

# GRADUATION PROJECT / TFG

INDUSTRIAL DESIGN & PRODUCT DEVELOPMENT SCHOOL

## **DESIGN OF A STOOL THROUGH UPCYCLING TECHNIQUE**

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# **TITLE**

DESIGN OF A STOOL THROUGH UPCYCLING TECHNIQUE

# **TÍTULO**

DISEÑO DE UN TABURETE A PARTIR DE TÉCNICA UPCYCLING

# **TITULO**

DISSENY D'UN TAMBORET A PARTIR DE TÈCNICA UPCYCLING

# **SUMMARY**

The project focuses on the study of objects that are not more in use, pretending not to be able to make any more use of them. That is, they will not perform the function for which they were designed.

Considering the condition of these, majority of them were found in local shops in Tainan, Taiwan. As discarded products, it is proposed to give them a new use. These discarded items come directly from the manufacturing sites of the originals.

After conducting an extensive field study, not only within the context of local design but also within the broader scope of art, such as installations and the user experiences, products will be developed that encourage reflection.

Highlighting the work of local artisans in Taiwan especially in Tainan. Providing a vision of development in the field of recycling and reuse of resources.

## **KEY WORDS:**

Hand work, cultural interchange, design, user experience, design exhibition, urban sociology, street furniture, circular economy, local crafts and ecology.

# RESUMEN

El proyecto se centra en el estudio de aquellos objetos que han quedado en desuso o que ya son considerados como un residuo, y que por lo tanto no tienen ninguna salida al mercado. De esta forma serán procesados para ser reutilizados de una forma diferente a la que fueron destinados.

Teniendo en cuenta su estado, la mayoría de ellos se encontraron en espacios locales de Tainan, Taiwán. Al tratarse de productos en desuso se plantea buscar soluciones para extender su vida útil.

Tras la realización del estudio de campo, no solo en el contexto del diseño local sino también en el ámbito más amplio del arte, tanto instalaciones como experiencias del usuario, se desarrollarán productos que fomenten la reflexión.

Se destacará el trabajo local y artesanal de los taiwaneses especialmente en la ciudad de Tainan, aportando una visión de desarrollo en el ámbito del reciclaje y reutilización de recursos.

## PALABRAS CLAVE:

Trabajo manual, intercambio cultural, diseño, experiencia de usuario, exposición de diseño, sociología urbana, mobiliario urbano, economía circular, artesanía local y ecología.

# MEMORY



# 1.INTRODUCTION

## 1.1.ORIGIN AND MOTIVATION OF THE PROJECT

As product designers our purpose is to create objects with a specific use but what about those who finish with a totally different utility?

This project aims to investigate about those products or elements that are not intended to be used in that specific way especially in products for public use (Sanchez and Frankel, 2010); but nevertheless, users or in most cases other "creators" give new uses to these objects. (Sanders and Stappers, 2007)

Since the middle of my career in the Industrial Design Engineering degree, I have discovered that my path within the world of design is closely related to how users perceive objects and, depending on the context in which they are found they could have one use or another.

Apart from this, in recent years I have been focusing my projects more on a manual-artisanal scale, in the workshop, than on the technological-digital way. Where, besides I have always made use of other elements that I have obtained from the environment, such as vinyl records, drink boxes or remains of concrete, which I have used to develop my own designs.

For this reason, this project will consist of the development of a new product made from others, giving them a totally different use than the one they were intended for. Without considering the condition of these, whether new or already used. By this, we can not only enhance our understanding of human adaptability but also potentially discover innovative solutions for design, product development, and sustainability. (Salter and Michael, 2003)

Starting from my experience living in the Dominican Republic (Central America), I gained a rich experience of how the people and culture make the best of what they have, using products until they can no longer use them anymore.

## 1.2. PROBLEM IDENTIFICATION

Objects are fashioned to perform a task. The evolution of these items is influenced by the technological and cultural resources at hand.

This project aims to investigate and understand the reasons behind the practice of using objects in **unconventional ways**, exploring the psychological, sociocultural, and environmental factors that drive such behavior, to be able to create some. (Pario, 2011)

By gaining insights into why some objects are used in unintended ways, we can not only enhance our understanding of human adaptability behavior but also potentially discover innovative solutions for new designs, product development, and sustainability in many ways.

The project will focus on everyday products, from our space of work or house to leisure spaces such as bars, restaurants, and all kind of public spaces. Since ever, consumers have been adapting their local resources to solve their daily problems for several reasons such as: local traditions, high ability to resolve, few resources, work efficiency or many times just instinct. (Salter and Michael, 2003)

But also, in recent years this has become a trend in the way we take advantage of existing resources in terms of climate change mitigation. (Belda, 2018) As I have learned at university, many times our goal as designers in the 20th century is to be able to solve problems and create products considering that we should be as responsible as possible in the use of certain materials and their life of use. The reason for this is because the market is saturated with new products that we don't really need in our routines. Most of time they are necessities created to consume more.

Apart from all this, the project will have a clear aesthetic focus, since it is very important to me that the products are so that the users can fully enjoy the possession of them. Without losing for the same reason an artistic point of view as an object of exhibition and reflection of why these products are not being used for what they were really created for. (Cartier and Willis, 2008)

## 1.3. OVERALL OBJECTIVE

The objective of this project is to reconsider the design of a stool through recycling. The use of products whose useful life has ended will be made, with the aim of raising awareness about conscious consumption and providing a new perspective to this type of seating.

In a more specific approach about this, it will consist on a research, experiment and develop products from Taiwan.

The overall objective could be summarized in:

- Modify the production-consumption archetype
- Develop a critical thinking of why things are made like they are
- Highlight the beauty of the conventional products
- Generate a space for reflection on the products that surround us
- Contribute to the improvement of the environmental mitigation
- Observation of how the population makes use of products
- Waste reduces

## SUSTAINABLE DEVELOPMENT GOALS

### 11 – Sustainable cities and communities

By “upcycling” a product that has been discarded, we would be reducing the amount of waste that goes to landfills and therefore, we would be promoting a more sustainable lifestyle in communities. Upcycling not only decreases the environmental impact of waste disposal but also offers several additional benefits to both individuals and the environment.

First and foremost, upcycling encourages creativity and innovation within the community. By reimagining and repurposing items that are no longer in use, individuals can tap into their imagination and resourcefulness. This creative process can lead to the development of new skills and the



*Figure 1: SDG number 11*

strengthening of a community's sense of self-sufficiency. In addition to the social benefits, upcycling contributes to environmental conservation by reducing the demand for new resources and minimizing the energy and pollution associated with the production of new goods.

## 12 – Responsible consumption and production

Upcycling different resources and using waste components promotes a circular economy and reduces the production of new ones, contributing to more responsible consumption and production.



Figure 2: ODG number 12

In a circular economy, the emphasis is on minimizing waste, conserving resources, and creating a sustainable system where materials and products are used efficiently, repaired, and repurposed to extend their lifespan.

This approach significantly reduces the strain on natural resources and curbs the environmental impact associated with the extraction, manufacturing, and transportation of new materials and products. By upcycling and repurposing waste components, we close the loop on the lifecycle of goods, reducing the need for virgin resources and the generation of greenhouse gas emissions. By diverting waste from landfills, upcycling reduces the pollution and environmental degradation associated with landfilling, which can have detrimental effects on local ecosystems and human health.

## 13 – Climate action

Recycling reduces the need to use new materials to make a product, therefore it can reduce carbon emissions associated with manufacturing, transporting and disposing of the new product. The process of manufacturing new materials and products is often energy-intensive and produces greenhouse gas emissions that contribute to climate change.



Figure 3: IDG number 13

By recycling, we decrease the demand for raw materials, which leads to a reduced environmental footprint. The energy saved in the recycling process, when compared to producing new materials from scratch, can be substantial. This translates into a smaller carbon footprint for the product and, by extension, for the entire supply chain.

Recycling also plays a critical role in reducing emissions associated with the transportation of new products. When materials are recycled locally, it decreases the need for long-distance transportation of raw materials. This not only cuts down on carbon emissions from transportation but also supports local economies and reduces the overall environmental impact.



*Figure 4: Sustainable goals*

## 1.4. JUSTIFICATION

By exploring objects that are not intended to be used in unconventional ways, this design project serves to bridge the gap between my technical background as an engineering student and my broader interests in aesthetics, spaces, and art.

The very act of repurposing everyday objects or utilizing them in unexpected ways allows me to engage with design in a novel and creative manner.

One of the key justifications for this project lies in the exploration of creativity and imagination. While engineering principles guide me in creating practical and functional solutions to problems, this endeavor lets me embrace a more imaginative and playful approach. By pushing the boundaries of an object's intended use, I can break free from the constraints of traditional design and engineering, fostering a sense of innovation that encourages me to think out of the box.

Furthermore, this project provides an opportunity to appreciate the inherent beauty and aesthetic qualities of objects. Through the act of recontextualizing everyday items, I can discover new aspects of their form, texture, color, and overall design that might otherwise remain unnoticed. This exercise enables me to develop a heightened sensitivity to the aesthetics of objects, which, in turn, enhances my ability to create and appreciate beauty in various forms.

Additionally, by experimenting with unconventional object use, I aim to blur the lines between art and design. Objects, when repurposed creatively, can transcend their utilitarian functions and take on an artistic quality. This project allows me to explore the interplay between functionality and artistry, highlighting the notion that objects can be both practical and visually compelling, blurring the boundaries between these two disciplines.

Moreover, the project fosters an essential connection between the designer and the end user. It encourages a dialogue about the perceptions, expectations, and interactions people have with objects. By subverting conventional use, this project invites people to question their preconceived

notions about everyday items, stimulating conversations and inviting viewers to engage with these objects in a way that goes beyond their typical functions. In this sense, it acts as a catalyst for dialogue and deeper contemplation about the objects that surround us.

In conclusion, this design project represents a departure from my traditional engineering focus, allowing me to delve into the realms of aesthetics, creativity, and artistic exploration. By reimagining objects beyond their intended purposes, I aim to foster innovation, appreciate the beauty in everyday items, challenge the boundaries between art and design, and encourage meaningful conversations about our interaction with objects. This endeavor exemplifies the intersection of my technical background with my passion for aesthetics and serves as a platform for personal and intellectual growth as a designer and artist.

