. This indicates that large companies make great marketing efforts and that they prefer the best-known and most reputable products. However, a significant part of the company's clientele values craftsmanship.	The company exclusively offers handmade products crafted entirely in-house, with a primary focus on furniture. Prior to the retirement of the owner, Tina, the company operated its workshop, allowing for the production of larger quantities. Currently, a carpentry company is responsible for manufacturing furniture, albeit in smaller batches.

	<p>The artisanal products sold by the company convey a sense of origin, as they are created in Alhama de Granada. Additionally, customers value the transparent production process and quality of design, which is a result of the company's years of experience.</p>	<p>The company's handcrafted furniture is designed with a focus on enhancing the customer's daily living experience. To achieve this goal, the company employs materials that boast longevity and ease of maintenance, albeit necessitating some upkeep. As a testament to their quality, customers have reported owning furniture produced by the company since its inception, which continues to maintain its structural integrity and aesthetic appeal.</p>
	<p>The company's primary materials for its product manufacturing processes are gold and silver, with a notable emphasis on utilising recycled materials from previous customer products. This approach promotes the use of sustainable and environmentally friendly materials and processes throughout the production process.</p>	<p>Olby's approach celebrates the authenticity and integrity of natural materials, with a particular emphasis on wood, stone, wool, and cotton.</p>
CUSTOMER	<p>The customer base is diverse, with customers over 50 years of age seeking high-quality and durable products, while younger customers tend to prioritise lower prices.</p>	<p>The company's customer base has typically comprised individuals in their 40s and 50s. Nevertheless, there has been a noticeable shift towards attracting a younger audience, driven by a growing appreciation for artisanal craftsmanship among this demographic.</p>
	<p>The customer appreciates the personalised treatment provided by the employees, with the majority of customers becoming repeat customers after their initial purchase.</p>	<p>Customers hold the company's artisanal craftsmanship in high regard, along with the personalised and attentive service provided during the purchasing process. This not only drives repeat business due to the durability of the products but also the positive customer experience, resulting in a loyal customer base.</p>
MORE	<p>The time spent in the shop varies depending on the customer's product needs. Products requiring workshop repairs or customisation tend to take longer than branded products that are already manufactured.</p>	<p>They have a great deal of expertise and experience among cabinetmakers and upholsterers. Expertise is important because every detail must be manufactured with the same care as the whole.</p>
	<p>The sales strategy of the employees centres on personalised and dedicated customer service, emphasising the value placed on the customer's time and satisfaction.</p>	<p>The company's primary selling point to customers is using handmade, locally sourced natural materials, which serve as the foundation of its product offerings.</p>

Table 4: Comparative Table of the Companies Pablo Joyería Relojería and Olby Design

The comparative table of the companies offers a view of the shared values and similarities between them, along with how customers respond to these values. Given that the value of the product represents a crucial connection between the company and its customers (Best, 2015),

it was crucial to establish a foundation for comprehending both companies and subsequently investigating the key challenges they encounter. With the commonalities between the two companies identified, the subsequent step involves addressing the primary issues faced by each company and subsequently developing a product idea that leverages these shared values.

3.1.2 PROBLEM IDENTIFICATION

To further explore the company Pablo Joyería Relojería, a brainstorming session was conducted with the company and its employees, who possess first-hand knowledge of the business. The group consisted of 4 employees of the company, including an artisan, two retail salespeople and a designer. The session lasted one hour, and the main objective was to gather unbiased thoughts and opinions about the company and identify its primary challenges. The session was moderated to guide the discussion and ensure that the group stayed on topic and focused on the brainstorming process (Paulus & Yang, 2000).

The group started with general questions about the company, and the conversation gradually flowed towards potential areas of interest.

This approach was taken to examine the company and generate information critically and rationally (Paulus & Yang, 2000). The employees themselves identified the main topics, leading to a written conversation where common ideas, problems, and values of the company were highlighted. This method was essential in gaining insight into the company's challenges and identifying potential solutions to improve its operations (Paulus & Yang, 2000).

All of the concepts and ideas generated from the brainstorming session were further developed in collaboration with the user. Based on the identified problems, as discussed in Chapter 1.2, emerging opportunities were identified that could address these issues. This collaborative approach allowed for a more diverse range of solutions to be considered, as the user's insights and perspectives were incorporated into the process. By involving the user in this phase, we were able to gain a deeper understanding of their needs and preferences, which helped to inform the development of potential solutions.

3.1.3 OPPORTUNITY IDENTIFICATION

The subsequent phase involved close interaction with the customers of Pablo Joyería Relojería and conducting brief interviews to identify potential problems or areas for improvement, leveraging the ideas obtained in the previous stage. During these interviews, the customers were asked questions such as "Do you encounter any issues or see any opportunities for improvement related to jewellery and watchmaking in general and, more specifically, at Pablo Joyería Relojería?" Through these conversations, a plethora of opportunities were identified, and a total of 15 brief interviews were conducted to ensure a large number of opportunity ideas were generated (Plumbre et al., 2010). The identified opportunities were then evaluated through the Real-Win-Worth-It (RWWI) method (Ulrich & Eppinger, 2020), where each opportunity was assessed against the following questions:

1. Is this opportunity real?
2. Is there something to gain from this opportunity?
3. Is it a sustainable advantage over the existing possible solution?

4. Is it financially worthwhile?

The primary objective was to narrow down the opportunities, even relating them to each other. The final opportunity identified was the result of this process, where multiple users defined a similar problem: they did not know what to do with the packaging they received when purchasing jewellery, often accumulating small plastic boxes or discarding them. The final opportunity identified in Table 1 was: *A container that not only stores the jewellery at the time of purchase but is reusable and becomes a jewellery box, reflecting the values of craftsmanship and expertise*. This opportunity fulfilled the criteria determined through the RWWI questions and was considered to be a viable solution to the problem.

1. Is the opportunity real?	
Is there a need?	Yes
Can the customer buy?	Yes
Is there a viable concept for the product already?	Yes
Will the product satisfy the market?	Yes
Is the product acceptable within the social, legal, and environmental norms?	Yes
2. Is there something to be gained from the opportunity? Is it a sustainable advantage to the possible existing solution?	
Does it have a competitive advantage? Is it sustainable?	Yes
Does it fit the brand?	Yes
Does it have the management that can win? (Experience? Fit with culture? Commitment to this opportunity)	Yes
3. Is the opportunity worth it financially?	
Will it make money?	Yes
Is the risk acceptable? (What could go wrong? (Technical risk vs market risk)	Yes

Table 5: The Real-Win-Worth-it criteria applied to the Opportunity Identification

Upon evaluation of the project's objectives, the initial step is to conduct extensive research on the requirements and preferences of the end users. This approach is crucial to prioritise and develop a product that caters to the customers' needs and expectations (Ulrich & Eppinger, 2020). The primary focus is to ensure that the product satisfies the user's requirements and delivers value to them. Therefore, the research process is instrumental in identifying the user's pain points and designing a solution that addresses these concerns effectively (Ulrich & Eppinger, 2020). Ultimately, the research findings will guide the product development process and ensure that the final product aligns with the user's needs, preferences, and expectations.

PHASE 1

After identifying the opportunity to be addressed by the project in the preliminary phase, the next stage will involve an examination of user needs utilising diverse techniques ranging from observation and questionnaires to interviews, all conducted directly with the user. This phase will culminate in the creation of a user profile comprising two distinct personas, ultimately leading to the formulation of product specifications.

3.2 CUSTOMER NEEDS ANALYSIS

The objective of the research is not solely to amass data via interviews and questionnaires but also to arrange a workshop that deliberates on the primary challenges articulated by users concerning the nowadays products designed to target the identified opportunity. Defining problems can be a challenging task, with some studies suggesting that it is even more difficult than finding solutions to that problem (Getzels & Csikszentmihalyi, 1967). However, users possess cognitive abilities that can aid in making this process more efficient (Getzels & Csikszentmihalyi, 1967, 1967). Therefore, the initial step will be to commence with a group activity, which can lead to surprising outcomes and provide an opportunity for reflection (Morris, 2007). Although the process typically begins by gathering information through interviews or questionnaires, approaching it in an innovative way can yield valuable insights (Morris, 2007).

3.2.1 WORKSHOP I

Hence, the primary objectives of the workshop are to engage with users in a deliberate and structured process, select appropriate participant profiles to achieve the workshop's goal and gain a deeper understanding of users' needs and current problems in the market related to existing products.

3.2.1.1 WORKSHOP PROCEDURE GENERATION

The initial stage of the workshop comprised a brainstorming session aimed at clarifying the concepts and main objectives to be developed therein (Morris, 2007). This session was

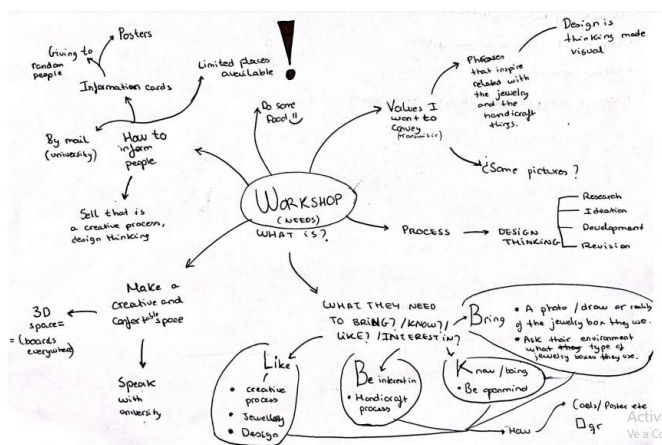


Figure 2: Workshop I

conducted in the presence of both the designer and an expert teacher with specialisation in the relevant creative processes. A central focus of the session was the theme of user interaction with the prevailing market concept (Morris, 2007). Consideration was also given to enhancing the dynamism of the workshop and promoting participant engagement to ensure maximum concentration and optimal

performance (Paulus & Yang, 2000). Additional aspects deliberated included the physical layout of the workshop space, strategies for attracting and retaining the interest of attendees, and the desired participant demographics.

3.2.1.2 WORKSHOP ORGANIZATION

Following the initial brainstorming session, the structure and objectives of the workshop began to take form. Initially, the primary focus was on studying the needs and identifying the main problems encountered by clients when using existing jewellery boxes in the market. Traditionally, creative processes begin with defining a clear goal, but applying the theory of opposites to this approach can yield unexpected results (Thompson, 1999). In this theory, emphasis is placed on the opposite side of things, and therefore, the decision was made to present participants with a problem instead of outlining a specific objective for the session (Thompson, 1999).

Attention then turned to the selection of appropriate tools and methods for the workshop. It was recognised that following a strict order was not always necessary or desirable and that flexibility was key to adapting to the evolving needs of the session (Csikszentmihalyi, 1997). To attract the right participants with sufficient interest and motivation, posters were created and displayed throughout the university with the minimalist slogan "Creative Workshop" to elicit interest in innovative and unfamiliar activities. The lack of detailed information about the



Figure 3: Workshop I Posters

workshop was intentional to ensure that only those genuinely interested in the process would apply (Brandt, 2004).

3.2.1.3 WORKSHOP PARTICIPANTS

The registration process was based on a QR code, through which participants were required to complete a short survey consisting of the following questions:

- Introduction: "Hello! If you are here, it is because you are interested in learning and being part of a creative process..."
- Question 1: Personal information (email and name): This question aimed to collect participants' personal information and confirm their attendance.
- Question 2: What are you studying, and in which course?: This question aimed to identify the participants' fields of study and level of experience to tailor the workshop content better.
- Question 3: Have you ever gone through a creative process to generate ideas?: This question aimed to assess the participants' prior experience with creative processes.
- Question 4: Do you wear jewellery or watches?: This question aimed to identify potential customers among the participants.
- Question 5: Where do you keep your jewellery?: If participants answered "yes" to the previous question, this question aimed to identify their storage habits.

PARTICIPANTS						
N	F/M	Age	QUESTION 2	QUESTION 3	QUESTION 4	QUESTION 5
1	Female	25	Biomedicine Mster, two year	No	Yes	Plastic tuppens with cotton
2	Female	21	Molecular medicine, 3. Year bachelor	No	Yes	Little bag
3	Female	28	PhD student two year	No	Yes	Original jewellery boxes
4	Male	21	Computer science	No	Yes	In a small plastic bag (which can be zipped, not afraid of tarnish and can easily recognise)
5	Male	21	Computer science	No	Yes	Watches box
6	Male	21	Computer science	No	Yes	Small box

Table 6: Selected Participants in Workshop I

The survey was designed to be concise and easy to complete to increase participation rates. After the registration deadline, six individuals signed up for the workshop, whose profiles are presented above.

3.2.1.4 WORKSHOP DEVELOPMENT

To address the issue of packaging waste, a one-hour session with six participants, who did not know each other, was conducted in this time frame to keep the participants focused on the activity.

The session began with introductions to establish a more open atmosphere. The context of the problem was then presented, and a modular jewellery box was proposed as a solution. Participants were given a set of guidelines to follow during the session (Paulus & Yang, 2000), including keeping an open attitude, avoiding judging other ideas and taking notes of all ideas discussed so as not to lose them when entering a conversation.



Figure 4: Participant carrying out the first step of observations in Workshop I

At the commencement of the session, participants were provided with a commercial jewellery box and instructed to observe it carefully while taking note of their observations on post-it notes that were placed along the table. These notes were then placed on a board labelled "observations". This preliminary exercise was intended to invigorate the group, enhance their focus, and induce a state of flow (Csikszentmihalyi, 1997). Subsequently, the participants were instructed to document the strengths and weaknesses of the jewellery box on post-it notes and



Figure 5: Development of the Workshop I session

place them on separate boards labelled "strengths" and "weakness", respectively. The objective was to allow the participants to identify what worked and what did not work in the jewellery box based on their perspectives and to prepare for the final activity.