## **1.5. PREVIOUS REQUIREMENTS**

The integration of seating, like benches, within city outdoor spaces is crucial for areas where people wait, meet, or socialize, ensuring coherence with other elements to avoid creating isolation or emptiness during non-use. (Yücel, 2012)

Optimal bench locations include places with heavy pedestrian traffic, such as retail corridors, transit stops, plazas, and areas near cultural institutions, enhancing accessibility. Bench placement should consider factors like protection from wind, sun or shade options, and proximity to amenities like bus shelters and waste receptacles. (Grabiec, Łacka and Wiza, 2022)

Social dynamics play a role, with benches set at right angles promoting socialization, while those in rows hinder group conversation. Design considerations include comfort, particularly in areas where people spend extended periods. Appearance aligns with the surroundings, fostering a sense of ownership, encouraging responsible care, and positively contributing to safety.

## **MATERIALS**

This project will implement the use of unconventional methods or reused materials. Research involves exploring street resources, scavenging for discarded or overlooked items that can be transformed into something innovative. This approach minimizes waste and environmental impact, highlighting how innovation can arise from unexpected materials. The project breathes new life into these materials, challenging preconceptions about everyday object value and potential. The overarching goal is to foster a sustainable and creative design ethos. (Yücel, 2012)



## **PROBLEM SOLUTION**

In the design industry, designers create objects with clear and practical solutions for specific needs or situations. Simultaneously, they innovate, adapting objects for entirely new and unexpected uses. This dual purpose reflects a holistic design approach, acknowledging that functionality and creativity go hand in hand. The goal is not just repurposing but enhancing utility, making objects more versatile and sustainable. The aim is to inspire users to see these objects with a fresh and imaginative perspective. (Salter and Michael, 2003)

## **AESTHETICS**

The objective aspires to achieve with the aesthetics of these products is to revolutionize the traditional perception of secondhand goods, as my grandfather used to say, *"But that's no longer worth anything."* The aim is to breathe new life into these objects by infusing them with a fresh and contemporary appearance. By doing so, not only extends the lifespan of these items but also make them more appealing to a modern and environmentally conscious audience.

The design philosophy revolves around preserving the nostalgia and stories that these objects carry while simultaneously elevating their aesthetic appeal to meet the demands of today's consumers. Through this approach, we hope to inspire a greater appreciation for sustainable and mindful consumption while revitalizing the market for secondhand products. (Kolbrún, 2022)

## UTILITY

When it comes to the topic of utility in design, especially in the context of repurposing or upcycling objects not originally intended for their new use, it's crucial to strike a balance between creativity and functionality. Here are a few key considerations:

- **Enhanced Functionality**

One of the primary objectives in reimagining the utility of everyday objects is to enhance their functionality. The redesign should address a specific need or problem, making the object even more useful.

- **Versatility**

A well-designed repurposed object should ideally offer versatility. It should serve multiple purposes or adapt to various contexts. This versatility increases the object's utility and makes it more appealing to a broader audience.

- **Practicality and Durability**

The design should ensure that the newly repurposed object is not only practical but also durable. Users should find the object easy to use and maintain. Durability ensures that the object can continue to serve its purpose effectively for an extended period.

- **Educational Value**

Repurposed objects can also have educational utility. They can serve as tangible examples of sustainable design and inspire others to think creatively, a part of involving a range of skills, such as carpentry, welding, sewing, painting, and more... This supports the concept of "decent work" by offering opportunities for self-employment.

## 2. RESEARCH

### 2.1. UPCYCLING

Upcycling, also known as "supra recycling," has seen significant growth in recent years, particularly after the pandemic. This environmentally friendly design approach involves transforming discarded products into new goods, increasing their value from an environmental, quality, or aesthetic standpoint. While the concept originated in the mid-20th century, it gained prominence in 2002 when William McDonough and Michael Braungart introduced it as the reuse of modifiable materials to give them a second life.

In a world grappling with vast amounts of waste and rapidly depleting natural resources, upcycling emerges as a necessary solution. This innovative approach not only contributes to sustainability and waste reduction but also addresses pollution issues by reducing production and energy costs. The practice of upcycling, or super recycling, entails turning used objects into products with equal or greater value, engaging consumers in addressing global challenges. Its success is partly attributed to widespread dissemination on platforms and social networks, where numerous videos and tutorials have made this practice accessible to all.



Figure 5: Upcycling example

## 2.2.TAIWAN UPCYCLING EXAMPLES

Firstly, a field study has been carried out to analyze what has already been done and how the ideas can be adapted to the work environment, with this it is possible to find out what solutions are proposed by consumers and understand what their needs are.

This research helps us to understand mostly what kind of resources they use. Based on the location of the project, this are some examples of what is made on the city of Tainan and surrounds.



Figure 6: Local examples of upcycling

## 2.3. URBAN FURNITURE SEATS

Urban furniture has been developing in parallel with the growth of cities; it arose from the need to develop activities on urban roads. Its evolution is linked to the evolution of cities, and with them the society that makes them up. That is why they are constantly evolving, depending on science, technology, art, ideologies and many more factors. This decorative and at the same time functional element promotes the full functioning of the modern city.

The comparison between the development of cities is crucial in addition to those interrelated aspects such as leisure and rest in the culture of a country. In the city of Tainan, due to the infrastructure of the place and its conditions, the spaces where you can sit are limited. In addition, the excessive use of motorcycles means that people do not spend as much time in the same place, picking up their food and travelling to their homes or other private spaces as example. Nor should forget the weather conditions because during most of the year the temperatures are high above 20°C.

In conclusion, from this introduction we are going to present the different types of seats that are presented in the environment.



*Figure 7: Seat between shops*



Figure 8: Chairs in front of house



Figure 9: Seats in front of shops

The figures in this section are images that correspond to private spaces but for public use, whether the space between two commercial premises or a rest area in front of the laundry or bar.

In some cases, these seats are fixed and in the example of the restaurant they are not. The structure and materials they use can be seen to be different depending on the case.

## 2.4. WASTE EXAMPLES

Taiwan presents an exclusive care in the control and recycling of urban waste, making a very **precise separation** of them before being collected by the recycling group. Therefore, as we can see in these images, the materials are stacked and separated by groups of citizens who oversee collecting and grouping them for later collection. (Yu-Chi Weng, 2011)



*Figure 10: Metal Recycle*



*Figure 11: Plastic Recycle*



*Figure 12: Cardboard Recycle*

## 2.5.CO-DESIGN IN URBAN FURNITURE

The words “urban furniture” is defined differently, as private or public furnishings in public spaces that provide certain services and perform various public functions. Urban furniture (street furniture) is define as objects and equipment installed for various purposes along streets and roads from The Cambridge Dictionary.

This project will emphasize the importance of the public spaces in rapidly developing cities and focuses on the role of elements like street furniture. The interdisciplinary aspect of co-design becomes evident, once each actor contributes to the process with a different perspective on the urban spaces’ needs.

The principles of co-design, which encourage **user involvement** in developing design solutions for specific groups or society, align seamlessly with current trends. While terms like co-design and co-creation may appear recent, they have, in fact, been in use for nearly four decades.

In the 20th century, industrial designers transitioned from collaborating with architects to playing an independent role in addressing urban challenges, spurred by post-war reconstruction. Today, with over 550 cities exceeding one million inhabitants, rapid urban development necessitates innovative public space design. Urban elements, synonymous with street furniture, like benches and streetlights, significantly contribute to accessibility, daily activities, and city identity. The user-product relationship for urban elements is crucial, considering users don't purchase such items. The importance of the urban elements to cities is evident. People are sometimes so accustomed to having them around that they do not even notice the role these elements play in their daily life. The significance of street furniture is strongly connected to accessibility. Urban elements make “the city accessible to everybody and easier to get around in” Decision-makers, often distant from the lay public, impact public space planning, leading to urban alienation and vandalism. Addressing this, co-design involving designers, users, and decision-makers emerges as a solution, aligning with contemporary design approaches. (Efe, Cürebal, Gad and Tóth, 2016)



## **2.6. Materials**

When selecting materials for urban furniture, they conscientiously focus on various aspects. Technical and technological factors, including strength, durability, safety, life cycle impact, and reusability, are paramount. Spatial, economic (considering wear and tear), sensory (addressing user comfort, acoustics, lighting, and appearance), and psychological (ensuring well-being) aspects are also crucial. (Calkins, 2012) The significance of strength and durability, given the external exposure, cannot be overstated. Traditionally, metals and alloys, wood, natural stone, concrete, and plastics have remained the predominant materials for urban furniture (Grabiec, Łacka, Wiza, 2022). These materials endure as popular choices due to their diverse attributes, reflecting a comprehensive approach to material selection in urban furniture design.

### **Metal and alloys**

Stainless steel, originating from the First Industrial Revolution, stands as a popular material choice and can be deemed a relevant cultural heritage. Its versatility, high strength-to-weight ratio, and adaptability to diverse design aesthetics are noteworthy. Furniture crafted from stainless steel relies on solid and stable castings. This material boasts durability, corrosion resistance, impact resistance, and demands no maintenance. Notably economical in terms of life-cycle costs and fully recyclable, it outshines other materials. In a similar vein, aluminum emerges as an excellent option for outdoor furniture. Renowned for its strength, remarkable weather resistance, malleability for diverse shapes, and a spectrum of color options through powder coating, aluminum proves resilient against scratches. Its lightweight nature renders it apt for mobile furniture solutions. (Derek, 1997)

### **Wood**

Wood emerges as a widely favored material for crafting street furniture due to its natural warmth in cold weather and coolness in hot climates, a quality unmatched by metals. However, drawbacks include slower drying after rainfall compared to metals, increased maintenance requirements, and

susceptibility to burning, breaking, or vandalism through graffiti. While wood may offer cost-effectiveness, the choice of wood should be contingent upon the furniture's location and frequency of use. It's crucial to recognize that wood, despite its appeal, demands careful consideration and appropriate selection to ensure longevity and resilience in varying environmental conditions.

## **Concrete**

Concrete stands out as a frequently employed material in crafting urban furniture. This material offers notable advantages, as it is both weighty and challenging to vandalize. Durability is a key attribute associated with concrete furniture. Specifically, architectural concrete is commonly utilized, allowing for grinding, polishing, texturing, and coloring, unlike traditional concrete. Despite its sturdiness, the heavyweight of concrete negates the need for mounting, but this poses a drawback for mobile furniture. In line with eco-friendly practices, certain urban furniture items, such as benches, incorporate concrete with recycled aggregate. Nonetheless, a drawback is evident in its limited drainage and ventilation capabilities after rainfall. A considerable portion of existing concrete street furniture appears outdated, lacking innovative design elements.

## **Stone**

Natural stone, akin to concrete, exhibits comparable qualities. This material finds successful application in crafting furniture for public spaces, seamlessly integrating with urban and rural landscapes. The remarkable resistance of certain stones to varying climatic conditions ensures prolonged service in urban furniture. An emerging trend involves the bold use of stone and steel combinations, exemplified in gabions employed as elements in fences, retaining walls, or contemporary seating and plant containers.

## **2.7. RESOURCES OPPORTUNITIES**

From a field study made on the cities and countryside of Taiwan, it has been found several opportunities to develop the project. This process has turned out to be quite complete since it has intervened in factories, small local craft places, shops, markets and mainly restaurants.

Every aspect has been considered: the condition of them, the place where they were located, the factors contributing to their abandonment, their structural integrity, and whether they could continue to be used. Moreover, great importance has been given to understanding its meaning to the citizens and the broader local culture of the country, recognizing the indispensable value between heritage, tradition and modernity.

As we move forward with search development, it is essential to narrow down the countless resources at our disposal. Below we list possible possibilities through which we can take advantage of Taiwan's rich cultural and economic landscape to advance this project.

The possible resources that may be used for the development of the project will be listed below.

## BAMBU

**Description:** Bamboo is a multipurpose plant—it can substitute for timber in many respects due to its lignified culms, and because of its fast growth, intricate rhizome system, and sustainability, it has become a plant with conservation value, able to mitigate phenomena that result from global climate change.

**Origin:** Natural habitat, forest.

**Reason:** Extreme flexibility associated with high strength, high axial permeability (good for impregnation) protective layer with extremely low radial permeability. (Liese and Köhl, 2015)



*Figure 13: Bamboo harvesting in Alishan mountain*

## CANVAS

**Description:** Canvas is a plain weave cotton and sometimes hemp fabric, a very tight and strongly cylindrical fabric coated with PVC where the average content varies between 60% and 70%, the rest being polyester fibers.

**Origin:** Election campaigns and haberdashery.

**Reason:** High mechanical resistance, flexible and waterproof to highlight. Electrical insulator, high impermeability to chemicals as well as heat and light. (Malo and Ordóñez, 2014)



Figure 14: Canvas in different uses

## CARDBOARD

**Description:** Cardboard is a material made up of several layers of paper superimposed and adhered to each other, based on virgin fiber or recycled paper. Cardboard is thicker, harder and more resistant than paper.

**Origin:** Markets, shops.

**Reason:** It offers a wide range of properties including light, resistant, versatile, ergonomic and manufactured from other recycled materials. Is used for packing and delivery all kind of stuff.



Figure 15: Cardboard collection

## PLASTICS

**Description:** Plastics are made up of polymers, which are large organic molecules composed of repeating carbon units or chains called monomers, such as ethylene, propylene, vinyl chloride and styrene. They have several ways. The applications of plastic are infinite: from replacement parts for electrical and industrial devices, to every day products. Despite the huge quantities of plastic waste being generated, only 9.5 % of all plastic produced between 1950 and 2015 was recycled, while 12.5 % was incinerated and 78 % was dumped in landfills. (Geyer, Jambeck, and Law, 2017)

**Origin:** Markets, restaurants, houses.

**Reason:** It is an ultralight container, with a firm structure that supports high resistance depending on its direction. They are airtight, resistant to breakage and have inviolability.



Figure 16: Plastic collection

## CAN

**Description:** A can is a metal container designed to securely hold various liquids and preserved goods, providing a reliable means of storage and transportation. Typically crafted from durable materials like tinplate or aluminum, cans serve as a protective barrier against external elements, safeguarding the contents from contamination, light exposure, and physical damage. These containers are essential in preserving the freshness and quality of beverages, foods, and other consumable items over extended periods.

**Origin:** Markets, restaurants.

**Reason:** It is an ultralight container, with a firm structure that supports high resistance depending on its direction. They are airtight, resistant to breakage and have inviolability.



*Figure 17: Can collection*



## TATAMI

**Description:** A tatami is a traditional Japanese flooring mat typically made of rice straw covered with a woven rush straw surface. These mats are rectangular and are commonly used as a flooring material. Tatami mats are renowned for their natural, breathable properties, which help to regulate room temperature and moisture levels, making them ideal for creating a comfortable living environment.

**Origin:** 明章榻榻米, Tainan. Manufacture shop.

**Reason:** It is a traditional element in Japanese culture, which is also found in Taiwan. It is assembled by hand to achieve superior quality, and depending on the type, it is made with natural or reused fibers. (Graham, 2014)



Figure 18: Tatami collection

## GAJI BAGS (茄芷袋)

**Description:** Gaji bags are the most traditional and essential Taiwanese market bags made of nylon. Traditionally made by hand from soft reed, they are currently sewn by machine creating a woven nylon mesh of green, red and blue after the era of industrialization.

**Origin:** Jing Liao village in Tainan. Manufacture shop.

**Reason:** The object is a highly recognized nationally in Taiwan for its main characteristics, which include durability, easy maintenance and affordable price. It is widely used by consumers for different purposes.



Figure 19: Bags collection

## 2.8. MARKET



Figure 20: E-metabolism

**Name:** E-metabolism

**Company/Designer:** Andra Formen

**Description:** E-metabolism is a collection of lamps, chairs and vases made from electric scooters fished out of the canals of Malmö, Sweden by the design collective of Andra Formen. This project aims to get the attention of the problem of electric scooters being dumped in the canals of Malmö.

"Me, as a craftsman, I thought 'how can I use traditional crafts to do something like this?' and then we let the material speak to us."

**Specifications:** 48cm x 50cm x 70 cm



*Figure 21: Handlebar Table from 1982*

**Name:** Handlebar Table from 1982

**Company/Designer:** Jasper Morrison

**Description:** Jasper developed the Handlebar Table at home in January 1982, in his final year at Kingston. It was 'a product requiring minimal machining or manual labor to produce' – a solution to the unhelpfulness of Kingston's metalwork technician. In one early model – now lost but shown below – he painted the handlebars and the wood to hide its poor quality. He showed sketches and photographs of it as part of his graduate exhibition at Kingston in June 1982. In July, he showed it at the Coexistence shop in London, and sold it in an edition of ten. The Design Museum purchased one of the ten in 2012.

**Specifications:** 45cm x 45cm x 62 cm



*Figure 22: NYC subway urinal*

**Name:** NYC subway urinal

**Company/Designer:** Benjamin Nordmark

**Description:** The creation is considered as an art object that potentially could have the function of bought a seat and a urinal. By using the NYC subways frequently Benjamin, notice how dirty the trains can be, and sometimes even smells like urine. So, after looking on the shape of the seats a lot, they made the association of the urinal to him, and by combining these two observations the idea of the NYC Urinal came to life.

**Specifications:** He thought it would be interesting to use a cheap material as plywood and give it a completely new character by making it appear like the seat was built in plastic. Only a small area underneath the seat is left untreated to reveal the true nature of the material that was used.



Figure 23: Bondage Baggage

**Name:** Bondage Baggage

**Company/Designer:** Maia Ruth Lee

**Description:** Bondage Baggage is a series of sculptures based on Lee's observation and documentation of luggage at the Kathmandu International Airport in Nepal over the past five years. About a third of Nepal's GDP is generated through Nepalese migrant workers who carry out labor in the Gulf and Malaysia. Upon return to their country, they frequently bring back valuable goods like electronics or clothes with them, disguised in a unique way to protect their nosily acquired valuables from possible theft at the airport security.

**Specifications:** Wrapped and bound with variously colored tarp, rope and tapes, the meticulously packaged luggage's combine practicality and creativity while carrying their own personal stories through space and time.



Figure 24: Génois Pouf

**Name:** Génois Pouf

**Company/Designer:** Dvelas

**Description:** This sail is used to be transformed into bean bags. Their special design applies the geometry of a tetrahedron to give them a backrest, resulting a sofa that is extraordinarily stable and comfortable.

**Specifications:** Bean bags of polyester fabric from a recovered sail. Suitable for outdoor use. Available bolt rop colors: White, Black, Red, Navy, Mink, Orange, Yellow, Blue.



Figure 25: 2004 - Pare

**Name:** 2004 - Pare

**Company/Designer:** Anon Pairot Studio

**Description:** This chair is inspired from local handicraft technique and Thai tropical culture combined with modern life style.

The design that brings the rough nature close to the people and represent the charming of Thai tropical nature by artistically design with sustainable vision.

**Specifications:** Handicraft chair inspired from local Bamboo rafting. - "Pare Lounge chair" at the Latest Show with Inspired by Cologne 2006.





*Figure 26: The Primordial bench*

**Name:** The Primordial bench

**Company/Designer:** Luca Cipelletti

**Description:** This bench is made of Shit Bricks – bricks made from a sustainable clay-composite of processed, odourless cow dung. Formed as an L-shape, Cipelletti's five Giga Shit Bricks are carefully arranged to resemble the corner of an archaeological ruin.

**Specifications:** This bench is part of the 10 experimental pieces of public furniture created by international designers to help regenerate a park area just outside of Stockholm, Sweden. By the name of "Superbenches".



Figure 27: Cushy

**Name:** Cushy

**Company/Designer:** Märta Hägglund & Sanna Gripner

**Description:** Conceived as an "exterior living room", the duo wanted to translate the aesthetic and comfort of traditional upholstered sofas and armchairs into public outdoor seating.

**Specifications:** These two-seater sofa and matching armchair, are made from purple metal mesh. This bench is part of the 10 experimental pieces of public furniture created by international designers to help regenerate a park area just outside of Stockholm, Sweden. By the name of "Superbenches".



*Figure 28: Max Lamb's Superbench*

**Name:** Max Lamb's Superbench

**Company/Designer:** Max Lamb

**Description:** Lamb fashioned a zigzagging design out of a length of simple stainless-steel tube that is bent six times at 90 degrees in alternating directions.

**Specifications:** This bench is made of a CNC mandrel bending machine This bench is part of the 10 experimental pieces of public furniture created by international designers to help regenerate a park area just outside of Stockholm, Sweden. By the name of "Superbenches".



Figure 29: Core Stool, 2018

**Name:** Core Stool, 2018

**Company/Designer:** Philippe Malouin

**Description:** This chair consists on experiment with materials and manufacturing techniques, Malouin creates innovative objects like rugs painstakingly made of Japanese-style chainmail or stools that double as ballpoint pens, tracking their movement across the floor. For Philippe Malouin, process is as important as the final product. "A good way to get an idea off the ground is to try it" he has said.

**Specifications:** 40 × 40 × 48.3 cm  
Made of poured concrete with exposed aggregate.



*Figure 30: Steel Works for The Breeder*

**Name:** Steel Works for The Breeder

**Company/Designer:** Philippe Malouin

Description: Made on 2021. One-offs is made from scrap metal found in scrap yards in the UK and in Greece. Exhibition made for The Breeder Gallery in Athens.