Finally, the participants were instructed to utilise their observations and notes to identify ways to enhance the jewellery box's strengths and address its weaknesses. These notes were then converted back into post-it notes and placed on a final board labelled "improvements". The purpose of this activity was to elicit diverse perspectives and interpretations from the participants and guide them towards a constructive outcome (Paulus & Yang, 2000). This process aimed to generate user needs for new features that were not present in the existing jewellery box by leveraging the participants' insights and observations.

This guided process allowed participants to develop their ideas gradually and ultimately suggest possible improvements to the product. By addressing the problem in a structured and collaborative way, the session aimed to generate a range of diverse and innovative solutions to the problem of packaging waste.

During the course of the second task, the activity became increasingly dynamic and participatory. Participants engaged in lively and thought-provoking conversations at various stages of the process, with a concerted effort made to capture and document all ideas and insights shared. This approach proved fruitful, yielding several noteworthy comments and observations that could be of great value to the overall design process.

"I used to travel with my jewellery in a small textile bag, and sometimes I am afraid that my big rings can be destroyed inside this bag." Participant 2.

"I do not wear much jewellery, but I love watches. Every morning I must look where I left them; I always become angry because I do not find them. I would love to have an organised place to order them." Participant 5.

3.2.1.5 COMMENTS

This activity provided participants with the opportunity to approach the design process from multiple perspectives, allowing them to gain new insights and perspectives. In addition, the workshop provided an environment that encouraged objective and unbiased analysis of the product, as it involved observations of the product and what they saw of it, as evidenced by the fact that participants focused on the various components and functionalities of the product and used objective data (see Figure 6) to support their observations. Although participants also shared their personal experiences with the product and their emotional reactions to it, these subjective elements were balanced with the objective aspects of the workshop. Thus, two roles were predominant in this process, according to the 6-hat theory (de Bono, 2008) the red role (feelings, intuition) and the white role (facts and data).

In addition, the time constraints imposed on each activity within the workshop helped to maintain participants' focus and ensure their active participation. As a result, the participants' engagement and input increased incrementally throughout each phase of the workshop, as reflected by the increasing number of ideas generated and captured (Figure 6).

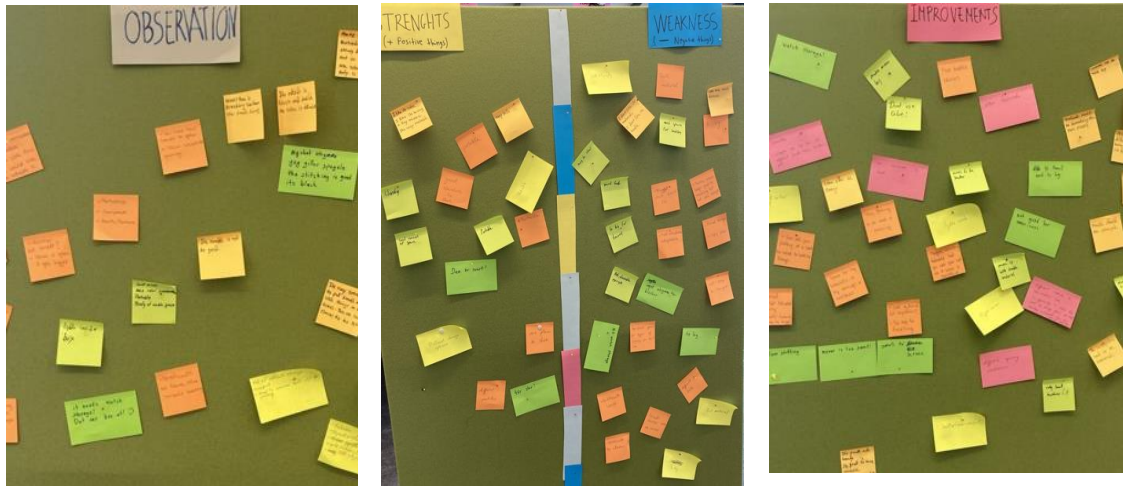


Figure 6: Progression of the workshop process, consisting of observations, skills and weaknesses and finally, improvements

3.2.1.6 CONCLUSIONS

Upon completion of the session, the information collected from the participants was collated and organised into two broad categories: namely, the primary features and needs that were discussed during the workshop, as well as potential solutions to these issues as proposed by the participants. Furthermore, two additional columns were added to the table to capture notes and comments provided by the participants, in addition to the designers' notes in colour on the right.

While the table serves as a preliminary summary of the insights gained during the workshop, it is important to note that further research is required to identify user needs (Brandt, 2004). To this end, a larger number of participants will be surveyed using a questionnaire to elicit more detailed information regarding additional features and characteristics of the product. This will serve to augment and refine the user needs table, providing a more robust foundation for the design team's work going forward.

Features (Needs)		Solution	Comments	Notes	Designer notes
Space for:	Watches	Good distribution	Different modules for each kind of jewellery and watches	"Design can be different, like having a watch on the front side."	
	Neckles				
	Earrings	Enough drawers			
	Rings				
	Others				
Material		Durable		"Take care of the jewellery."	Study materials for it
		Hygienic			
		Softer material		"Material soft for delicate jewellery."	
Size		Adaptable	Depending on the user, they	"See all your jewellery at a look."	

		prefer big o small sizes.	"No need to look for things."	Make sure disability people can use it
		Disability people	"2 hands necessary to open."	
		More compact.	"Space for big bracelets, earrings or necklace"	
Opening mechanism	Lock		"Make sure it is lockable."	
Space for looking at us	Mirror			
Transportation	Handle			
Adapt to the environment.		Against humidity		Study materials
		For travelling		
Take care of the jewellery.			"Material soft for delicate jewellery."	

Table 7: Workshop I Observations

3.2.2 QUESTIONNAIRES

Regarding the data collection process, the initial interview was conducted as part of a study aimed at gathering the requisite information to define the profile of the primary user and identify the key needs and specifications for the product (Plumbre et al., 2010). Alongside short interviews and workshop I, two questionnaires was administered to collect data from a Spanish audience and an International audience, respectively. The results of this exercise yielded a wealth of valuable insights, particularly in terms of cultural and societal differences in attitudes towards the product.

In total, 319 responses were collected from the Spanish questionnaire, while 50 responses were obtained from the international questionnaire. Both surveys had a broad age range, with a potential emphasis on the 17-27 age group, as indicated by the data presented in the following Figure 7. It is worth noting that the discrepancy in the number of responses between the Spanish and International questionnaires can be attributed to greater familiarity with the product among the former group, resulting in a higher response rate. However, the number of responses was considered similar for both surveys, thereby ensuring a fair and balanced representation of user perspectives.

These data sets provided more detailed information regarding user needs and preferences, allowing for a more nuanced understanding of the primary issues faced by users when consuming the product (Ulrich & Eppinger, 2020). Examples of such challenges include the specific size of the jewellery, the box needed by each user, and the disposal of jewellery packaging, which often results in waste. These insights serve to highlight some of the most critical issues faced by users, thereby facilitating the development of targeted solutions that cater to their specific needs and preferences.

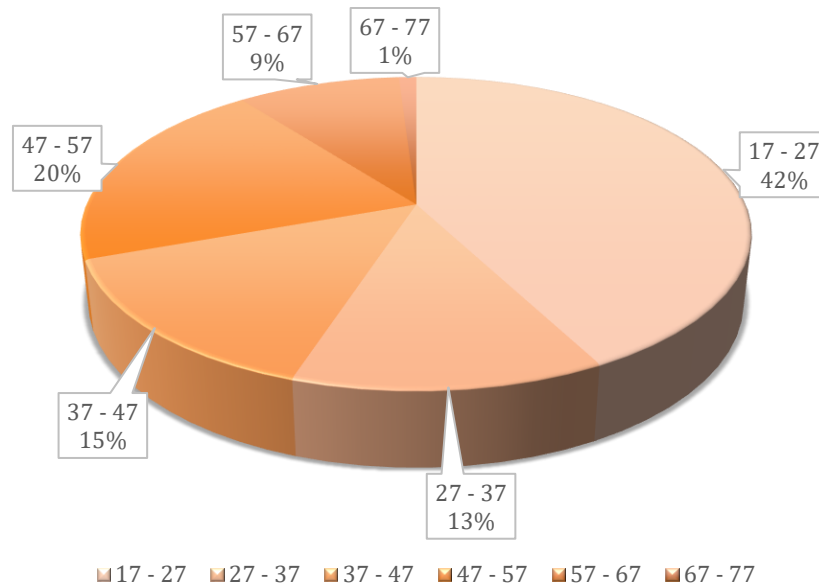


Figure 7: Participants' Age Spanish and International Questionnaire

To improve response rates and minimise respondent abandonment, we employed a quick response question approach in our questionnaire design. The questions were formulated to provide statistical data on the respondents while preserving their anonymity and privacy (Plumbre et al., 2010). The success of this approach is reflected in the high completion rate of the questionnaire, with more than 80% of respondents completing it in its entirety.

The initial questions were more personal and aimed at gathering demographic data on the respondents. This included their age (open-ended question), current position (open-ended question), and frequency of wearing jewellery (multiple-choice question with answer options including Every day, About every day, Occasionally, Never). It is important to highlight that when collecting information for the question regarding current positions (see Table 8), data was gathered on various positions. The table included those positions that were most relevant to the project and familiar to the respondents. However, this selection was not the determining factor in the process. Instead, it served to provide general information and give an overview of the main profiles of the survey participants within the given range of the survey.

The rest of the information was considered essential to define the potential target audience for the product, as wearing jewellery or watches was a key requirement for its consumption, i.e. being a consumer of the primary product was a prerequisite for being a user of jewellery and, therefore, the packaging of jewellery. Moreover, it allowed for greater design specificity to ensure that the final product would meet the needs of the intended audience.

Subsequently, the questionnaire posed questions about the respondents' jewellery storage preferences. These included where they kept their jewellery (open-ended question), which items they would like to store in a jewellery box (multiple-choice question with answer options including Rings, Bracelets, Necklaces, Watches, Earrings, Other), and if the last answer was other, what they would keep (open-ended question). Finally, the questionnaire asked respondents to describe their perfect jewellery box (open-ended question) and how much they would be willing to pay for it (open-ended question).

What would you store?

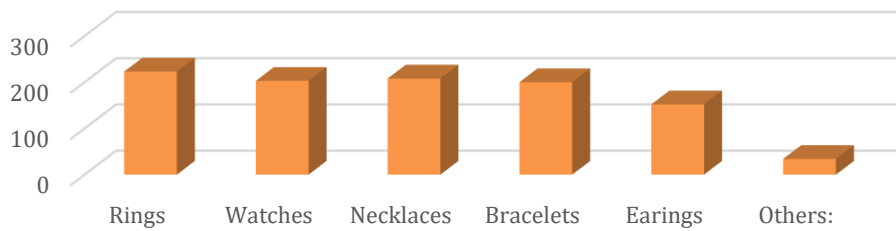


Figure 8: Questionnaire about what the people would store in their jewellery boxes

The subsequent questions in the study were directed towards product design, with a focus on understanding user behaviour and eliciting personal opinions on the ideal features of a jewellery box. Through this line of inquiry, valuable insights were obtained regarding user needs and preferences, which were later used to develop specifications for the product (Cross, 2021). Notably, the responses to the question on ideal jewellery box features revealed several latent market needs that would inform the product design, such as being able to adapt the size of the jewellery box according to the number of jewellery each person has; it should be noted that the remaining needs will be reflected in the specifications in chapter 3.2.4.

Additionally, respondents were asked to indicate the amount they would be willing to pay for such a product, resulting in an average of 80 euros in the Spanish survey and 10 to 20 euros in the international survey. These findings were instrumental in the product development process.

Actual Position		Where do you store jewellery?	
Student	89	Jewellery Box	160
Worker	107	Small box/boxes	56
Housemaker	32	Do not have	11
Retired	5	Bedside table	10
Entrepreneur	9	Drawer	20
Others	68	Small textile bags	9
Wearing frequency		Cabinet	6
Every Day	138	Safe Box	7
Occasionally	94	Others:	45
Never	41		

Table 8: Questionnaire Results Spanish and International Survey

The results of the questionnaire indicate that the respondents tend to store and wear a wide variety of jewellery or watches, as evidenced by both the International and Spanish surveys. Furthermore, these surveys revealed similarities in needs between the two populations. Although not all data is presented in this section, the product specifications were developed through a thorough selection of individual responses. It is worth noting that although the free-response questions required more effort, they provided valuable data that would not have been possible with short interviews (Brandt, 2004). These questions allowed for a more personal understanding of the users' needs and preferences. While future questionnaires may benefit from more limited response options, in this particular case, the investment in analysing the free responses was deemed worthwhile (Brandt, 2004). Ultimately, the design of the questionnaire will depend on the specific objectives of the study, with a balance between efficiency and richness of information. While questionnaires provide a quicker way of exploring certain aspects, interviews can provide valuable personal insights that would be difficult to obtain with the questionnaires (Plumbre et al., 2010). For the next step, interviews will be conducted to delve deeper into specific areas with potential users.

3.2.3 INTERVIEWS

The interviews conducted in this study followed a multi-phase process. Before the interviews, a diverse group of individuals were selected for the study, including employees, users, consumers, and buyers with varying ages, cultures, and backgrounds, to obtain a range of perspectives (Willis, 2015). The questions posed during the interviews were open-ended and general, allowing interviewees to freely express their opinions on specific topics. Throughout the interview, interviewers aimed to avoid imposing any subjective point of view and instead allowed the interviewees to lead the discussion, progressively moving from simple to more complex or broader questions (Willis, 2015).

After the interviews were conducted, the data collected was analysed, keeping in mind that respondents' answers were influenced by their beliefs and limitations. To obtain a deeper understanding of each person's thoughts, it is beneficial to include different target groups in the interviews (Brandt, 2004). The questions asked during the interviews differed from those in the questionnaires to obtain new information that would be used to complete the product specifications and target group.