**Specifications:** For Philippe Malouin, process is as important as the final product. "A good way to get an idea off the ground is to try it" he has said. This chair consists on experimenting with materials and manufacturing techniques, Malouin creates innovative objects like rugs painstakingly made of Japanese-style chainmail or stools that double as ballpoint pens, tracking their movement across the floor.



*Figure 31: FLOW chairs*

**Name:** FLOW chairs

**Company/Designer:** Daisuke Yamamoto

**Description:** This chair is made of recycled steel on podium for the Milan Design Week in 2023. Yamamoto presented them on podiums of the same material to emphasize second life for the steel sheets and components as a series of sculptural chairs.

The designer therefore chose to create a second life for the steel sheets and components as a series of sculptural chairs.

**Specifications:** "This project began with the awareness that everyday recycled construction materials are disposed of, then new construction begins – a so-called 'scrap and build'," Yamamoto said.



Figure 32: Shovel Stool

**Name:** Shovel Stool

**Company/Designer:** Chun-Ming, Yang

**Description:** It is neither a shovel nor a typical chair, but something in between. The sharp shovel blade allows you to insert it into the ground. Unlike comfortable chairs for extended sitting, the elongated shape of the seat creates a temporary and ever-changing sitting posture.

**Specifications:** Design from Ming Chi University. Selected work for "Kengo Kuma & Higashikawa" design competition.



Figure 33: Bento

**Name:** Bento

**Company/Designer:** Bae Joonyeol

**Description:** Bento is built main of four parts: bottom container, to container, cap and buckle strap. Can be used versatile since it is a stool. Inspired by Japanese bento box, Bento is packed and carried around whenever and wherever individuals want to go.

**Specifications:** Versatile design made of bento boxes. To carry it individuals, have to wrap around the buckle strap through the hole.





Figure 34: The Box exhibition

**Name:** The Box exhibition

**Company/Designer:** Max Lamb

**Description:** The Box exhibition features a menagerie of 23 chairs alongside heftier pieces such as a sofa and a dining table, all constructed using nothing but cardboard and a homemade glue consisting of flour and water. British designer Max Lamb is showing 33 different furniture pieces made using cardboard waste from his own studio in a bid to push the material's structural capabilities.

**Specifications:** 23 chairs made of recycle cardboard.



*Figure 35: Churros, Kazuko Okamoto*

**Name:** Churros, Kazuko Okamoto

**Company/Designer:** Chairs & More

**Description:** The Churros collection is a group of modular benches that expresses and integrates two essential concepts for contemporary seating: the ease of use and the modularity of composition, responding fully to the evolved furnishing needs, especially in the contract sector.

**Specifications:** Churros is made with the innovative Polypus polyurethane, suitable for outdoor use, with a smooth and soft texture to the point of being appreciated precisely for its soft, comfortable and compact appearance while maintaining all the technical characteristics of resistance to atmospheric agents and abrasion. Bi-component molded Polypus polyurethane, fireproof, waterproof, water-resistant, soft to touch and 100% hygienic.



Figure 36: Lumber table

**Name:** Lumber table

**Company/Designer:** Studio PESI

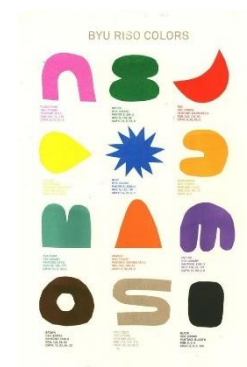
**Description:** Made of cardboard, studio PESI based on Seoul, Korea explore the potential use of cardboard as product design element out of his standard use in transportations.

The designers wanted the table's aesthetic to be different from other cardboard furniture, which they said was usually folded or laminated.

**Specifications:** To cut sections for the Lumber table, PESI turned to the die-cutting press, one of the standard methods for processing cardboard.

## 2.9. MOOD BOARD

In the following subsection of annexes, a trend panel is attached, an inspirational collage built with images of colors, products, textures, shapes, etc. used in the design of the product in question. From which the idea of designing a product that can be placed in similar locations and follow a similar aesthetic has been created.



## 2.10. REQUIREMENTS

**SECURITY:** Since it is an element for public use, it cannot put the user's safety at risk during its use.

**FUNGINOLITY:** The furniture must fit the expectations of the users by a correct use of it. These will be intuitive elements for a wide range of users.

**MATERIALS:** The stool will be composed by 2 discarded products as metal cans and tatami sheets. There will also be use of plastic fabrics.

**SOSTENIBILITAT:** The product aims to use as many discarded elements as possible.

**ERGONOMICS:** Must be accessible, that is, they require minimal effort in operations, in order to facilitate their access so that they can be used easily.

**RESISTANCE:** Simple and stable structure, capable of supporting the uses of the user without fatigue.

**DURABILITY:** The product is designing to keep the value of durability of each element.

**IMPERMEABILIDAD CLEANNESS:** Its elements have been selected to ensure their impermeability and durability also for correct cleaning.

**CONFORT AND USE:** The user must feel comfortable using the product.

**TRANSPORT:** Light weight and structure that makes it easy to transport.

**PRODUCT LOCATION – LOCAL INSPO:** It should be considered that the design should not cause an obstruction to the pedestrians.

**NARRATIVE:** This product tries to reflect the second life behind what may be a product already rejected and destined to be recycled.

**PRODUCT TYPOLOGY:** A stool.

## 3. PRELIMINARY DESIGN

### 3.1. FIRST IDEAS

The proposed briefing consists of the creation of a product related to street furniture from other products that have been rejected because they have reached the end of their useful life.

Initially, the briefing of the project is not totally fix. Due to the lack of contextualization of the country and the lack of information about the real needs and what is already done. We already know that the project is carried out around the use of oil cans since they are very recognized and abundant.

What was still not so clear was what approach we were going to give to the design to provide an effective solution in the context. The aim is to generate products manufactured with cans as raw material, but which would have to be processed and mechanized in order to obtain the desired results at that time.

This was a big drawback at the beginning since all the ideas that were proposed generated more problems in the manufacturing process than solutions were provided. Here some examples:

#### The origin of the idea

By making a horizontal cut on an oil can and attaching a wooden stick to it, we obtain the result of a *leaf collector*. This product is used by Taiwanese people since they are kids.

In this way, the can will be the starting element for our design, taking into account its characteristics, the opportunities it offers and its connection to the local context.



Figure 37: Original oil can



Figure 38: Leaf collector

Starting from this idea of the leaf collector, a solution is sought to be able to apply this methodology to a non-conventional seat in the same way that this utensil is not.

## 1° Alternative

Initially, the idea of using this same collector design was proposed but in an alternative way since its presence is widespread throughout the area.

Due to the high temperature during the whole year, this seat would also incorporate sun protection.

But due to the fragile support, this could cause possible instability when sitting, it was thought to look for alternative solutions for this as shown in the figures.

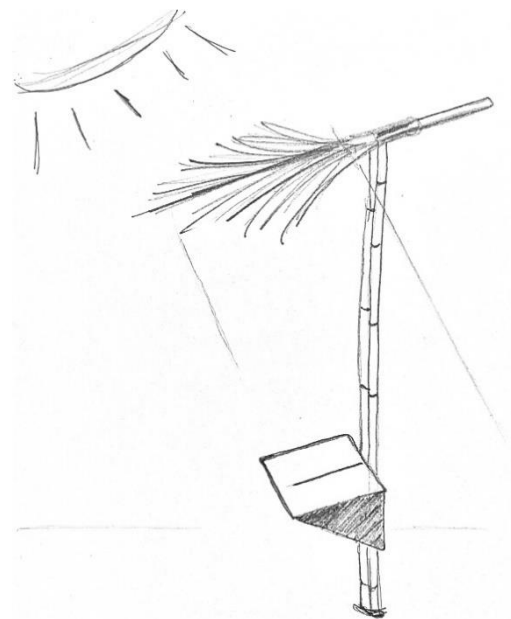


Figure 39: First alternative

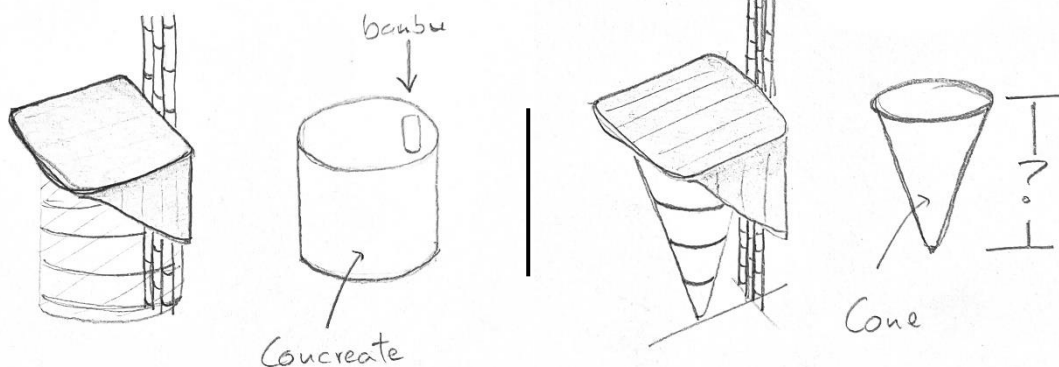


Figure 40: First solutions

## 2° Alternative

From this it was thought to analyze the reason for fragility in this combination of elements. The problem was caused due to the assembly between the metal seat and the vertical stick.

In this way, it was proposed to integrate wooden plates and ropes that could solve the assembly problem.

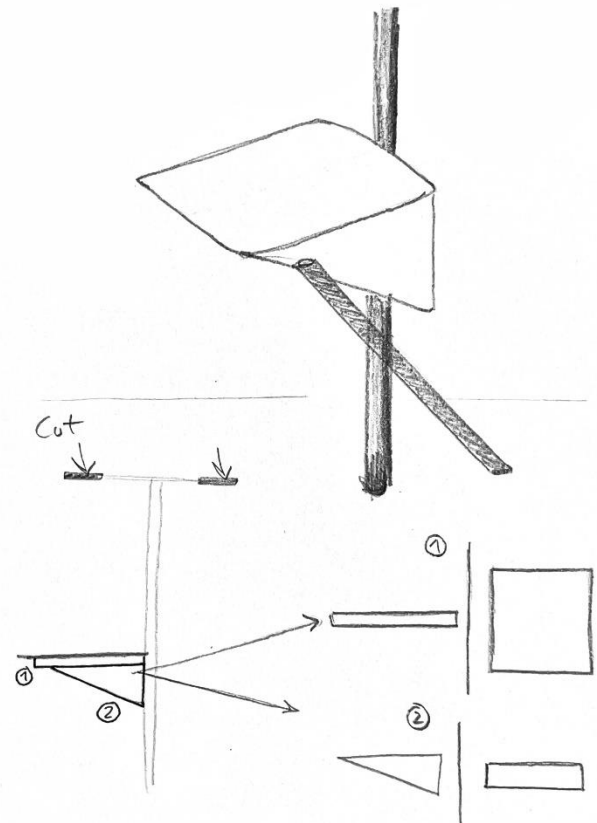


Figure 41: Second alternative

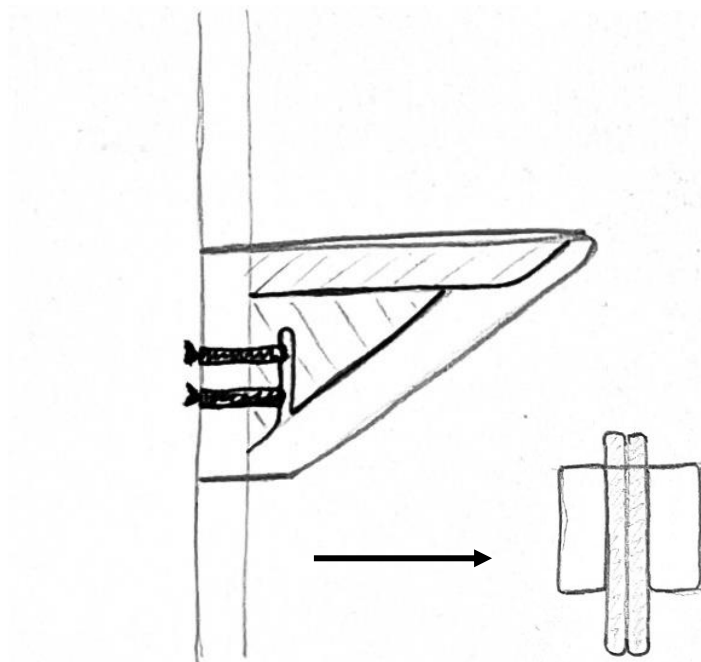


Figure 42: Second alternative



### 3<sup>a</sup> Alternative

It was thought that a set of seats could be a more robust solution, thus creating a bench for more than one person, also considering the sun protection function.

From this idea, different possibilities are proposed to be carried out due to the characteristics of the same.

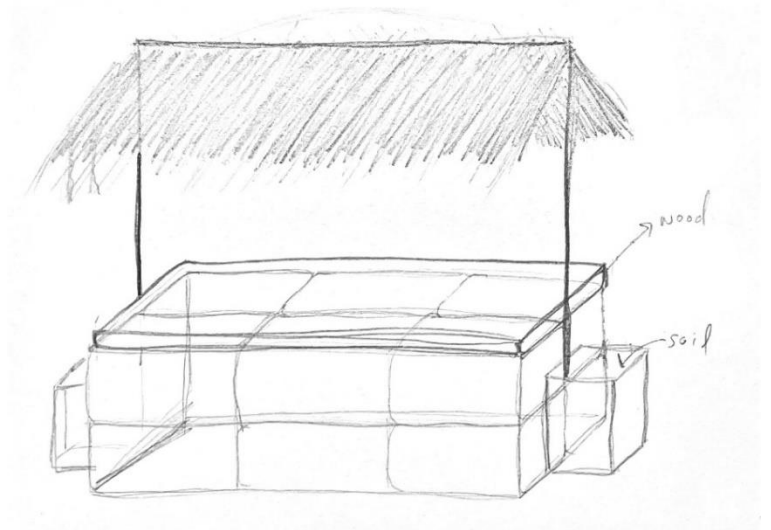


Figure 43: Third alternative

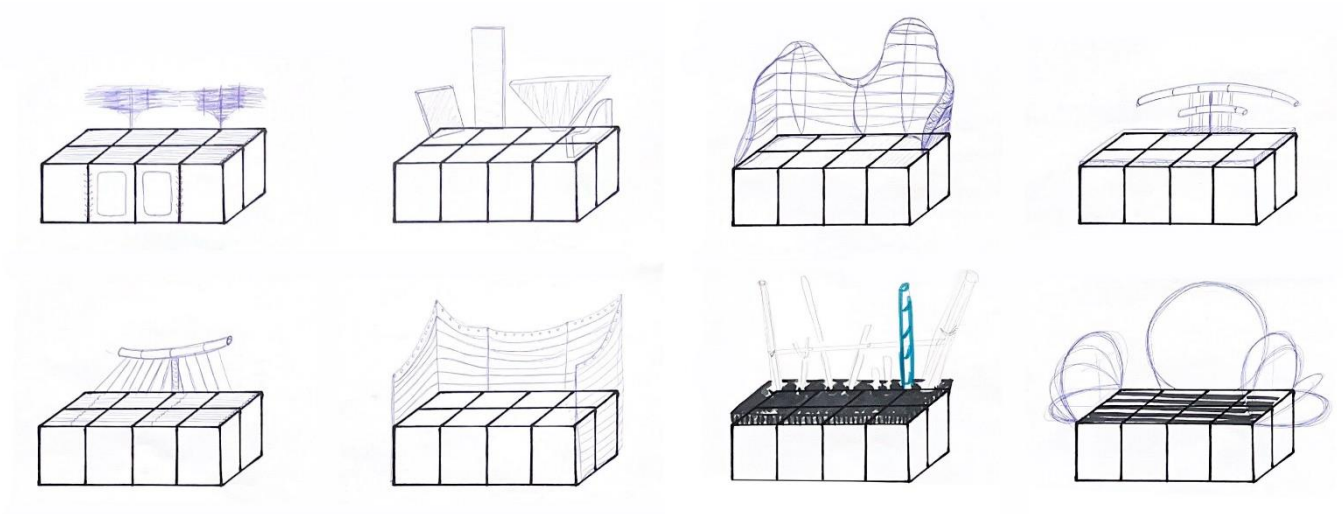


Figure 44: Ideas from 3<sup>o</sup> alternative

## 4° Alternative

This idea proposes the use of the metal can vertically. So, by this way is possible to reduce the manufactured process. This alternative value more the work on the aesthetic and visual part of the product, making use of the gaji bags on the cushion or other kind of fabrics, promoting its appearance.

The solution proposed by this alternative is that this design has a more versatile use and also encourages interaction with the user since this product will not be fixed to the floor but can be moved like a stool.

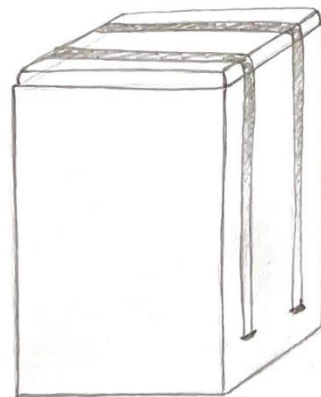
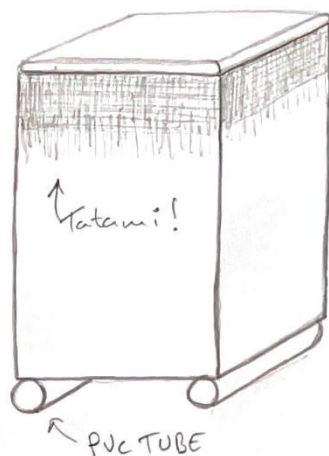
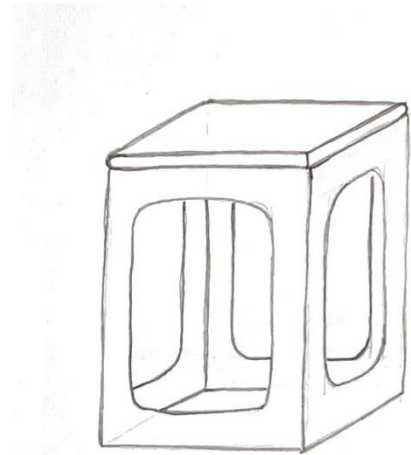


Figure 45: Fourth alternative

## SELECTION CRITERIA

To select the most appropriate alternative, the weighted sum methodology is used, in the most justified way to obtain the best option among all. This method consists of attributing a certain percentage to the criteria that will define the best option among the alternatives.

### Requirements

- Functionality
- Versatility
- Simplicity
- Security
- Endurance
- Costs

Next, through a percentage attributed according to the briefing of the project objective and the context, each requirement will have a value.

### Values

- Functionality / 25%
- Versatility / 20%
- Simplicity / 15%
- Security / 20%
- Endurance / 10 %
- Costs / 10%

Each alternative will be evaluated out of 10:

	Functionality	Versatility	Security	Simplicity	Endurance	Costs
A1	4	7	5	5	4	7
A2	4	7	8	7	7	6
A3	8	5	9	4	8	4
A4	6	7	8	7	7	8

Table 1: Values of alternatives

According to these scores, the corresponding percentages are applied

	F (25%)	V (20%)	S (20%)	Sp (15%)	E (10%)	C (10%)	Total
A1	1	1,4	1	0,75	0,4	0,7	5,25
A2	1	1,4	1,6	1,05	0,7	0,6	6,35
A3	2	1	1,8	0,6	0,8	0,4	6,60
A4	1,5	1,4	1,6	1,35	0,7	0,8	7,35

Table 2: Percentages of values

The alternative chosen according to this selection method is A4.

## 3.2.ANTHROPOMETRY

To achieve an adequate design, an anthropometric study will be carried out in which the necessary measurements of the user will be considered. In this way we will achieve an ergonomic design solution adapted to the dimensional needs of the user (Harvey, Stanton and Young, 1999)

As a source of information for the measurements of the human body, the current regulation (ISO 7250-1:2017), includes the basic measurements of the human body for technological design.