Specific questions asked during the interviews included the following:

- Question 1: Do you believe that a large number of jewellery boxes are wasted during the sale of jewellery?
- Question 1.1: Do you think that a lot of jewellery packaging is wasted? Do you know how to find a functional use for it after buying the jewellery?
- Question 2: Do you think that craftsmanship is valued highly enough in the industry?
- Question 3: Would you be interested in repurposing jewellery boxes for other uses? If so, which target group(s) do you believe would be interested?

Questions 1 and 1.1 serve as the initial questions in the interview, but the specific question depends on the profile of the interviewee. Consequently, question 1 was posed to individuals who work in the jewellery sector and possess the requisite professional experience and expertise, while question 2 was directed towards other interviewees.

After conducting research on existing products and identifying problems that users face, the next step was to delve deeper into the users' thoughts on these issues to define their needs more accurately. To achieve this, the designer asked questions such as the sustainability of packaging in jewellery and the value of craftsmanship. Another question was posed out of curiosity to know if users had considered reusing packaging and who the potential customers might be.

The interviews were conducted informally, with the interviewer guiding the conversation, and new needs emerged as a result of the questions. For instance, one of the primary needs that emerged was for jewellery to remain visible and easily accessible to users, as there are cases where the jewellery may be stored in packing boxes, resulting in it being forgotten and not used. The interview approach proved, therefore, adequate, as informal conversations can often yield more valuable insights than formal ones (Best, 2015). The results of the interviews helped to clarify aspects that were previously vague and were used to create product specifications and shape the potential user persona.

With the information gathered from this activity, combined with data from earlier stages, the designer was able to create product specifications and develop a persona for the potential user. This allowed for a more refined understanding of the target audience and their needs, enabling the designer to create a product that would better meet their requirements.

3.2.4 TARGET GROUP

After completing previous activities, including Workshop I, questionnaires, and interviews, the next objective was to build a persona (see Figure 10). This profile would be used to develop product specifications that focus on the user in order to start the product creation process.

To carry out this task, it was first decided to arrange the information gathered in the previous activities in a way that would link and connect the ideas, thus facilitating the visual work. To do this, the designer conducted a brainstorming session (see Figure 9) in which two idea maps were made at the same time, each of them entitled "target group" and "product specifications", the results of which are discussed in the next chapter. This session consisted of consolidating all the ideas and thoughts collected during the previous activities, with the designer filtering and organising them dynamically (Stickdorn, 2014).

The results of this session were highly gratifying as they led to the identification of two main ideas: the main users and their characteristics, as well as their needs, which will be further elaborated in the following chapter through the specification table. By emphasising these key aspects, the design team was able to create a clear and concise user profile, drawing influence from Workshop Chapter 3.3.1. This profile offered valuable insights into the target audience's requirements and preferences, enabling them to develop product specifications that would effectively address those needs (Brandt, 2004).

"My greatest motivation in life is to make a positive impact on those around me"



PAULA LOPEZ
Secondary Teacher

PROFILE
Gender : Female
Age : 46
Location : Granada, Spain

PERSONALITY
Creativity ★★★★★
Problem Solving ★★★★★☆
Communication ★★★★★
Extrovert ★★★★★☆

FAVORITE BRAND




BIOGRAPHY
A secondary school teacher in a small town. She loves her job and tries to raise awareness among her students about the environment and sustainable living. She uses small brands in her products, from clothes to accessories. She loves craftsmanship and unique pieces.

MOTIVATIONS
Create a positive impact on society through environmental talks to the people around them.

INTEREST
Reading psychology books, watching environmental documentaries and going out for a drink with her friends.

FRUSTATION
Trying to consume sustainable products is not an easy, as all shops, even local ones, offer a lot of packaging that in the end you don't know what to do with them.

"Each time through designs, I strive to communicate something different and to raise awareness in society about what truly matters."



STEFAN JOHANSSON
Designer

PROFILE
Gender : Male
Age : 28
Location : Skövde, Sweden

PERSONALITY
Analytical ★★★★★
Problem Solving ★★★★★☆
Public Speaking ★★★★★

FAVORITE BRAND





BIOGRAPHY
As both a professional and passionate designer, he possesses a versatile skill set can create anything from automobiles to lighting fixtures. He maintains an open mindset towards any design opportunity that comes his way, but has recently developed a growing interest in sustainable design. His creative inspirations often stem from the values embodied by small brands and their unique approaches to design.

INTEREST
Staying organized is important to him in his daily life, and he appreciates objects that aid in organization. Whenever the opportunity arises, he enjoys travelling to different parts of the world and collecting unique handmade jewellery as keepsakes. He has natural curiosity for exploring new experiences and brands, and holds a deep appreciation for the dedication and craftsmanship of artisanal brands.

FRUSTATION
Finding jewelry boxes that can organise jewelry is very difficult especially when it comes to adapting the amount I have.

Figure 10: Personas

3.2.5 PRODUCT SPECIFICATIONS

This method aims to capture client needs and translate them into design language by identifying variables that can be applied to real-world design. The importance of each need, as determined by the clients, has been ranked using a *value-importance table* (see Table 9) gathered in the preceding sections (Ulrich & Eppinger, 2020); all the final sum of each user requirement is reflected in the green column of the table.

Importance value	
Strong	3
Medium	2
Weak	1

Table 9: Importance Value
(E*: Scale variable, range 1-10)

		Metric	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	Importance order 1-10 (1 most important)
			Removable inside parts	Liquid resistance material	Modular (possibility to take away parts)	Enclosed space to (to avoid jewellery)	Intuitive and fast opening	Material against oxidation of the jewellery	Minimalist Design	Adjustable Dimensions	Sustainable materials	Ethical labour process	Transparent process	Use of as few materials as possible	Functional wood material design	Manufacturing process simplification	Take care of the finishing touches	Compartments for each type of jewellery	
Needs (Customer Attribute)			u p		µg/ m³	s	µg/ m³	E*	m m	E C V		E*	Nu mbe r	ye ar	C O2 e	E*			
1	Easy to clean	9																	6
2	Easy to move as a whole	9																	6
3	Easy to access jewellery	6																	9
4	Easy and intuitive to use	11																	4
5	To avoid the deterioration of the jewellery	7																	8
6	Attractive appearance to fit in different environments	8																	7
7	The size varies according to the amount of jewellery	9																	6
8	Sustainable manufacturing process	14																	1
9	Understand the process behind the product	6																	9
10	Resistant and does not break in a short period	8																	7
11	No jewellery entanglement	7																	8
12	Clearly access to all the jewellery	12																	3
13	Fits the storage space of each customer	13																	2
14	Environmentally aware	10																	5
15	Differentiated spaces for each jewellery type	9																	6
16	Children safety	5																	10

Table 10: Product Specifications QFD

Occasionally, some design variables may not be fully defined. However, by utilising QFD, it is possible to prioritise the most significant characteristics based on user input (these are ranked in order of preference, according to the value score, in the *importance order column*). This method has served to guide the subsequent creative phase, inspiring a solution that addresses all identified needs.

PHASE 2

Upon defining the client's needs, characteristics, and product specifications in the previous phase, the subsequent stage will involve generating the project concept. This phase will feature a second creativity workshop to collect ideas and concepts that will then be compiled through sketching sessions. Subsequently, selected sketches will be prototyped in the form of mock-ups. Finally, these concepts will undergo an evaluation process, which will enable the commencement of prototyping in the company workshop.

3.3. CONCEPT GENERATION

The objective of the subsequent project phase is to initiate the development of the project concept, utilising the robust foundation established in previous phases and leveraging the precise specifications and user requirements. It is important to note that while the user needs have been identified, it is possible that they may not be fully aware of all their needs and may discover new needs after using the product (Morris, 2007). So, at this stage of the process, openness to new ideas that can address most of the needs and even uncover new ones is essential. In order to facilitate the concept generation process, a workshop will be conducted in collaboration with users to identify potential product features. Then identified features will be analysed by the design team, summarised through sketches, and finally, analysed through mock-ups.

3.3.1 WORKSHOP II

Therefore, the goal of Workshop II is to conduct a productive concept-generation session with the participants, as collective thinking in a group through an appropriate process tends to generate better ideas (Paulus & Yang, 2000). In this case, to ensure a productive process and valuable outcomes, the process will be studied to enable such results (Paulus & Yang, 2000). Consequently, the same guidelines as in the first workshop will not be followed, as the objective is different.

3.3.1.1 WORKSHOP PROCEDURE GENERATION

In a similar fashion to the previous workshop, a brainstorming process was implemented to plan and organise the objectives and intentions to be accomplished in this subsequent session (Morris, 2007). The main objectives were to thoroughly reconsider the customers and their profiles in conjunction with the users and to commence shaping the product idea. The process was designed to be a straightforward activity for participants, where their interest was the sole

requirement, as all other aspects would be systematically arranged beforehand (Csikszentmihalyi, 1997).

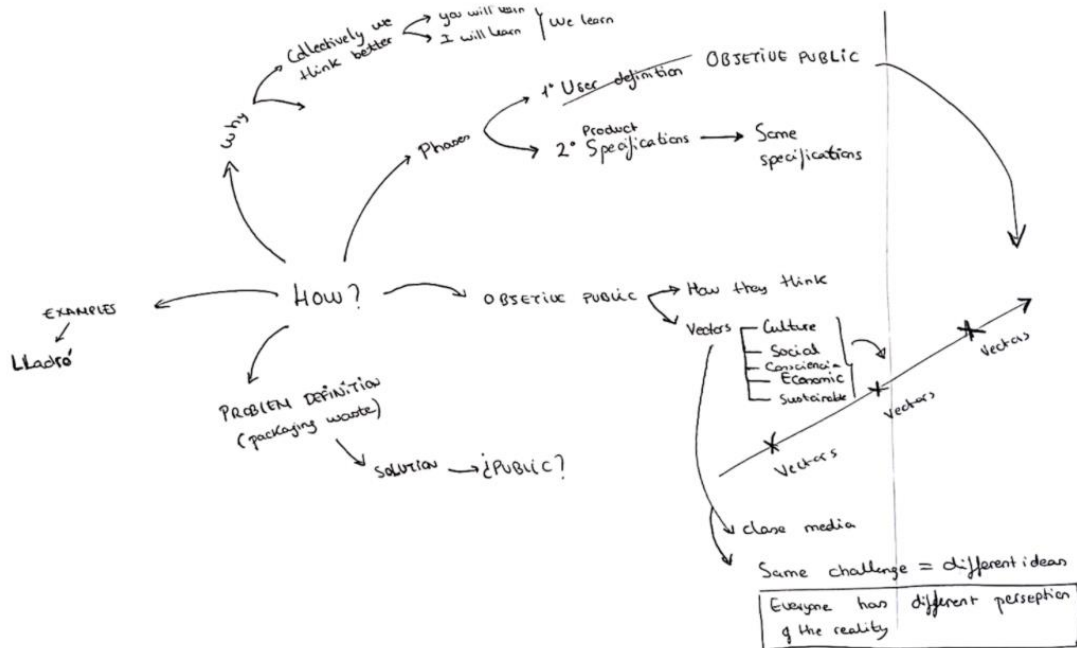


Figure 11: Workshop II Generation Brainstorming

3.3.1.2 WORKSHOP ORGANIZATION

To attract an audience interested in jewellery and creative activities, a visually appealing poster was created for the workshop. The aim was to capture the attention of as many people as possible and provide more information about creativity, jewellery, and design compared to the previous workshop. The target audience included designers or individuals with prior experience in design, as collaborative work between designers and users can lead to an enriching and surprising creative process (Kristensson et al., 2004). Research indicates that designers tend to create more natural products, while users generate more innovative ideas without practical constraints (Kristensson et al., 2004). The results of this collaborative process were studied



Figure 12: Workshop II Poster

3.2.1.3 WORKSHOP PARTICIPANTS

The workshop was attended by 8 participants, of which 3 were final-year students of Industrial Design Engineering, and the others were potential users. This was a pleasant surprise. Similar to the previous workshop, information was collected through a QR code on the poster. Participants filled out a short survey which helped the designer to understand their profiles.

The first question asked for personal information, such as name and age, to determine whether participants would attend. The next question asked about their professional profile, as the aim was to attract potential designers and users. The remaining questions asked participants about their use of jewellery in daily life, where they store it, and how much they would be willing to pay for a jewellery box. These questions helped to identify potential participants, as a minimum level of interest and understanding in the field was necessary for the workshop to take place (Füller et al., 2012).

PARTICIPANTS						
N	F/M	Age	QUESTION 2	QUESTION 3	QUESTION 4	QUESTION 5
1	Female	22	Product Design Engineering Student	Every Day	Physical Store	300-600 SEK
2	Female	23	Humanity Student	Almost every day	Jewelry Box	300-600 SEK
3	Male	25	Student	Just for going out	Box	100-300 SEK
4	Male	21	Industrial Design Engineering Student	Just for going out	Box	600-900 SEK
5	Male	23	Industrial Design Engineering Student	Almost every day	Jewellery and Watches Boxes	600-900 SEK
6	Male	21	Student	Occasionally	Personal Box	100-300 SEK
7	Female	21	Neuroscience student	Every Day	Box	300-600 SEK
8	Female	25	Computer science master student	Occasionally	Jewelry Box	300-600 SEK

Table 11: Workshop II Participants' profiles

3.2.1.4 WORKSHOP DEVELOPMENT

At the beginning of this project, careful planning was undertaken to ensure that the project's main objective of generating the maximum number of ideas was achieved (Cross, 2021). This was achieved through a creative method that involved interested participants, and the entire session was planned to last no longer than two hours. A total of 20% of this time was dedicated to introducing the project to participants and conducting joint research on the possible target groups, while the remaining 80% was allocated to generating ideas using the Manual Thinking process (Huber & Jan Veldman, 2016).

To begin the session, participants were introduced to one another and provided with the tools they needed to participate in the process. The importance of being open to new ideas, not judging the ideas of others, and generating a large number of ideas was emphasised (Paulus & Yang, 2000). The project was then introduced to participants by outlining the main problem it aimed to address and the key values it aimed to convey.

The next challenge for the participants was to identify the target group. Participants were asked to brainstorm ideas about who would be interested in purchasing this product. This activity allowed participants to think more broadly and find other scenarios for the product that the designer had not even considered before (Morris, 2007).



Figure 13: Example of Defining target group in the Workshop II

Following the initial phase of the project, the Manual Thinking process was employed to generate ideas. The eight participants were divided into pairs and were instructed to define the target audience for their product (Figure 13). They were then introduced to the Manual Thinking method, a versatile idea-generation technique commonly used by large companies, which is based on mind mapping (Huber & Jan Veldman, 2016). Before commencing the activity, the participants were informed that they would need to present their final idea

within a 2-minute timeframe, clearly defining the objective that they aimed to achieve and therefore serving as an incentive to complete the activity.

The creation process (80% of 2 hours) was divided into three phases: 40% for idea generation, 30% for selection and 30% for presentation. In the idea generation part, participants were provided with the necessary material to develop innovative ideas for their user profiles. The selection phase required participants to select two or three ideas and combine them. The important thing was not to have a good idea but to combine ideas (Huber & Jan Veldman, 2016). Participants summarised all their ideas on cards and looked at their peers' ideas for inspiration (see Figure 14). During the presentation phase, participants were asked to explain their ideas in a concise manner, using the length of a Twitter headline as a guideline. This ensured that each person spoke for the same amount of time and that the explanations were brief and to the point. Overall, this part of the project used a creative and innovative approach to generating ideas that emphasised collaboration, diversity of thought and effective communication (Kristensson et al., 2004).



Figure 14: Participants' tables, where the order of the process is indicated, phase 0 definition of the user, phase 1 mental map of ideas, phase 2 definition of ideas (the ideas were shared with the rest of the colleagues) and phase 3 presentation of an idea summarised in a Twitter headline.

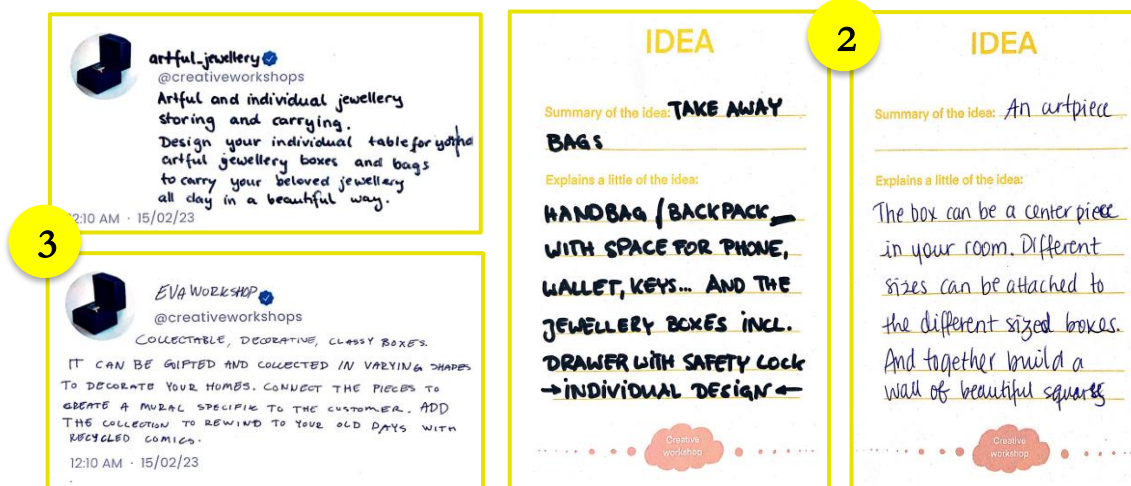


Figure 15: Twitter headlines for the presentation (Phase 3) and summary of ideas for the sharing ideas (Phase 2)

After the presentation phase, a concluding round was held where participants shared their feedback on the activity. The users agreed that working with designers helped them to develop their ideas further and that the process was mutually beneficial. Many of the participants had not previously been involved in such processes and found the experience innovative and empowering. Some of the comments made after the session were:

"I didn't expect it to be so creative before starting the process, let alone thinking of ideas on this subject; I loved it".

"I found exciting the idea of combining objects that at the beginning have nothing to do with each other, and later on they do, who would have thought that a jewellery box could become a stool at the same time? Me today!"

3.2.1.5 COMMENTS/ CONCLUSIONS

The project yielded many valuable insights. The team experimented with different methods and approaches to achieve their objectives and were pleasantly surprised by the effectiveness of the process. One key takeaway was the importance of trying out new methods, even if they are not the main ones used in the field. Additionally, the collaboration between designers and individuals from other fields and backgrounds led to unexpected and innovative ideas, which will inform future design phases. The brevity of the process kept participants engaged and focused and helped generate curiosity and interest in the subject matter. Throughout the process, participants were encouraged to remain focused on the task at hand, guided by the designer's directives. As a result, many participants discovered their creative potential and expressed surprise at their abilities.

After the initial brainstorming phase with the participants, the designer proceeded to collect and review all new ideas and thoughts that emerged. These novel ideas will be further developed and refined in the next design process in combination with the designer's own ideas. One of the next steps in the design process involves the use of sketching sessions to filter and evaluate the ideas generated during the previous activities. Through an iterative process, the

designer will work to create a final product design that incorporates the most valuable and innovative ideas generated in the previous and following stages of the project.

3.3.2 SKETCHES

In this section, the aim is to present the use of sketches as a powerful tool to translate information and ideas from previous activities into visual representations. Sketching not only helps to visualise ideas but also aids in rethinking and refining them, relieving the mind of some of the cognitive burdens associated with information processing and memory (Koos & Steur, 2020). The sketching sessions have been organised into three groups based on the activities carried out in each session. The first group includes sessions where ideas were explored without any constraints or limitations. The second group comprises sessions that focus on specific features that were explored during the design process. Finally, the third group explains sessions where previous concepts were redesigned to address certain aspects that did not work during prototyping. Some of these sessions included the use of mock-ups to visualise the idea with real-world measurements. This division of the sketching sessions has enabled a systematic approach to refining and improving ideas generated during the early stages of the design process.

3.3.2.1 SKETCHING AS A TOOL FOR EXPLORING BOUNDLESS DESIGN IDEAS

In these sketching sessions, the primary objective was to generate a large number of ideas and explore them without the pressure of producing high-quality sketches. The designer was encouraged to put all the ideas that came to mind on paper and allow themselves to be carried away by their thoughts (Csikszentmihalyi, 2002). Additionally, the designer was prompted to relate sketches with objects that may initially appear unrelated, as this approach can often result

in exciting and innovative concepts. These sessions were particularly beneficial during moments when the designer faced creative blocks and struggled to progress with a particular idea. By channelling all their ideas onto paper and discovering new ones, the designer could avoid fixating on one concept and explore a broader range of possibilities (Tedjosaputro, 2018). Figure 16 provides an example of one of these sessions.

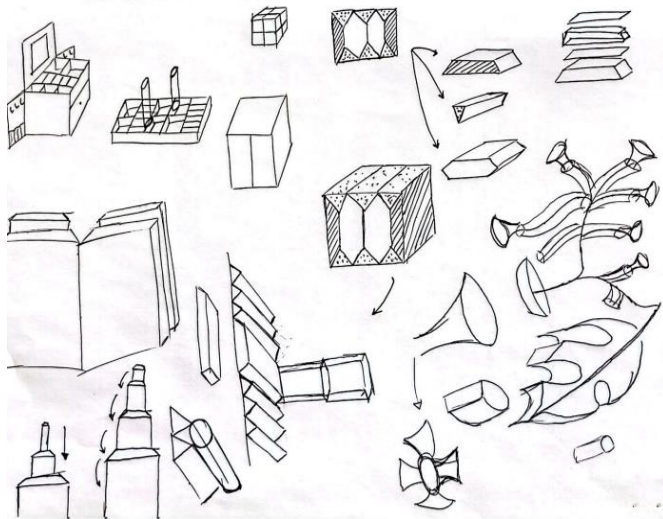


Figure 16: Sketching Session

3.3.2.2 INVESTIGATIVE SKETCHING SESSIONS TARGETING SPECIFIC FEATURES

This phase is a natural extension of the previous phase, where the focus is on the refinement and development of a specific concept that was generated in the initial phase. The goal is to delve deeper into these concepts by focusing on specific features or aspects. It is important to note that the exploration of these concepts does not stop, and if an idea is not working, new ones are generated without getting fixated on a single idea (Zhang & Zhang, 2010). As a result of this process, different sections are created with diverse explorations of concepts, and in some cases, sketches are translated into physical paper layouts to get a clearer idea of the dimensions in the real world. It should be emphasised that while specifications and previous steps of the process are taken into consideration, they do not dictate the generation of ideas but instead are evaluated together with the user's needs and specifications at the end of the generation process.

Firstly, the design process of a jewellery box drew inspiration from Japanese culture, specifically the traditional carpentry techniques, which prioritise the use of minimal materials. To achieve this goal, the team explored various methods of opening and closing the box without the need for screws, metal clasps or other external fasteners. The emphasis on wood as the primary material further supported this approach, as the technique is commonly applied in wood-based designs.

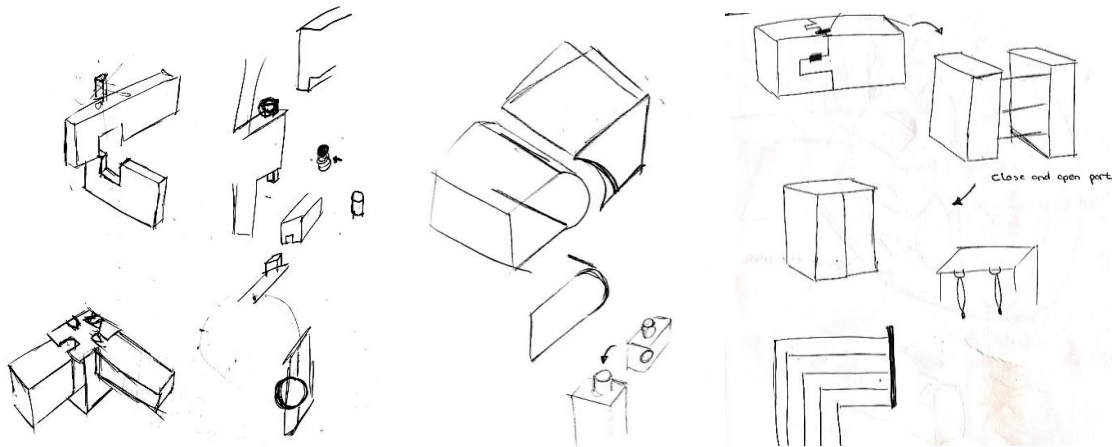


Figure 17: Some ideation sketches inspired by Japanese carpentry techniques

Secondly, the design team has conducted extensive exploration of various forms of jewellery boxes and packaging through a series of sketching sessions. During these sessions, the team examined a range of design concepts that integrate both box and packaging elements into a single concept. These explorations have resulted in several innovative ideas, some of which were inspired by concepts developed in Workshop II.

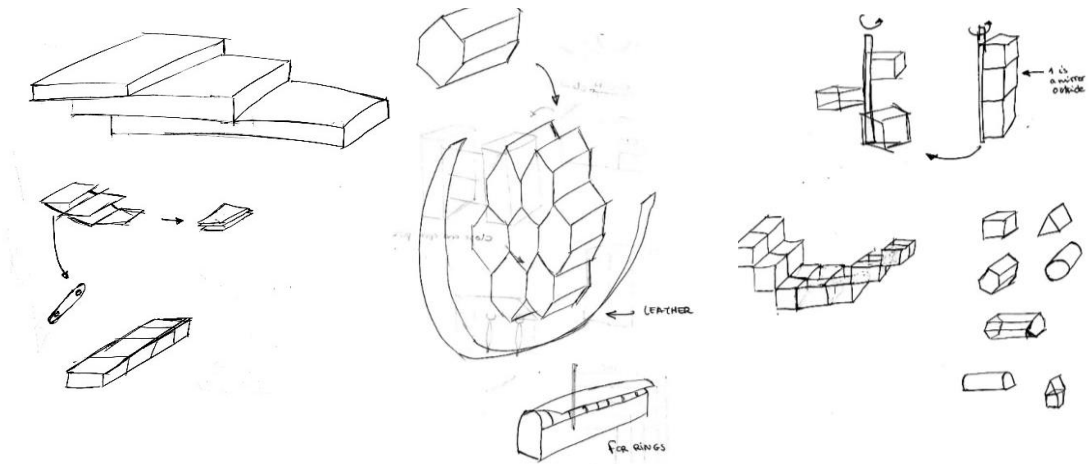


Figure 18: Exploring shapes through sketches

Next, because the experimentation was focused solely on the outer form, the sketches that followed shifted the focus to how the jewellery and objects inside the box interact with it, including their placement within the box. A generation of ideas was carried out through sketches for this purpose.

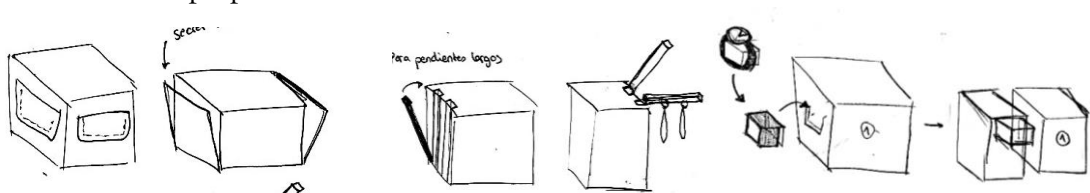


Figure 19: Union of what is to be stored inside the prototype and prototype

Then, exploration of more specific features followed, such as the creation of a single piece that could be utilised to make different items ranging from packaging to a jewellery box. This concept had been previously considered in workshops and previous sketching processes. Hence, ideas for achieving this were explored, initially considering a spring system and, later on, magnets.