Below are the measurements of the subject that will be necessary for the ergonomic development of the design:

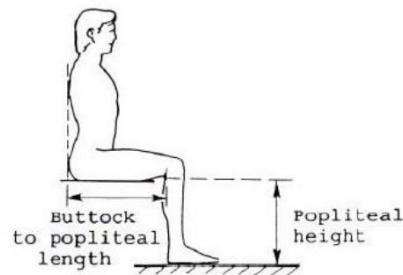


Figure 46: Anthropometric measurement of seat height

Measurement (cm)	Mean(cm)	Min(cm)	Max(cm)	Percentile	Percentile	Percentile	Standard Deviation
Vertical Grip Reach	201.68	179.0	232.0	185.3	196	225.7	15.39
Stature	165.96	149.00	180.00	157.1	167.0	177.3	7.83
Eye Height	154.87	134.50	171.00	144.0	153.0	169.2	9.25
Shoulder Height	137.58	124.00	149.00	128.5	135.5	148.1	7.55
Crotch Height	75.54	60.00	90.50	65.0	78.0	85.6	7.57
Elbow Height	105.83	93.00	120.00	96.6	104.5	117.3	7.62
Hip Height	84.28	75.50	104.00	76.0	81.3	102.2	8.01
Knuckle Height	69.76	60.00	79.00	63.6	70.0	79.0	5.26
Fingertip Height	61.34	53.50	67.00	56.7	61.0	67.0	3.82
Tibial Height	46.89	39.00	58.00	41.3	46.0	57.1	5.10
Biacromial Breadth	32.98	22.50	39.00	23.9	35.0	37.7	4.70
Bideltoid Breadth	43.12	35.00	49.00	39.1	44.0	48.0	3.23
Sitting Height (erect)	84.25	68.50	90.00	78.6	85.0	88.2	4.50
Eye Height, sitting	72.62	61.00	77.00	69.1	73.0	76.6	3.70
Shoulder Height, sitting	54.12	36.00	61.00	42.3	56.5	60.1	6.79
Elbow Height, Sitting	25.07	18.00	46.00	19.8	23.4	34.3	6.40
Elbow-Fingertip Length	44.70	39.50	51.00	40.0	44.0	51.0	3.84
Shoulder- Elbow length	34.26	27.50	39.00	31.6	33.5	39.0	2.89
Buttock Popliteal Length	49.45	41.50	57.00	44.2	48.0	56.1	4.51
Thight Clearance	15.14	8.00	19.00	10.7	15.0	18.1	2.86
Knee Height	51.74	45.50	58.00	46.0	50.0	58.0	4.26

Table 3: Dimensions for the seat design

S.N	Parameter	Anthropometric Measure	Design Dimension (cm)	Design Criterion
1	Seat Height	Popliteal height	47.3	5th percentile of the knee height of the population is usually required so that a larger number of the population is accommodated.
2	Armrest Height	Elbow rest height	19.8	The 5th percentile of the elbow rest height was considered in the design.
3	Seat Depth	Buttock popliteal height	44.2	The 5th percentile of the buttock-popliteal length should be used to determine the seat depth.
4	Backrest Angle		110°	Base on literature
5	Back Rest Height above Seat	Sitting shoulder height	42.3	5th percentile of sitting shoulder height
6	Backrest Width	Hip breadth sitting	44.0	50th percentile of (Bideloid) breath
7	Seat Width	Hip breadth sitting	37.7	95th percentile of hip breadth
8	Seat Back Rest Height (Upper)	Sitting Shoulder Height	42.3	The 5th percentile of Sitting Shoulder Height.
9	Knee height		50.0	5th percentile of Knee Height

Table 4: Summary of anthropometric

The objective of this anthropological study is to adapt the limitations of the design in the most appropriate way for the user.

Guided by the previous images, measurement popliteal length has been considered to determine the height of the seat, ensuring that the person's feet can rest comfortably on the floor. Popliteal Length measurement has been used to establish the seat depth and the Hip Breadth Sitting measurement has been used to determine the seat Width, providing adequate support for the spine.

In summary, our chair design will fit the following recommended measurements:

Hight between 35-45 cm

Deep between 25-35 cm

By following these parameters, we ensure that the stool is suitable for a wide range of people, considering considers the anthropometric differences of the population.

### 3.3. CONCEPTUAL DESIGN

Once the previous studies have been completed, we will capture the inspiration that will serve as a starting point for the redesign from our stool.

In this section we mention the elements that have focused the idea of development of the project as well as inspiration taken from other design projects.

#### UNUSUAL PRODUCTS



Figure 48: Inflatable products

Industrial design students from Muthesius University in Kiel, Germany, have created ten inflatable products including a transparent suitcase and a blow-up seat for an installation called Air Supply at Milan design week.

(Englefield, 2022)

Stefan Diaz features a bamboo bench and a pair of trestles that can support a tabletop. Each trunk has been left in its natural state, and the furniture is assembled by threading cords through the canes and tying individual parts together.

(Tucker, 2017)



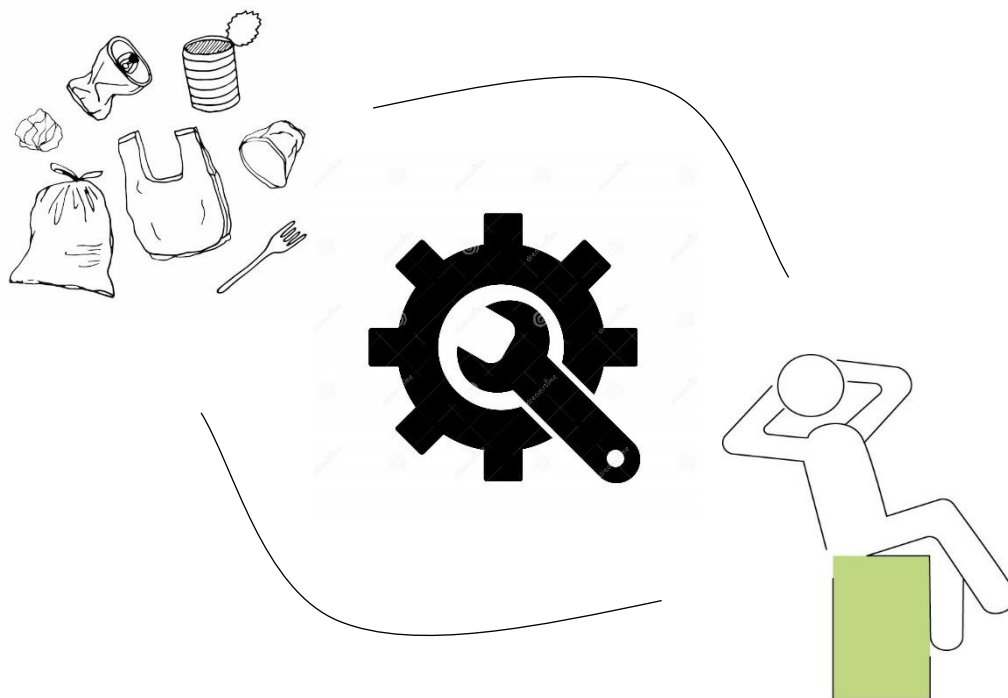
Figure 49: SOBA bamboo

## DESIGN TREND

MDW is the largest and most prestigious furniture and design fair in the world. Which has taken place since 1961, when a group of Italian furniture manufacturers organized the first edition of the exhibition in Milan. The aim was to promote furniture design and production, and to turn northern Italian city into an important design player.

According to a renowned fashion magazine in the world of design known as DeZeen, the use of industrial material waste is among the trends of Milan Design Week 2023.

From agriculture to construction, using waste materials produced by other industries continues to be a popular strategy to reduce the environmental impact of the new design products.



*Figure 50: From waste to design*

## NARRATIVES THROUGH OBJECTS



Figure 51: Punching bag

Donttakethewrongway is the studio behind this concept that explores designing common spaces for the *frustrations* we all face. Frustrations that go beyond designed systems and happen, well, because we are human.

The public punching bag offers an outlet for these emotions to maybe develop a healthier way to address personal and collective issues in a public setting.

Below I will make some reference to the market study section since it shows clear examples of narrative through objects. These approaches are due to the clear artistic strategy, not only focused on the design of a formal product.



Figure 52: E-metabolism chair

### E-metabolism

This project aims to get the attention of the *problem of electric scooters* being dumped in the canals.



Figure 53: NYC subway urinal

### NYC subway urinal

The creation is considered as an art object that potentially could have the function of bought a seat and a urinal.



## **CONCLUSIONS**

This project includes oil cans as one of its fundamental elements, due to the excessive use made in the preparation of fried food in Taiwan.

For this, food safety is a potential concern. College students in Taiwan like to eat Taiwan fries, light fried chicken, deep fried chicken, steak, smelly tofu, grilled chicken and spaghetti. These are high fat, high calorie foods, which are having adverse impact toward students' health.

(Shih, Wang, Shih, Lee, and Lin, 2020)

Several cohort studies in US populations showed that higher consumption of fried foods was associated with an increased risk of type 2 diabetes) and cardiovascular diseases, which are among the leading causes of death.

(Cahill, Pan, and Chiuve, 2014)

From another side some messages will help the consumer to interact with the products. The color palette is vibrant and with striking elemental colors, to attract attention and encourage interaction with users. Inspire by the contemporary graphic designers as Irma Boom, Giovanni Covre, Camuffo Lab, Karl Gerstner, and Michael Bierut.

With all this, this project tries to raise awareness through a committed graphic design that informs and generates positive changes in social and environmental issues.

### 3.4. EXPERIMENTATION PHASE

In this section, the design development will be resolved in stages until a solution is reached in accordance with the requirements already mentioned above. From this, several questions will be presented to follow.

#### HOW TO AVOID INSTABILITY?

Due to the presence of the plug through which the oil is poured, it presents a 0.5 cm offset with respect to the base of the quadrangular prima structure. As is shown in the next figures.



Figure 54: Top view



Figure 55: Profile view

Due to this, it is considered directly removing this entire lower plate.



Figure 56: Total cut

This solution is taken from examples observed and already carried out by other creators of the environment. At first it turned out to be the most viable option but at the same time complex due to the determination required to cut the metal.

The second option is just removing the plug and the hunger, from a more precise cut. However, it is complicated when creating a curved and smooth finish in the curved area of the same. Straight cuts do not present any inconvenience and are easier to later bend the tabs to prevent cuts.



Figure 57: Partial cut



Figure 58: Net in partial cut

In response to the partial cut, making use of an element that is also very present in Taiwan such as pink plastic ropes, it was decided to create a mesh that can protect this area and the option of filling it with another material. to provide stability and weight.

These ropes are used among many other things to unify and fix all kinds of things in Taiwan, from religious offerings to even takeout food.



Figure 59: Plastic ropes

Cutting the plates is not a very suitable option due to the cost of the mechanical effort to cut them, including the fact that the cans must be washed once opened and this exponentially increases the cost of execution.

For this reason, the idea of cutting the cans is ruled out. The best option will be to find a way to stabilize the can with another external element, since the work is directly related to disused elements, two options are proposed.

## WHAT TO USE AS A BASE?

As we have already mentioned in the materials section, plastic is a waste that is present during the everyday, but the real problem is that could be more harmful when found in the sea for the life of marine fauna, as is the case with nylon ropes.



Figure 60: Nylon ropes

The instability problem from this solution is solved, it can be a useful way since the rope when is compressed by the weight, it stabilizes the space between the ground and the height difference with the can.



Figure 61: Nylon rope base

However, when looking for the most appropriate option to fix the rope to the base, we again encounter another problem, since nylon and metal are materials that cannot stick, we need an external element such as a cable tie to hold it. Since we have decided not to manipulate the can, we proceed to look for another solution.

The next possible material we will consider using will be the tatami. Tatami is made of straw weaving. They are resistant and have a long life of use, usually have rectangular shape.

Tainan is the old capital of Taiwan, so it still preserves many spaces of local crafts compared to the capital, so we have found a store that manufactures these products and with the help of the translator we have been able to interact with the craft man.



Figure 62: Tatami craft shop

The manufacture of tatami generates waste, since the craftsman obtains large sheets of chipboard, from which the interior of these is made, and must cut them and adjust them to the measurements that the client wishes to obtain. So, the result always generates some waste that must be recycled.



Figure 64: Store interior



Figure 63: Tatami waste

## HOW TO MAKE THE SUPPORTS?

Firstly, the collected tatami boards are unified and sewn together, it consists of three layers of two different materials, one of wood chipboard and the other foam. We must separate this composition by cutting the sewn as we can observe in the previous chapter. Then with a manual saw, we will cut small pieces of 3 cm each side approximately.



Figure 65: Tatami cut

When the tatami cutting is finished, with the help of sandpaper we will polish the surface of the blocks created and we will also remove the corners to give it a smoother finish.



Figure 66: Tatami support

This type of material is suitable for this part of the design, since it has a lot of resistance to wear and tear and is impervious to rain and impacts. Likewise, the material adapts to any type of surface, provides grip and the necessary stability with respect to the problem caused by the bottle cap. It can be adhered with glue or Velcro, as is the case with this prototype.



Figure 67: Tatami base

## HOW TO MAKE THE CUSHION?

Having solved the most crucial problem so far, we will now focus on finding viable alternatives for the seat.

The requirements for the seat are that it must be comfortable, waterproof, affordable, resistant to friction and, to the extent possible, we will look for the most sustainable solution. These will be cut with an automatic saw.



*Figure 68: Tatami cut*

Throughout the manipulation of the tatami sheets, this has turned out to be a material that is very in accordance with the requirements that we have established, so we will use it in the same way.

In this case, we need to obtain 23 x 23 cm pieces to cover the surface of the seat but because the iron obtained from the store does not meet these characteristics, we must make each piece in two parts as shown in the following figure.



*Figure 69: Cushion cut*



These will be the result once the tatami pieces have been cut to size and then unified. As you can see in the image again, the corners of these have been sanded to adapt their shape to the support.



Figure 70: Tatami cushion



Figure 71: Seat upholster

As a final element, the seat covering will be made with a locally well-known fabric in Taiwan, but in the same way a study is being carried out on other waterproof fabrics to analyze the best options in this regard.

Within the prototyping of our stool, we define the prototyping process as finished to be able to give way to the final design and the following sections such as the definition of the plans and budgets.



Figure 72: Final prototype

## **4.FINAL DESIGN**

In this section, the exhaustive conclusion and justification of each component and phase of the final design are carried out. The reasons behind the choices are detailed, demonstrating the coherence and effectiveness of the project, ensuring its viability and relevance.

### **4.1.COMPONENT JUSTIFICATION**

#### **OIL CANS**

The primary focus of the project development revolves on recycling cans, specifically oil cans. These cans are a common sight in daily life, found on streets, within restaurants, schools, and other public areas. They serve as a focal point for various community activities, including recycling initiatives aimed at maintaining cleanliness and order. Additionally, they attract groups of individuals dedicated to collecting them for monetary gain. The presence of these cans underscores their importance as a sustainable resource and highlights the potential for creative solutions to utilize them effectively in environmental conservation efforts and community development projects.

The square shape of 18-liter metal oil cans offers structural stability and versatility in design, facilitating the creation of stools or chairs with balanced weight distribution. Constructed from durable materials such as steel or aluminum, these cans provide robustness and resistance to deformation, ensuring longevity in furniture applications. Their smooth surfaces are appropriate for painting or coating, enabling customization to suit various aesthetic preferences. Additionally, the metal's inherent strength and rigidity enhance the chair's durability and load-bearing capacity, making it suitable for both indoor and outdoor use. Overall, the combination of shape, material, and properties makes these cans an ideal choice for sustainable and functional furniture design.

## **TATAMI**

Using tatami waste parts presents a dual advantage by combining sustainability with cultural heritage. These discarded mats, comprising woven rush grass and rice straw, offer a renewable resource for eco-friendly furniture production while honoring traditional Japanese craftsmanship, really present in Taiwan due to its past. The incorporation of tatami waste into furniture design not only reduces environmental impact but also preserves cultural identity.

Tatami waste parts possess inherent properties that enhance their suitability for furniture construction. The woven rush grass and rice straw composition provides natural insulation, regulating temperature and promoting comfort. Despite their lightweight nature, tatami waste exhibits remarkable durability, ensuring longevity in furniture applications. Furthermore, their organic materials contribute to a healthier indoor environment by minimizing off-gassing of harmful chemicals often found in synthetic materials.

Repurposing tatami waste aligns with sustainability goals, reducing landfill waste and promoting resource efficiency. This approach not only reflects a commitment to environmental stewardship but also celebrates the rich cultural heritage associated with tatami craftsmanship.

## 4.2.FINAL SOLUTION

At the end of the experimental phase, several key insights were gathered. Tatami proves to be versatile, serving both as support and cushion interior for the project. Throughout experimentation with various fixatives including glue, Velcro, and double-sided tape, the latter emerged as the superior choice. The choice of double-sided tape ensures ease of assembly and durability, guaranteeing a stable and long-lasting outcome.

Furthermore, the selection process was informed by practical considerations such as cost-effectiveness and accessibility of materials. Likewise, double-sided tape is widely accessible and affordable, making it an ideal choice for securing the tatami components.

Beyond fixing the elements, it explored fabrics to protect the seat, contemplating a seat collection. Experimentation with vibrant color finishes enhances object visibility, meeting design criteria. The cans' appearance will also feature color, with engraved phrases via stickers for narrative and product understanding. This holistic approach not only enhances aesthetic appeal but also ensures functional durability, offering a cohesive and engaging user experience while fulfilling the project's objectives. Through consideration of both form and function, we strive to create an innovative and visually striking solution that resonates with users and enriches their interaction with the product.

In this way, the final design presents a collection with three finishes, one in metal, yellow and blue.

With the metallic color, the piece is presented that is upholstered with the traditional Taiwanese fabric and the other two colors are presented with an orange, yellow and pink fabric in various combinations between them.

## 4.3.RESULT

For the presentation of the results, it has chosen to display the product in strategic scenarios and different potential uses. This decision is based on a local analysis of seating arrangements across the city from street intersections to areas in front of shops, restaurants and public parks. The objective is to offer a comprehensive view of how the product can seamlessly fit into diverse urban settings and address various user requirements. This approach aims to highlight the product's versatility and its ability to enhance public spaces while meeting the practical needs of individuals in different environments.



*Figure 73: Final stool*



Figure 75: Chair in context 1



Figure 74: Chair in context 2

In Taiwan, the practice of placing seats outside restaurants serves as a practical solution to accommodate waiting customers in densely populated urban areas. Despite their utilitarian purpose, these outdoor seats also offer patrons a chance to observe the bustling street life while anticipating their meal. Additionally, this setup reflects the cultural emphasis on efficient use of space and the importance of convenient in dining experiences.



Figure 76: Chair in context 3



Figure 77: Chair in context 4



Apart from the original metal idea, other vibrant colors have been chosen for the color palette. Influenced by other local products and the park's aesthetics.

Figure 78: Final stool II



Figure 79: Chair in context 5





Figure 80: Chair in context 6



Figure 81: Chair in context 7



Figure 82: Chair in context 8



Figure 83: Chair in context 9

## **4.4. CONCLUSIONS**

Discovering and ultimately fulfilling the set objectives in this project has been an enriching experience that has provided valuable learning and overcoming numerous challenges along the way. It is important to conduct a general review to highlight both the positives and the challenges faced, especially when carrying out the project abroad.

First and foremost, it is necessary to emphasize the satisfaction generated by focusing on reuse and upcycling, thus contributing to the circular economy, an increasingly relevant trend today. However, the project faced certain difficulties, particularly at the outset, due to the lack of a closed briefing, which delayed its start.

One of the main cons was the need to adapt to a new cultural and linguistic environment. The language barrier, in particular, posed significant challenges and generated fatigue throughout the process. The search for resources, workspaces, and understanding of formal procedures were affected by this barrier, requiring constant perseverance and overcoming the embarrassment to ask and seek solutions in local stores.

Despite these challenges, the discovery of the potential of oil cans as a resource was a significant turning point. The ability to give new life to a common object, in a context where waste production remains a global challenge, was a source of satisfaction and motivation to move forward.

Furthermore, exploring the territory, both in urban and rural areas, allowed for a better understanding of the specific challenges faced by the country in terms of waste management, especially due to the scarcity of habitable space. This discovery provided a broader perspective on the importance of addressing the issue of waste at both local and global levels.

In summary, despite the obstacles and challenges encountered, the project has been a valuable experience that has contributed to personal and professional development, as well as awareness of the importance of sustainability and resource reuse. Carrying out this project abroad has provided a unique insight and a deeper understanding of the challenges and opportunities facing the field of upcycling and the circular economy internationally.