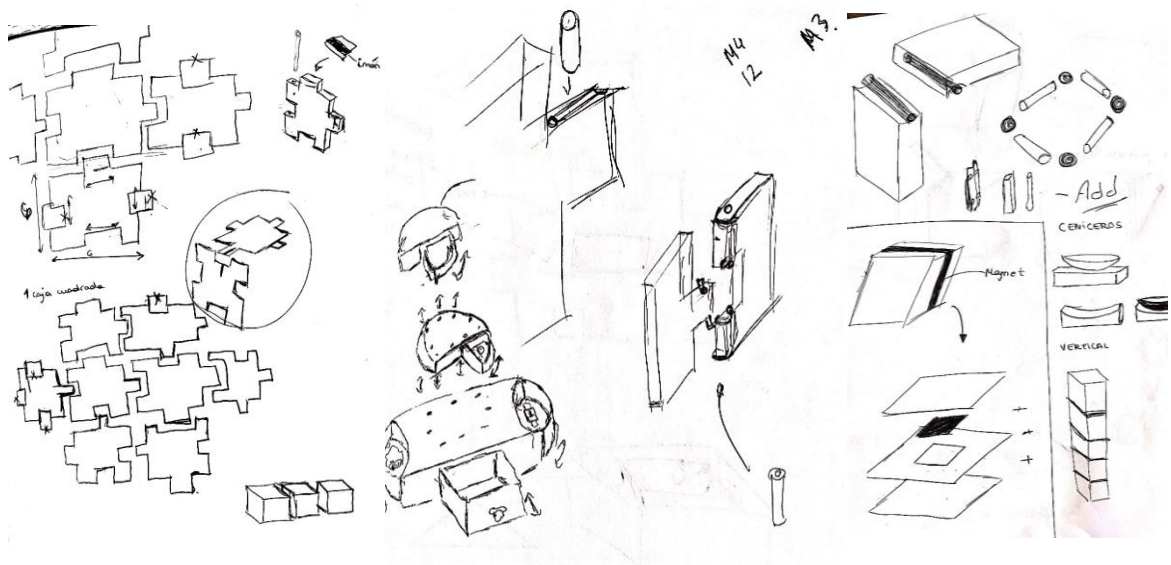


Figure 20: Testing through sketches the idea of a single piece of work.

Several valuable insights can be drawn from this sketching phase. Firstly, it proved to be an effective tool for cognitively organising feature ideas. By putting ideas down on paper, designers were able to clarify their thinking and generate new and improved feature ideas. The evaluation of the generated concepts will occur at the end of this chapter, where both the concepts themselves and the mock-ups created through these concepts will be evaluated.

Following this phase, mock-ups of the concepts were constructed (to be presented later), and some designs were revised based on feedback from Olby Design. In the subsequent sketching phase, designers reconstructed designs that had already been tested in mock-ups and combined new ideas with existing concepts that were not feasible to produce. These concepts were subsequently restudied and developed through sketching (Tedjosaputro, 2018).

3.3.2.3 PRODUCT REDESIGN THROUGH SKETCHING

In this phase, the redesign of concepts and the reasons behind it are presented. The designer's limited experience in working with wood necessitated the involvement of the company in filtering the proposed concepts and offering suggestions on how they could be manufactured more efficiently without compromising quality. The combination of the designer's creativity and the company's experience led to a series of concept iterations that are showcased in the subsequent sketches (Kerpen et al., 2020). However, even the company's experience could not anticipate all the potential difficulties that may arise during the manufacturing process, so the designs had to be continuously rethought and revised.

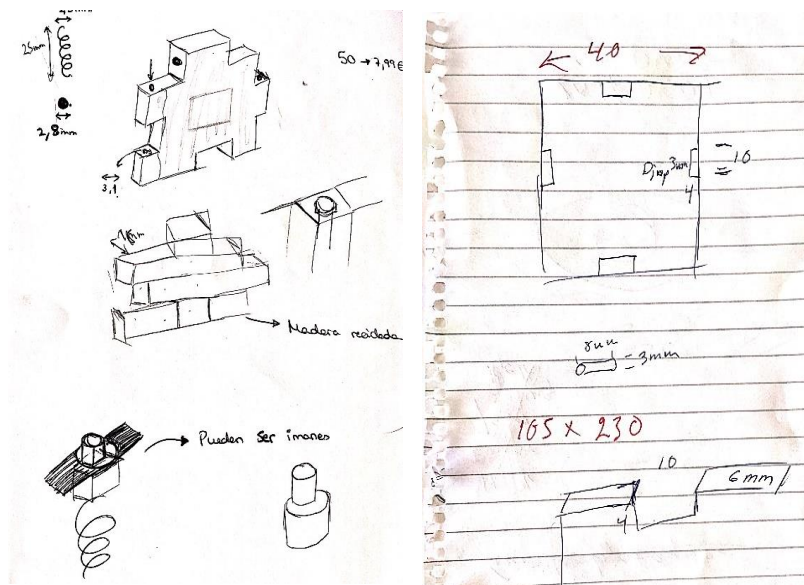


Figure 21: Magnets measurements

The redesign of the single piece (Figure 21) to create a complete assembly was initially proposed but was found to be unfeasible in the workshop. The company proposed an alternative solution involving the use of multiple pieces glued together. However, this concept presented further challenges and was eventually replaced by the magnet concept, which underwent testing

in the workshop. The subsequent design concept (Figure 22) underwent various iterations during mock-up and a sketching session with the company, where they sought to create an alternative concept to magnets. The design was redesigned multiple times until it reached its final phase, which will be presented in the concluding part of this report. Overall, the iterative process of sketching and prototyping has enabled designers to constantly reassess and refine their design ideas, resulting in an enhanced design outcome. Therefore, in the following, the

mock-ups will be explained and then lead to the evaluation of concepts to be able to prototype them.

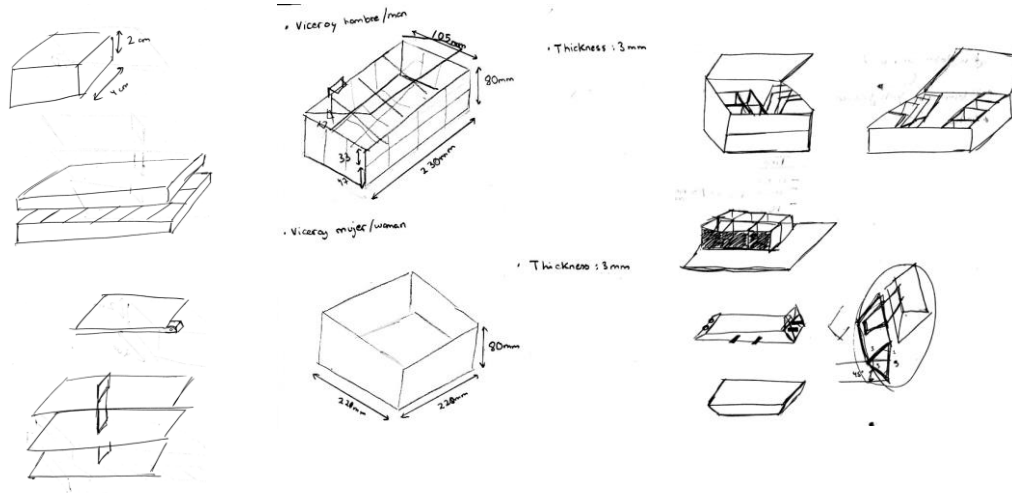


Figure 22: Sketching Redesign

The assessment of the sketches is not considered conclusive until the analysis chapter, wherein the rationale behind the selection of the sketches and mock-ups will be expounded. Accordingly, preliminary mock-ups were generated from the sketches to expeditiously conceptualise ideas and obtain an understanding of the dimensions and systems associated with said sketches.

3.3.3 MOCK-UPS

It is noteworthy that during the collaboration with the company, the designer generated multiple models using wood directly in the workshop, owing to its feasibility as a medium. In this section, the designer's models from the ideation phase will be presented, some of which were subsequently fabricated in the workshop. The primary objective of these mock-ups was to enhance the comprehension of the concept and facilitate communication between the company and the designer, as well as to investigate the various dimensions of said concepts.

The initial prototype (see Figure 23) was subjected to testing utilised magnets, necessitating visualisation of the system and determination of the optimal placement of magnets. Magnets of dimensions less than 1 cm were employed, and the magnetic strength at each corner of the model was examined. Subsequently, this prototype was taken to the workshop, where the effectiveness of the magnets on wood could be assessed in a more realistic setting, considering the wood's weightier nature relative to the paper.



Figure 23: Magnet Mock-up

The subsequent model that was developed involved the implementation of a spring system to explore the actual dimensions through its realisation on paper. The feasibility of fitting the components together was also examined. Furthermore, the use of the prototype as a visual reference facilitated the continuation of sketching, enabling the identification and correction of impractical aspects that may be observed in the real world.

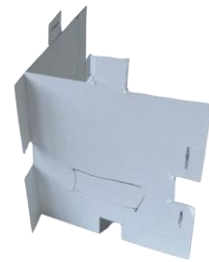


Figure 24: Puzzle Mock Up

An alternative approach that was explored involved the assembly of the pieces in a non-spring-loaded configuration, employing wood as a more sustainable material option. However, the company deemed the manufacturing process for this system to be excessively labour-intensive, and further investigation was impeded by time constraints.

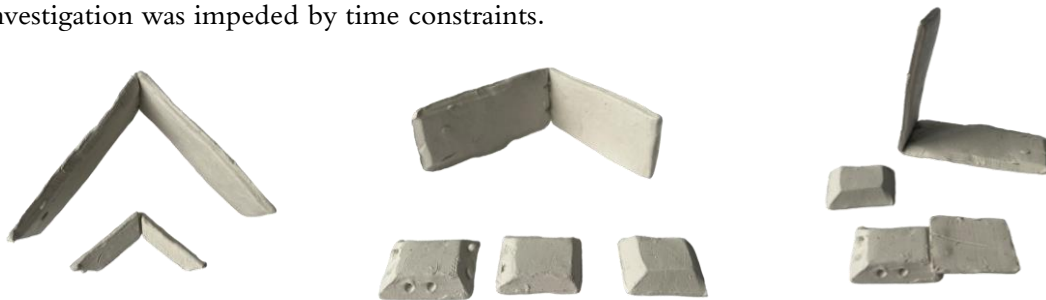


Figure 25: The testing of a clay-based joining function

The most recent prototype developed involved a modular, stackable jewellery box, incorporating internal compartments with dividers. The primary objectives of this model were to investigate its dimensions and visualise its scale in reality. Subsequently, several redesigns of the initial sketches were initiated, as the original concept, as presented by the designer, was



Figure 26: Testing measurements

deemed impractical for fabrication. This necessitated discussions with the company to identify the optimal alternative for manufacturing, utilising only wood as the primary material while ensuring efficient production processes.

After presenting these mock-ups, the process undertaken in the workshop will be explained. However, before delving into that, an explanation will be provided regarding the selection of

these concepts during the generation phase, as well as the primary criteria that influenced their selection.

3.3.4 CONCEPT EVALUATION

The evaluation during this phase was based on two key aspects: the user and the company Olby Design, taking advantage of the latter's extensive experience in the wood sector. From the outset, sketches were presented to the companies, accompanied by product specifications, which facilitated a thorough evaluation of the optimum system and product, which could then be examined in the workshop. The next step was to discuss with Pablo Joyería Relojería how the customer would react to the concepts, as they have a great deal of experience in the industry and in dealing with customers. Consequently, the guiding factor in this evaluation process has been the experience of the companies, which has ensured alignment with user needs and product requirements.

This approach to evaluation exemplifies the principles of "concurrent engineering", whereby sketches and paper mock-ups are developed simultaneously, with subsequent prototyping on the shop floor to assess functionality. Teamwork, trust, consensus decision-making and the effective use of technology are essential elements of this process, culminating in an effective method for conceptualising a product (Morris, 2007).

The selected designs strive to revolutionise the traditional idea of jewellery boxes while simultaneously taking into consideration the user requirements and adhering to Olby Design's design and manufacturing guidelines. The tower design retains the fundamental notion of modular jewellery boxes while incorporating essential customer needs like modularity. The puzzle design seeks to innovate by introducing a puzzle system into a single-piece jewellery box, while the magnet design explores the potential of magnetism in the context of jewellery boxes.



Figure 27: Concept 1
Tower Concept

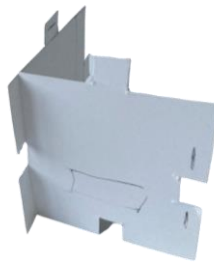


Figure 28: Concept 2
Puzzle Concept



Figure 29: Concept 3
Magnet Concept

From here, it will begin to enter fully into the workshop, where the most optimal manufacturing process to meet the needs of the client will be studied by Olby Design, while Pablo Joyería Relojería will assess whether the needs of the end-users are being met, based on their first-hand knowledge of customer preferences.

PHASE 3

In the third and final phase of the product design process, the workshop will play a crucial role in the creation of the final product. This phase involves the construction of physical prototypes, which will be tested with users as well as evaluated against the defined specifications and other important factors such as the manufacturing process, cost, and the requirements of the companies involved. This hands-on approach allows for a more accurate evaluation of the product's feasibility and effectiveness, as well as provides an opportunity for design modifications and improvements based on feedback from user testing. The use of Computer-Aided Design (CAD) software will also play a role in this phase, as it allows for the creation of detailed and accurate digital models that can be used to refine the physical prototypes further. Overall, the third phase of product design is critical in ensuring that the final product meets the needs and expectations of both the users and the companies involved while also being feasible and efficient to manufacture.

3.4 MODELLING AND TESTING

In this phase, the primary objectives are twofold: firstly, to test the previously obtained design concepts with an iterative mindset, and secondly, to gain knowledge of the carpentry techniques used for crafting small boxes and jewellery boxes. The designer's familiarity with the craftsmanship already employed in the production of these objects may lead to the integration of such features into the final product (Dina fekry gamal & Ahmed Samir, 2020). The prototyping process will begin using a 3D CAD tool to generate prototypes, which will subsequently be examined to determine the appropriate next steps, with input from the company.

3.4.1 PROTOTYPING

3.4.1.1 CAD PROTOTYPING

As previously indicated, the initial step in prototyping involved the use of the SolidWorks computer-aided design program for virtual prototyping. The primary goal during this stage was to generate concise visual representations of the design concepts before transitioning to the workshop. Thus, the typical progression from sketches was to translate the design concept into a digital format, which allowed for the identification of potential issues and the generation of new ideas via the visualisation of the design in three dimensions (Bryden, 2014). As we shall see below, the 3D design served as a valuable visual tool for discovering early problems and identifying areas for improvement prior to physical prototyping (Bryden, 2014).

The first concept that underwent prototyping was the *puzzle concept*, wherein the internal spring system was analysed using a suitable tool. However, after studying the design on the computer, the company with the designer found that this concept would require extensive work for each piece, with each jewellery box comprising at least 12 pieces to form a 100x100x100mm box (although the dimensions could be adapted by the user, these were considered to be the minimum dimensions of a jewellery box for this concept, due to the

jewellery storage space). Consequently, the decision was made to abandon this concept for the project. The company's experience in working with wood and its decision-making abilities were crucial at this juncture (Dina fekry gamal & Ahmed samir, 2020).

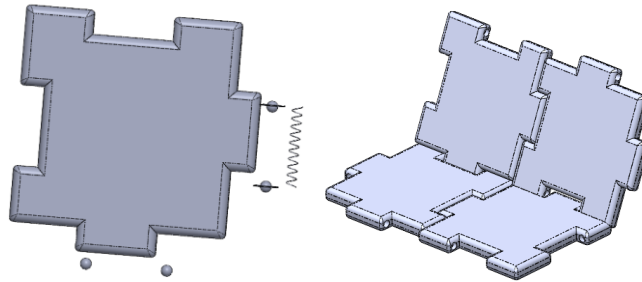


Figure 30: Prototyping the puzzle concept in SolidWorks

Consequently, another concept was tested. After testing the tower concept on mock-ups, the next step was to evaluate it on the computer. In this stage, the dimensions of the interior and exterior boxes were studied to ensure they fit perfectly. The central part of the tower concept was designed in such a way that it could be connected to the other equal parts, allowing for easy transportation. The 3D prototype of the tower concept yielded valuable insights regarding the dimensions of height and the number of interior boxes it could store.

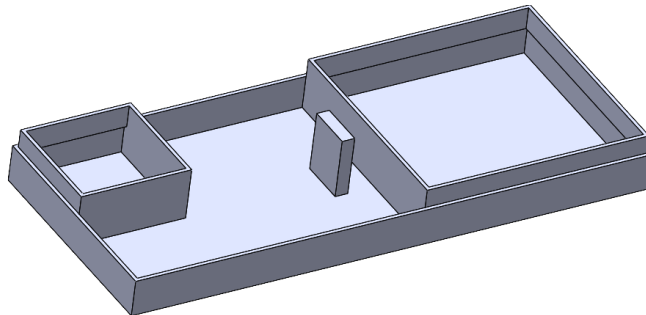


Figure 31: Prototyping the tower concept in SolidWorks

The magnet concept was excluded from the Solidworks prototyping process, as it was deemed necessary first to test the magnet's workability and its strength in combination with wood, prompting its direct transition to the workshop.

In conclusion, the integration of Solidworks prototyping provides an enhanced means of conceptual communication among a group of individuals. While traditional sketches may also serve this purpose, the former offers a more precise means of conceptualisation and serves as a valuable precursor to mock-ups (Bryden, 2014).

The following section will provide details on the introduction to the woodworking process through the prototyping of jewellery boxes. During this stage, Olby Design's approach towards jewellery box manufacturing will be communicated to the designer, allowing for the acquisition of knowledge on possible features and design implementations. (Kuo-Kuang & Ting-Ting, 2019).

3.4.1.2 INTRODUCTION TO WOODWORKING

The prototyping process was initiated from the sketching phase, where the primary objective was to familiarise the designer with the nuances of woodworking, given their limited experience in the field (Kuo-Kuang & Ting-Ting, 2019). The company demonstrated the workshop procedures and presented various features that could be incorporated into the design. Subsequently, conceptual parts were developed to be applied in the subsequent phases.

As a result, different features were obtained that served as inspiration for the designer in the concept creation process. The exploration of Japanese culture was carried out (see Figure 32), which included the demonstration of a Japanese joint in the workshop without any screws (Ogawa et al., 2015), where the designer recognised the amount of time and precision required to create such a joint, contingent upon the tools and experience.



Figure 32:
Japanese Testing

The process of opening and closing a simple box was also explored, which required (see Figure 33) accurate margins to prevent the pieces from sticking together.



Figure 33: Testing in the workshop Concepts

Another interlocking concept was developed, where the designer's sketch was used to create a jewellery honeycomb system. However, this idea was discarded since it was not visible and did not satisfy the crucial requirement of jewellery visibility.



Figure 34: Testing in the workshop Honeycomb System

Additionally, tests were conducted to evaluate the functionality of the snap lock of a small 40x40x30 mm box. The system involved a square box with a sheet added to the inside of the box, serving as a socket. It was concluded that precision was essential in creating the socket, similar to the Japanese technique, wherein accurate measurements of both the lid and the box were necessary. However, in this system, the level of precision required was slightly lower than that in the Japanese system.



Figure 35: Testing in the Workshop Closing System

The company's involvement in this process helped the designer comprehend the time and effort needed to manufacture small objects, which was a challenge for the company that typically worked on large objects. The iterative nature of the process enabled the designer to make informed decisions in the sketching process based on the knowledge gained from exploring concepts and ideas in the workshop (Dina fekry gamal & Ahmed samir, 2020).

Subsequently, after acquiring some practical familiarity with woodworking through the workshop and experimentation, the next phase would involve a thorough examination of certain aspects of the conceptualisations put forth in the mock-ups, specifically about the behaviour of magnets when used in conjunction with wood.

3.4.1.3 PROTOTYPING FEATURES

During the prototyping phase, significant attention was devoted to the magnets as a novel feature in combination with wood. The objective was to optimise the functionality of the magnets, which were perceived as a unique and distinctive feature (Hideo, 1996).

To achieve this objective, several prototypes were developed, wherein the magnets were implemented in different ways to the wooden pieces to assess their strength. The magnets were of elongated and narrow dimensions, measuring 10x2mm, thereby possessing maximal strength when two of them were joined together at the ends and laterally, although the latter was relatively less powerful.

Two prototypes were developed, wherein the strength of the magnets was evaluated in different orientations. Figure 36 depicts the first prototype, wherein the magnets were placed at each end of the wooden piece vertically. This prototype revealed that the magnet was not sufficiently strong to hold together independently.



Figure 36: Prototyping in the workshop, magnets feature

Therefore, the magnets were tested horizontally, where they were expected to be stronger. The magnets were positioned on the top and bottom of the piece, and multiple magnets were used to assess whether this increased their strength (see Figure 37). Although the magnets

exhibited a slightly greater degree of strength, they were still not sufficiently potent to stand on their own.



Figure 37: Prototyping in the workshop, magnets feature

The research on magnets persisted in determining the optimal method of creating powerful yet manageable magnets suitable for manufacturing small pieces. Subsequently, decisions were made with the company regarding the best course of action in the workshop based on both the manufacturing process and the user's requirements.

3.4.1.4 PROTOTYPING CONCEPTS

In this final phase of prototyping, after conducting market research on magnets, focused efforts were dedicated to the development of magnets in closer conjunction with wood. Techniques were explored to enhance the magnet's performance without significantly increasing its size. The resulting prototype underwent further refinement through redesign iterations, ultimately leading to the realisation of the final concept.

A noteworthy discovery during the market research phase was a children's game comprising plastic pieces embedded with magnets (Limmys, 2022), which can be assembled to form boxes, aligning closely with the desired objective. Notably, the novelty of this game lies in the magnets being inserted into small holes within each piece, allowing for freedom of movement and consequently augmenting their magnetic strength (Limmys, 2022). This intriguing feature was consequently chosen for testing purposes. Subsequently, we will delve into the manufacturing process to provide a more comprehensive understanding of the steps undertaken and their rationale.

Initially, in the first step in Figure 38, a 0.5 m block of wood was employed to create the grooves, as depicted in the accompanying illustration, wherein the magnets would be placed. The second step consisted of placing 1 mm wood veneer on all sides of the block. The third step was to remove the excess veneer by sanding it, which was then cut into 5 mm thick pieces, resulting in the components shown in Figure 38 below as the four-step. Finally, a layer of 1 mm thick wood veneer was applied, followed by the placement of the magnets and another layer of veneer. Once the assembly was sufficiently dry, the excess material was meticulously removed by sanding, as shown in step 5.

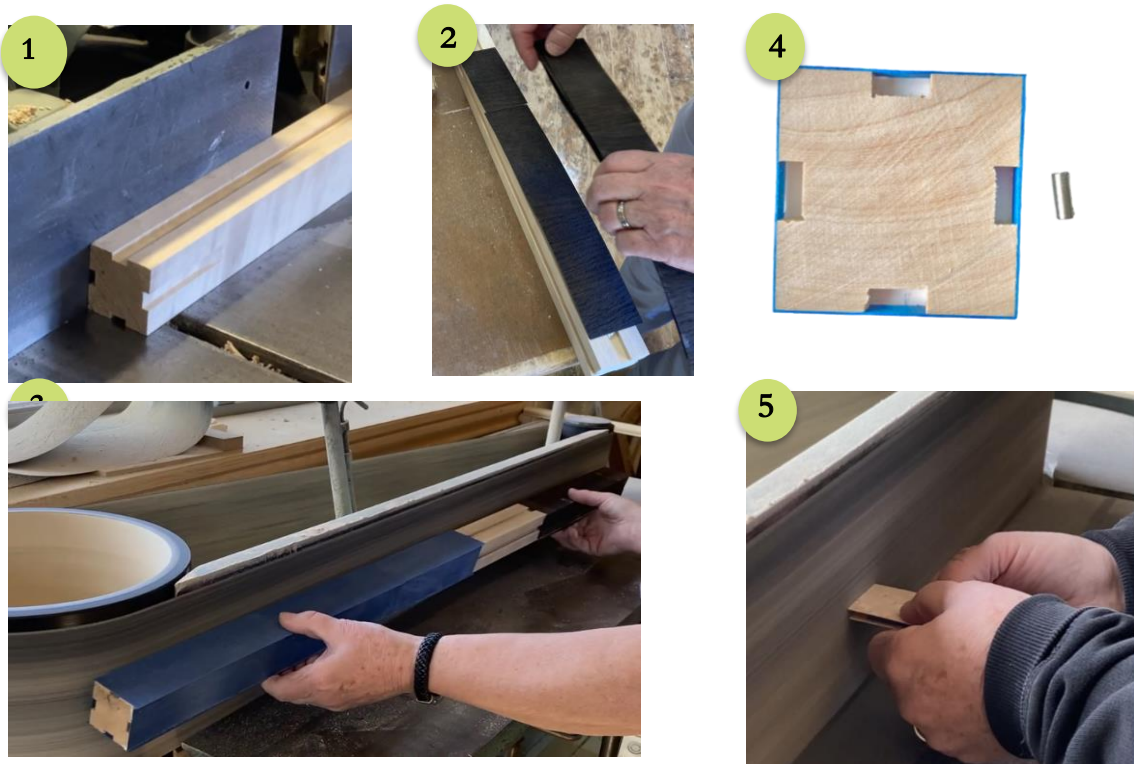


Figure 38: Process Magnets Prototype

Notably, this prototype exhibited significantly enhanced magnet strength, thereby validating its efficacy in terms of magnetic performance. However, several issues arose during the subsequent evaluation. Firstly, the added veneer was fragile, rendering it susceptible to breakage or expansion due to humidity and the passage of time. Additionally, the absence of chamfers on the pieces resulted in suboptimal fitting, leaving some parts with gaps, as depicted in Figure 39. While the magnet component of the prototype demonstrated functionality, structural issues persisted.



Figure 39: Magnets Prototype

Subsequently, the subsequent phase of this conceptualisation aimed at tackling the aforementioned challenges. Primarily, it necessitated addressing the issue of insufficient thickness in the veneer. The veneer utilised initially was deemed excessively thin (1 mm), thereby compromising the durability of the prototype due to its susceptibility to breakage over time. Furthermore, there existed an incoherence in the assembly, as the constituent parts failed to fit together seamlessly. Thus, both these factors disregarded the essential requirements

outlined in the specifications, namely long-term durability and an intuitive, user-friendly system.

In response, a viable solution was devised to rectify these concerns. Specifically, a thicker sheet metal measuring 2.5 mm was introduced. This intervention effectively alleviated the aforementioned problems by facilitating the implementation of a 45-degree chamfer. This modification not only enhanced the overall robustness of the assembly but also ensured a precise fit between all the components, thereby eliminating any gaps or misalignments.



Figure 40: Improved Magnets Prototype

The subsequent phase of this project involves the development of the tower prototype, which focuses on investigating the feasibility of stacking jewellery blocks. The interior of the tower will feature separators, which will be obtained with each jewellery purchase. Consequently, it was essential to prototype this concept to assess its functionality and gather user feedback (Bryden, 2014).

To begin with, a concise overview of the process will be provided, similar to the approach adopted for the previous prototype. This will enable a comprehensive examination of how the challenges posed by the concept were addressed from the outset. The first step in the process involves the preparation of materials, considering that they need to be balanced due to their 4 mm thickness (see Figure 41). This ensures that subsequent steps do not encounter issues related to the properties of the wood.