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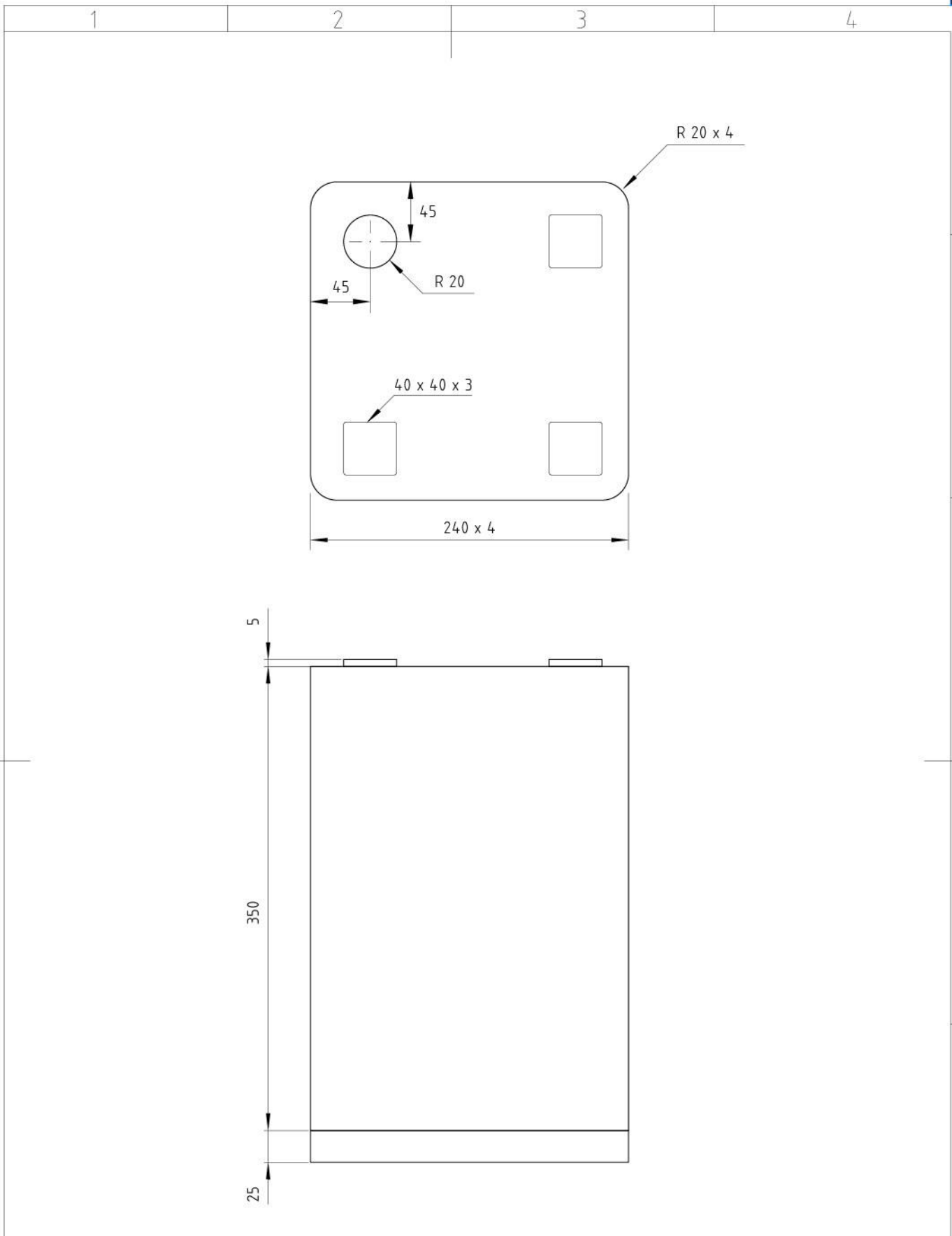
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# PLANE



TITLE OF DRAWING: Oil can stool

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DATE:

DATE: 20 / 05 / 2024

FORMAT: A4

UNIT: mm

SCALE: 1 : 4



PROPERTY:

Guillermo Páramo

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REVISION:

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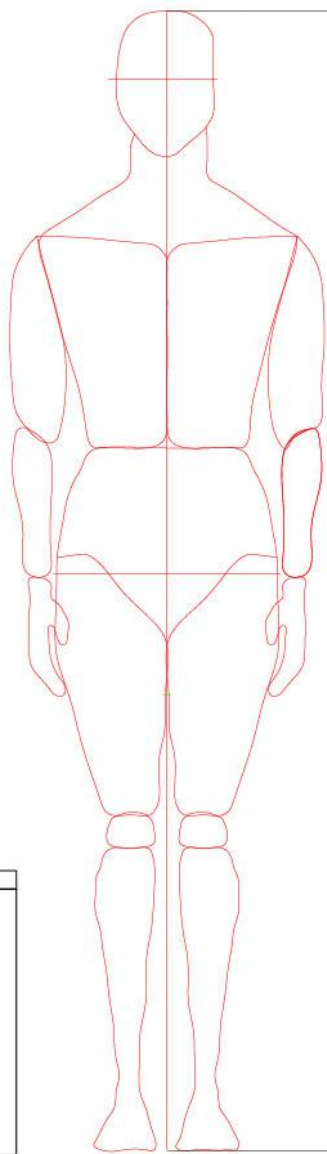
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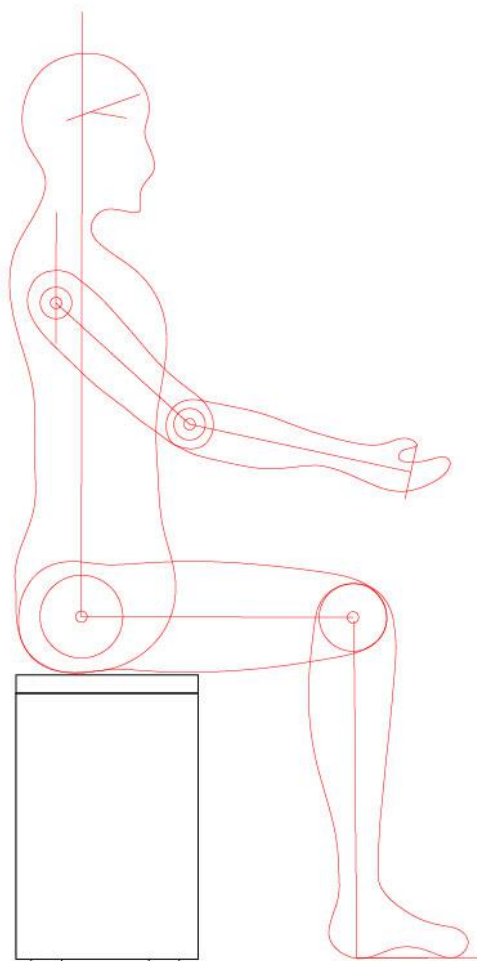
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# **SPECIFICATIONS**

## **1. PURPOSE**




This project focuses on the utilization of oil cans, a widely available yet often overlooked product among the population of Taiwan. Their goal is to give a new life to these cans in a way that is accessible to everyone. This initiative promotes sustainability and reuse, challenging the prevailing consumption system and at the same time advocating for the principles of the circular economy and waste reduction.

## **2. MATERIAL CONDITIONS**

This section presents a detailed analysis of the materials and tools used in the chair reconditioning process, accompanied by their corresponding characteristics.

## USED MATERIALS

MATERIAL	QUANTITY	MEASURE	USE	IMAGE
<b>OIL CAN</b>	10	Unit	Body of design	
<b>TATAMI</b>	2	m <sup>2</sup>	Base and seat	
<b>FABRIC</b>	1,50 x 0,50	m <sup>2</sup>	Cover pillow	
<b>SCOURER</b>	1	Unit	External can washing	
<b>DISHWASHING LIQUID</b>	700	ml	External can washing	
<b>VELCRO</b>	1	m	Fix base	
<b>DOUBLE SIDED TAPE</b>	1	Unit	Prototyping fix	
<b>STAPLES</b>	1	Box	Fix the fabric	

<b>SRPAY</b>	4	Unit	Body painting	
<b>MASKING TAPE</b>	1	Unit	Delimit the painting	
<b>SANDPAPER</b>	1	Sheet	Sand tatami	

*Table 5: Used materials*

<b>USED TOOLS</b>		
<b>TOOLS</b>	<b>USE</b>	<b>IMAGE</b>
<b>METAL SHEARS</b>	Cut metal sheets	
<b>HAND SAW</b>	Cutting tatami plates	
<b>ANTI-CUT GLOVES</b>	Protection for sharp	
<b>TAPE MEASURE</b>	Measure box size	
<b>FLAT PLIERS</b>	Fold tabs	
<b>MANUAL STAPLER</b>	Fixing fabric	

Table 6: Used tools

# BUDGET

Below in this section the design budget is broken down based on proposed recycling. The cost of the materials and tools used will be considered, as well as the manufacturing cost. With this, the objective is to accurately and transparently disclose the total costs of the project.

It will be made from the local currency, in this case New Taiwan Dollar, where the equivalence corresponds to an approximation of 1 EUR (€)  $\approx$  33 NTD (\$)



<b>MATERIAL COST</b>			
<b>MATERIAL</b>	<b>QUANTITY</b>	<b>PRICE / QUANTITY</b>	<b>SUBTOTAL</b>
<b>OIL CAN</b>	5	Recycle	0 \$
<b>TATAMI</b>	2	Recycle	0 \$
<b>FABRIC</b>	1,50 x 0,50	Recycle	0 \$
<b>SCOURER</b>	1	20 \$ / Unit	20 \$
<b>DISHWASHING LIQUID</b>	700 ml	130 \$ / 700 ml	130 \$
<b>VELCRO</b>	100 cm	60 \$ / 50 cm	120 \$
<b>DOUBLE SIDED TAPE</b>	1 unit	115 \$ / unit	115 \$
<b>STAPLES</b>	1 box	10 \$ / box	10 \$
<b>SRPAY</b>	5	100 \$ / Unit	500 \$
<b>MASKING TAPE</b>	1	40 \$ / Unit	40 \$
<b>SANDPAPER</b>	1	14 \$ / sheet	14 \$
<b>TOTAL:</b>			949 \$

Table 7: Material cost

<b>TOOLS COST</b>			
<b>TOOL</b>	<b>QUANTITY</b>	<b>PRICE / Unit</b>	<b>SUBTOTAL</b>
<b>METAL SHEARS</b>	1	250 \$	250 \$
<b>HAND SAW</b>	1	200 \$	200 \$
<b>ANTI-CUT GLOVES</b>	1	60 \$	60 \$
<b>TAPE MEASURE</b>	1	35 \$	35 \$
<b>FLAT PLIERS</b>	1	90 \$	90 \$
<b>MANUAL STAPLER</b>	1	120 \$	120 \$
<b>TOTAL:</b>			755 \$

Table 8: Tools cost

<b>MANUFACTURING COST</b>			
<b>OPERATION</b>	<b>TIME</b>	<b>PRICE / Hr.</b>	<b>SUBTOTAL</b>
<b>WASHING</b>	30 min	0 \$	0 \$
<b>CUTTING TATAMI</b>	2 hr.	200 \$ / hr.	400 \$
<b>SANDING</b>	2 hr.	0 \$	0 \$
<b>PAINTING</b>	2 hr.	0 \$	0 \$
<b>UPHOLSTER</b>	1.5 hr.	190 \$ / hr.	285 \$
<b>FIXING PARTS</b>	1 hr.	0 \$	0 \$
<b>TOTAL:</b>			685 \$

Table 9: Manufacturing cost

<b>TOTAL COST</b>	
<b>COSTS</b>	<b>SUBTOTAL</b>
<b>MATERIAL</b>	949 \$
<b>TOOLS</b>	755 \$
<b>MANUFACTURE</b>	685 \$
<b>TOTAL:</b>	2389 \$