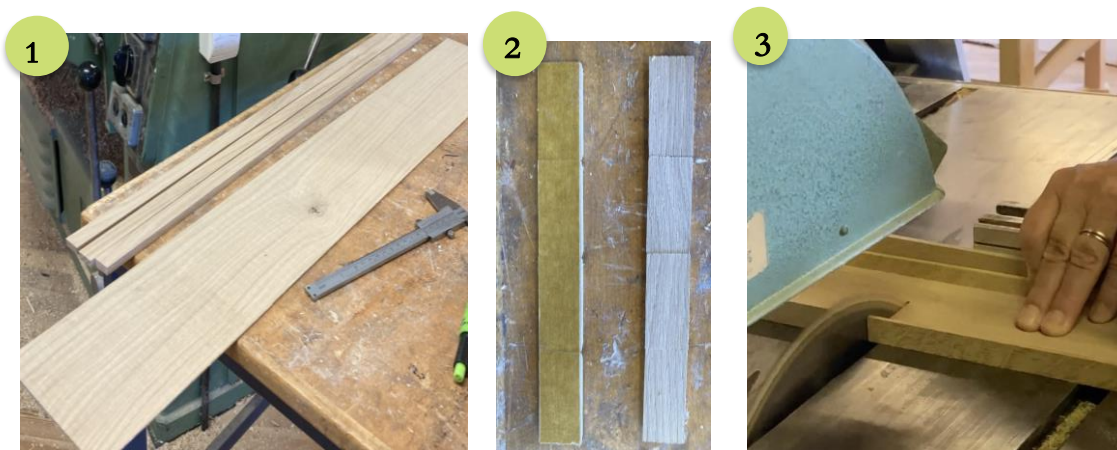


Figure 41: Some steps in the tower prototype process

The second step entails the cutting of the interior boxes, which are then glued together at a 45-degree angle. Subsequently, the outer components are prepared, wherein the sides are

affixed to the bases and subsequently cut into uniform pieces to form the outer part of the tower. Finally, the necessary finishing touches, including sanding, are applied to ensure the edges are smooth and safe for children, as specified in the product requirements. This step aligns with the actions taken during the development of the previous prototype.



Figure 42: Tower prototype, inside boxes



Figure 43: Tower prototype the whole parts together

To sum up, the dimensions of the boxes and why these dimensions were chosen will be discussed. In the case of the first prototype, the dimensions of 40x40mm were selected for several reasons. Firstly, this size was commonly available in the existing market for boxes, making it a convenient choice for sourcing materials (Benevolence LA, 2023). Additionally, opting for this size was deemed appropriate to initiate the development of the first prototype. For the second prototype, a more varied range of box sizes was chosen. Three sizes were identified to accommodate different types of jewellery. The smallest size of 40x40x20mm was tailored explicitly for smaller items like rings or small earrings. The medium size of 40x80x20mm was selected to accommodate slightly large jewellery pieces, such as pendants or oversized earrings. Lastly, the 80x80x20mm box was designed to accommodate bracelets and even larger jewellery items.

The selected dimensions for the initial prototypes serve as a starting point, considering the possibility of modification based on user testing and feedback in subsequent iterations. It is crucial to emphasise that these sizes were determined with the intention of better aligning them with user preferences and requirements (Morris, 2007). This inherent flexibility in adjusting the dimensions based on user testing facilitates iterative improvements and the optimisation of the prototype design. Subsequently, the results obtained from both prototypes will be analysed and discussed with the users, who play a vital role in determining whether the

product specifications have been successfully met. This evaluation process is carefully conducted by the designer, incorporating user feedback to refine the concept and address any potential shortcomings.

3.4.2 WORKSHOP III

Hence, the subsequent phase encompassed the execution of the latest workshop, primarily focusing on the testing stage, with the primary objective of assessing how the prototypes aligned with the predefined user requirements.

To commence the workshop, careful deliberation was given to the process and the requisite participants. As the ultimate aim was to garner user evaluations of the product and its outcomes, individuals unfamiliar with the preceding developmental stages were sought (Venez et al., 2022). Furthermore, it was crucial to engage potential clients whose profiles mirrored those of the target demographic. The rationale behind involving users who lacked prior knowledge of the process or its elements was to ensure their assessment centred on the final result rather than a comprehensive audit encompassing the entire developmental process (Venez et al., 2022).

Prior to the workshop initiation, the initial step involved recruiting highly prospective customers for the products. This entailed administering a questionnaire to groups of individuals, wherein they were allotted 20 minutes to complete an activity, as this is the time when the mind can be fully concentrated, and participants need to be focused on the activity (Csikszentmihalyi, 1997).

The participants selected for the workshop possessed specific characteristics that included frequent usage of the jewellery, a strong environmental consciousness, and a distinct appreciation for craftsmanship. To identify and recruit individuals meeting these criteria, a questionnaire was disseminated, consisting of the following key questions:

- Question 1: Personal Information (Gender)
- Question 2: Personal Information (Age)
- Question 3: Employment situation (Student, Worker, Housemaker...)
- Question 4: On a scale of 1 to 10, the latter being the highest, how environmentally conscious do you consider yourself to be in your daily life?
- Question 5: On a scale of 1 to 10, the latter being the highest, how vital is craftsmanship to you?

The objective of administering the questionnaire was to assemble a cohesive group of users who exhibited all of these aforementioned attributes (Brandt, 2004). Following the analysis of the responses, a total of six individuals were identified, all of whom demonstrated alignment with the specified characteristics.

To serve this purpose, a workshop was conducted involving six individuals who exhibited striking similarities to the profiles of the aforementioned "Personas". In this instance, users were individually interviewed and subjected to an evaluation test involving the prototype's usability. The test was designed to assess the extent to which the product aligned with the predefined requirements and needs, allowing users to render their judgments concerning its fulfilment, as they were the ones who initially defined the needs (Kristensson et al., 2004).

N	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6
1	female	25	student	Almost every day	8	8
2	female	23	student	Everyday	6	9
3	female	20	student	Occasionally	8	9
4	male	21	student	Almost every day	7	9
5	male	34	Worker	Almost every day	7	10
6	female	46	Worker	Everyday	8	8

Table 12: Participants' Profiles Workshop III

In the initial phase of the study, participants were individually presented with prototypes of a tower and magnet, along with a bag containing jewellery and a watch (refer to Figure 44). The objective was to place the jewellery inside the prototypes while the designer measured the time taken for this action. This evaluation aimed to determine whether the prototypes fulfilled the predefined criteria of ease of use and intuitiveness (Kristensson et al., 2004).

Subsequently, participants were requested to provide ratings on a numerical scale ranging from 1 to 10. The ratings were assigned to statements corresponding to various specifications. For instance, participants were asked to rate the ease of cleaning the prototypes on a scale of 1 to 10, where a rating of 10 indicated high ease of cleaning and a rating of 1 denoted significant complexity in the cleaning process.



Figure 44: Participants Workshop III

This evaluation procedure facilitated the comprehensive assessment of the extent to which the predetermined requirements were satisfactorily met. Notably, the specifications were initially defined by the users themselves, thereby ensuring that the prototypes were evaluated based on the users' individual needs and perceptions, as illustrated in Table 13, the "Media User" column. These evaluations were obtained by calculating the average of all user responses. Subsequently, to derive the "Total Average," the user-provided average was compared with the "Media Project," which encompassed the variables specified in the product requirements. The combination of these factors played a pivotal role in determining the degree to which the prototypes aligned with the stipulated requirements (Kristensson et al., 2004).

		1		2		3		4		5		6		Media Project		Media User		Total Media		
Nº	Needs (Customer Attribute)	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	
1	Easy to clean	8	10	9	10	8	6.5	10	8	8	9	9	10	8	8	8.5	9.5	8.3	8.8	
2	Easy to carry	10	7	8	8	6	6	8	4	10	7	8	5	7	4	8	6.5	7.5	5.3	
3	Easy to access	10	8	9	10	9	6	10	7	9	10	10	5	9	8	9.5	7.5	9.3	7.8	
4	Clearly access to all the jewellery	10	8	10	10	8	8	10	7	10	8	10	7	9	7	10	8	9.5	7.5	
5	To avoid the deterioration of the jewellery	10	9	9	9	8	7	9	9	9	9	10	8	10	10	9	9	9.5	9.5	
6	Attractive appearance	10	10	9	10	8	10	10	10	9	10	8	8	9	9	9	10	9	9.5	
7	Neither too small nor too big	9	5	8	7	7	8	9	9	5	6	9	9	7	8	8.5	7.5	7.8	7.8	
8	Ecologic process	9	6	10	6	9	6	10	10	8	6	9	5	9	6	9	6	9	6	
9	Ethical product	8	4	10	10	8	8	8	8	6	7	8	7	9	7	8	7.5	8.5	7.3	
10	To last over time	9	9	9	9	7	6	8	8	9	10	10	10	8	8	9	9	8.5	8.5	
11	No jewellery entanglement	6	6	5	7	7	4	8	2	9	9	8	2	7	4	7.5	5	7.3	4.5	
12	Enough space for all types of jewellery and some watches	10	10	10	10	8	8	8	4	9	2	8	5	8	6	8.5	6.5	8.3	6.3	
13	Adjustable to the space	10	9	9	8	8	6	10	6	10	8	7	8	9	9	9.5	8	9.3	8.5	
14	Environmentally aware	9	6	10	10	10	6	9	7	8	4	8	6	9	6	9	6	9	6	
15	Differentiated spaces	10	8	6	7	8	4	9	5	10	6	10	6	8	4	9.5	6	8.8	5	
16	Security for children and disabled people	7	2	10	8	8	4	8	4	9	2	9	4	7	5	8.5	4	7.8	4.5	
														Total			8.6		7.4	
T = Tower Prototype																				
M = Magnets Prototype																				

Table 13: User Needs Results Workshop III

Consequently, this study not only suggested that the Tower Prototype fulfils more of the Product Specifications but also revealed that when users interact with a product for the first time, alternative uses and innovative solutions often emerge. Additionally, assessing whether the product genuinely satisfies the specified requirements provide valuable insights into users' evaluations within a short timeframe. However, it is important to filter this information by comparing the users' results with the classifications made by the designer using predefined variables in the requirements table. The average of these evaluations ultimately determines the degree to which the specifications have been met.

In conclusion, this activity can be characterised as an experiment wherein previously unconsidered functions of the prototypes were discovered by the designer (Willis, 2015). Moreover, the findings specify that users encountered greater difficulty in using the magnet prototype due to the need for assembly. Users exhibited curiosity and experimentation with

the magnet prototype while expressing concerns regarding numerous aspects that did not meet expectations. Some users even contemplated combining elements from both prototypes.

The analysis indicates that a significant portion of the requirements for both prototypes has been successfully fulfilled, although the magnet prototype exhibits more deficiencies compared to the tower prototype. Moving forward, the evaluation will not only consider customer needs but also include other aspects of the process that have been previously overlooked and must be considered in the next chapter.

3.4.3 PROTOTYPE EVALUATION

In this concluding section, the evaluation of both prototypes will extend beyond the product specifications, which were established in response to user needs, as discussed in the preceding chapter. Moreover, additional relevant variables within the process will be diligently contemplated. To facilitate this assessment, a table inspired by the Matrix Pugh technique will be utilised (Cross, 2021). Through the application of weights, criteria will be assigned importance based on various factors that will be elucidated subsequently.

First and foremost, while the environmental factors have already been considered in the preceding section to facilitate an ecologically conscious process, sustainability remains a crucial aspect that warrants continued emphasis during the prototype selection (Kuo-Kuang & Ting-Ting, 2019). From the outset, the transmission of sustainability has been one of the primary objectives, which is reflected in various aspects such as the craftsmanship involved in the manufacturing process, the production time required, and the meticulous hand assembly conducted by skilled artisans (Kuo-Kuang & Ting-Ting, 2019).

Moreover, cost is another critical factor that has been given due consideration in the evaluation process. Pablo Joyería Relojería has placed significant emphasis on cost, recognising the substantial competition in the market. Realistically, if the price of the product is not competitive, its marketability will be adversely affected. Consequently, the cost factor has emerged as another pivotal point influencing the selection of the final prototype, which will be further explored and discussed comprehensively in the subsequent section dedicated to the final product.

Design Criteria	Weight	Tower Prototype		Magnet Prototype	
	W*	S	U	S	U
Sustainability	15	9	1.35	4	0.6
User Needs	20	8.6	1.72	7.4	1.48
Manufacturing	10	9	0.9	6	0.6
Assembling	10	7	0.7	5	0.5
Production Time	10	7	0.7	5	0.5
Costs	20	8	1.6	4	0.8
Companies need	10	9	0.9	6	0.6
Ergonomics	5	8	0.4	4	0.2
The overall utility			8.27		5.28

* W = Percentage weight of each criterion (form 100)
S = Score of quality of each design (from 10)
U = Utility (weighted score) of design = W x S

Table 14: Evaluation chart for the tower and magnet prototypes

In consideration of the previous requirements outlined by Pablo Joyería Relojería, factors beyond cost have also been examined to address the needs of both companies. One such factor is retail compatibility, which pertains to ensuring mutual agreement between the companies regarding the obtained results and the values conveyed by the product. The innovative design must incorporate the core values of both companies, thereby fostering a cohesive partnership. Furthermore, the design's ergonomics have been considered, particularly in response to Workshop III's observations regarding accessibility issues. The magnet prototype, in particular, received feedback from users highlighting its excessive depth, resulting in items being misplaced within it. Therefore, addressing this concern has been regarded as an important factor in the evaluation process. These designated "Design Criteria" have been assigned a range of values, which were discussed and agreed upon between the designer and the respective companies (Kerpen et al., 2020).

Ultimately, the tower prototype attained the highest score of 8.27 out of ten, making it the selected final prototype in this design process. In contrast, the magnet prototype, despite featuring innovative design elements, fell short of fulfilling all the necessary needs and requirements outlined for this project.

In the results section, a comprehensive analysis of the key attributes of the final prototype will be presented. This discussion will delve into the prototype's life cycle, elucidating the rationale behind its selection and highlighting its salient features.

4 FINAL PROTOTYPE ANALYSIS

In this final section of the report, the final product will be presented through the analysis of its life cycle (LCA), where the stages it goes through, from its introduction on the market to its decline and discontinuation, will be studied (Lewis et al., 2001). The chronological progression of the product's existence in the market will be represented. This is intended to aid in understanding the dynamics and changes that the product undergoes over time and the impact that it could have, mainly focusing on the social approach and placing great emphasis on the environmental one (Lewis et al., 2001).

The extraction of materials plays a crucial role in the development of the prototype. Through extensive research, it has been found that woods such as oak, walnut, and mahogany contain tannic acid, which exhibits remarkable properties against humidity (Price et al., 2021). Tannic acid reacts with metals to form insoluble compounds called metallic tannates, preventing oxidation and damage to non-gold or non-stainless steel jewellery (Price et al., 2021). Therefore, these woods are considered ideal materials for the intended use. Furthermore, the oak used in the prototype is sourced from sustainable and local forestry, focusing on natural forest regeneration and responsible management practices. This approach aims to minimise environmental impacts starting from the extraction phase.

The production process of the prototype differs from mass production in large companies, as it emphasises craftsmanship and experience. This handmade approach reduces the requirement for large quantities of materials and inexpensive labour (Kuo-Kuang & Ting-Ting, 2019). The pricing of the final product is set to be fair and ethical, examining the entire process involved. Additionally, the environmental impact generated in a small workshop differs from that of large companies. Although electricity is necessary for cutting and refining the wood, and adhesives are used for assembly, resource consumption is carefully managed during the production process. In the final stage of the production process, it is important to note that minimal surface finishes are chosen for oak, the material used in the jewellery box. The goal is to preserve its qualities and prevent the oxidation of the jewellery. After consulting with the company, it was decided that the surface treatment would be oil, which gives it a shinier appearance.

The distribution of the prototype is localised, as it is sold by small companies. Consequently, the product does not need to be transported over long distances, resulting in reduced ecological and social impacts. The limited availability of these unique pieces further encourages local consumption, adding value to the product (Lewis et al., 2001).

During the use phase, the jewellery box serves as both packaging and a modular storage solution. Unlike plastic alternatives, this product is made from non-plastic materials, eliminating the release of microplastics (Lewis et al., 2001). Its design promotes prolonged use, and as customers acquire new jewellery, they can expand the jewellery box according to their specific needs. This modular feature ensures that users only consume what they require, minimising unnecessary consumption and waste.

Moreover, the incorporation of findings from the workshop assessing the economic valuation of individual jewellery boxes revealed an average willingness-to-pay of 100 SEK among users. Remarkably, this pricing outcome aligns closely with the predetermined price set by the Olby Design company after carefully evaluating the production labour and material costs associated with the product.

In the final phase of the product's life cycle, options for recycling are available since the jewellery box is made entirely of wood, a 100% recyclable material. Users can choose to refurbish the product by seeking assistance from the original company or a carpentry service, offering a cost-effective means to extend its lifespan and reduce energy consumption. Alternatively, if refurbishment is not feasible, the wood can be recycled into wood particles for the production of chipboard or utilised in other applications (Lewis et al., 2001).

Through an evaluation of factors such as energy consumption, material selection, and impact reduction in each phase, the prototype fulfils approximately 82% of user expectations. Not only does it meet sustainability objectives, but it also embodies the values and principles of the companies involved, resulting in a truly sustainable and socially responsible product, thus creating a Sustainable Modular Jewelry Box prototype.



Figure 45: Main View Sustainable Modular Jewelry Box Final Prototype



Figure 46: Sustainable Modular Jewelry Box Final Prototype

5 DISCUSSION

Throughout the course of the final project, the incorporation of flexibility, freedom, and effective planning has become a crucial skill, allowing for the adaptation of time according to project requirements. This approach has facilitated ample room for reflection, testing, and modifications. Emphasising the significance of the literature review, extensive study has provided a solid foundation for the project's execution.

The development plan of the project was meticulously outlined using a Gantt Chart, which delineated activities and allocated timeframes prior to project commencement as per the specifications. This strategic planning proved immensely beneficial in realising the project's full potential. It should be noted, however, that while the plan underwent alterations throughout the process, it still contributed to bringing order to the proceedings. Creative workshops were organised from the project's inception, followed by a comprehensive study of techniques in the relevant literature. This aspect of the project successfully met the initial expectations. Nevertheless, it would have been advantageous to allocate more time to thoroughly investigate participant conditions and increase the number of participants, especially during the final workshop, to obtain valuable feedback. Unfortunately, due to constraints in terms of contacts and time, the project did not reach the international audience initially anticipated, as most interviews and questionnaires were conducted with Spanish individuals.

Concerning the workshop activities, there were higher expectations for conducting additional tests and exploring concepts. However, the development of the magnet concept consumed more time than anticipated due to the need to request specialised tools that were unavailable in the workshop. Although efforts were made to optimise other tasks during this time margin, the prototyping phase of the concept extended beyond the usual duration. It is essential to understand that when prototyping novel concepts, it is often necessary to work with tools unfamiliar to the company, particularly when transitioning from larger objects (furniture) to smaller ones (jewellery boxes). Consequently, this adaptability is understandable and contributes to the learning process.

Another significant challenge, as well as a primary objective, was to merge the packaging of a piece of jewellery with a final product, such as a jewellery box. This endeavour not only encompassed the limitations of packaging but also incorporated the constraints associated with the final product. Balancing the requirements of the designer, representing the client's needs, along with reaching a consensus among Olby Design, the manufacturing company, and Pablo Joyeria Relojeria, the retail company, posed a challenge for all parties involved. Consequently, the evaluation of the final prototype incorporated not only the client's opinion but also the perspectives of the companies, both of which significantly influenced the decision-making process.

Furthermore, conceptualising innovative concepts required knowledge and experience with woodworking, which the designer acquired through collaborative learning sessions with Olby Design. Nonetheless, mastery in this domain necessitates years of practice and hands-on experience. Thus, introducing a woodworking concept into the workshop posed a challenge,

although the acquired knowledge can be applied in future projects involving wood. Designing concepts while meeting all customer needs proved to be a daunting task, considering the necessary imposition of certain constraints to ensure the product's appeal and usefulness to the target audience.

Sketching emerged as one of the most crucial tools in the project, generating new ideas at each stage. However, sketches often lacked detailed information since they represented ideas conceived at the moment. Consequently, dedicated sketching sessions were conducted to consolidate and refine these ideas, sometimes in combination with previous ones. Nevertheless, due to time constraints, more detailed group sketching sessions would have been highly beneficial. This retrospective observation highlights an aspect of the process that can be improved and perfected in future projects. Furthermore, in this particular phase of the sketches, the role of the designer played a crucial part. It involved filtering the information gathered during the workshops and summarizing it effectively. It is worth noting that conducting more extensive sessions for this activity would have greatly benefited the overall process. Therefore, in future projects, more emphasis will be placed on this stage to ensure its significance is duly recognized.

I would like to mention that creating the specification table was a challenging yet engaging task throughout the process. It was not easy to accurately capture the users' needs and translate them into a language that the designer could understand and incorporate into the final product. This task required a significant amount of time, and in hindsight, there are many improvements that could be made to it. However, it is important to acknowledge that without the preceding process and learning experiences, I wouldn't have gained the knowledge necessary to evaluate this section more critically.

There are still lingering questions regarding the specification table, and it is not without flaws. Nonetheless, I believe it has been an integral part of the learning process. The goal was not to achieve perfection, but rather to learn from the mistakes made along the way. Striving for perfection can often be stressful and may hinder creativity or the development of more refined activities.

An additional noteworthy discovery was the effectiveness of workshops, which provided invaluable experiential learning opportunities. Investigating processes and subsequently immersing oneself in hands-on practice revealed the incredible potential of this approach. The first workshop posed challenges in attracting participants, despite considerable preparatory work. However, the second workshop witnessed significant improvement as the designer. The recruitment of suitable participants for the workshops proved challenging due to resource constraints. Students were selected based on these limitations, which posed a significant difficulty during the workshop planning phase. Posters and information dissemination through teachers were employed, although the effectiveness of the latter method was limited. Consequently, participants of varying age groups and profiles attended the workshops as no other options were available at the time. In future endeavours, it would be highly beneficial to explore workshops with a broader range of profiles. This step would contribute to enriching the workshop processes, facilitating new perspectives and insights. Another noteworthy aspect of the workshops, particularly the last one, is the measurement of the time participants spent

putting the jewellery in the box. This measurement was recorded in seconds, and the average time spent on this activity was analysed. However, due to time constraints, the results of this activity were not explored in great depth.

This product aims to raise awareness through multiple approaches. It not only seeks to provide packaging with a second life but also encourages a shift in purchasing behaviour. Rather than acquiring numerous cheap products and characteristics of fast fashion, the intention is to promote the purchase of quality products gradually, allowing individuals to build their collection of quality jewellery over time. This approach combines quality craftsmanship with a mindset shift. It should be noted that the jewellery box has been designed explicitly for Pablo Joyeria Relojeria, emphasising the cultivation of excellent work, experience, and craftsmanship within the jewellery sector. The design also takes into consideration that the jewellery box is intended for jewellery storage, with limited space allocated for daily-use watches to be placed on top of the jewellery box. This aspect was considered from the initial design stages, ensuring adaptability for optimal watch storage in potential designs.

Regarding prototype selection, a workshop involving users was conducted. The opinions of the participants and the designer were averaged to determine the degree to which the product specifications were met. It is essential to clarify that when asking users if they considered the product to be ethical, the evaluation process was divided into two parts. Users are not capable of assessing certain aspects, such as the company's needs or the sustainability of the product. Therefore, this part was evaluated based on different variables, taking the user's opinion into account but always through the filter of the designer, as previously explained in the project. The designer has the final say in decision-making. Thus, two tables were created as part of the analysis. The first table, Table 13, consisted of information gathered from the users during the workshops. It included the designer's filtering process, as mentioned earlier. The second table, Table 14, involved grouping the information from Table 13 under the category of "User Needs." Additionally, other variables discovered during the process were incorporated into Table 14. This approach proved highly beneficial, as it allowed for the evaluation of user needs and whether they were adequately addressed. Furthermore, it facilitated the inclusion of other aspects that played a role in the overall process.

It is worth mentioning that the concept of using magnets in combination with wood proved to be an intriguing idea that offered valuable learning experiences for both the companies involved and the designer. Extensive investigations were conducted to determine the best way to integrate magnets with wood. However, when considering the sustainability of the magnets, further research and development were not pursued as they did not meet one of the critical specifications.

In the final phase of the product, distribution will be a critical aspect, with Pablo Joyeria Relojeria playing a fundamental role in customer engagement. Initially, entering the market with a novelty may present challenges, but gradual awareness-building efforts aim to help people recognise the benefits of reusing and owning long-lasting products. However, as demonstrated throughout the workshops and the entire project development, real outcomes are only revealed through testing. Therefore, after refining the prototype and transforming it

into a final product, the intention is to gradually introduce it to the market and observe customer reactions, making necessary adjustments accordingly.

Although the objectives outlined in this report have been progressively achieved, it is essential to acknowledge that the final prototype still requires further user testing. Despite valuable feedback received during the last workshop, additional feedback is necessary. Consequently, the next project phase involves conducting tests with real users at the Pablo Joyería Relojería shop. This will facilitate a comprehensive evaluation of the prototype, identifying areas for improvement and potential redesigns.

This project has served to uncover the multifaceted nature of industrial design, surpassing its conventional industrial applications and revealing its immense potential. It highlights the fundamental pillars of creativity, craftsmanship, and innovation that underpin design, capable of creating positive societal impacts. By preserving culture and traditions, designers can contribute to a sustainable and environmentally friendly world. Redirecting the trajectory of design is imperative, and this project aims to raise awareness about the profound influence design can exert in this regard.

6 CONCLUSION

This section will be provided with a comprehensive report on the outcomes of the final project, including an evaluation of the purpose and goals and an assessment of their achievement. The primary objective of developing a packaging solution that serves not only as a disposable jewellery box but also as a functional jewellery case was primarily driven by the need to address the issue of excessive packaging waste prevalent in today's accessories industry. The project requirements were thus defined with a focus on tackling this problem. The specific objectives are outlined below.

Firstly, the project aims to raise awareness about handcrafted products that convey intrinsic values, fostering a sense of emotional connection with consumers. By doing so, it seeks to combat the culture of fast fashion characterised by the use-and-dispose mentality, wherein users have little attachment to the products, making it easy for them to discard them at any given time.

Additionally, the project endeavours to cultivate customer loyalty. Through the utilisation of the designed packaging, consumers are encouraged to support local businesses and engage in a mutually beneficial relationship. By providing customers with the means to build their final product, the project aims to reduce reliance on larger urban centres for purchases, thus promoting the vitality and sustainability of local communities.

Lastly, a fundamental objective is to deliver a product of enduring quality. The intention is to allow customers to gradually invest in a high-quality product, eliminating the inclination towards cheaper alternatives that may have a shorter lifespan. The focus is on creating an item that withstands the test of time, fostering longevity and sustainability in consumer choices.

Moreover, it is essential to highlight the significant objective of involving users throughout the design process. User participation has played a pivotal role not only in shaping the overall process but also in influencing the final product. From the project's inception, user needs have been meticulously considered and incorporated at each phase. Recognising that users are an essential component of the product, the design has been tailored to fulfil their requirements and desires in alignment with the aforementioned objectives.

To conclude, the final project successfully addresses the goals it set out to achieve. The packaging solution developed serves to minimise waste, promote values-driven craftsmanship, foster consumer loyalty, and deliver long-lasting quality. The inclusion of user perspectives throughout the process ensures that the design is not only functional and environmentally conscious but also resonates with the needs and preferences of the intended audience.

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