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Master's Thesis of Industrial Design

Product-to-Product Relation

Rethinking the relationship between products in
the domestic space

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Product-to-Product Relation

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the domestic space

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Abstract

Throughout the past decades, people have been surrounded by an increasing number of objects, and while interactions between such objects and users have been acknowledged, little attention has been paid to the relationship between objects. Based on previous research, the lack of consideration applied to the interaction between objects in space contributes to the increase of problems, such as clutter, mental problems, or unbalanced relationships between the user and their objects.

Going beyond the design solutions that primarily engage with the user in their domestic space, exploring a concept such as product-to-product relation can enhance new solutions that can meet both the problems associated with the domestic space, as well as the daily needs of contemporary users.

Therefore, this research proposes to explore a design approach that considers the physical relation and physical properties between objects by analyzing object's relations with study cases, by defining the product-to-product relation, including its characteristics and its position to the user, and by exploring with design practices the usage of objects' physical properties, in this case, the shape and weight, to improve the relationship between objects and users' life in their domestic spaces, as well as, to develop solutions in the field of design.

In the First Dissertation Projects of the design practices, the projects presented will focus on exploring how to apply the idea of the product-to-product relation using the shape of common technical objects, and how to create relevant solutions for the domestic space with it. With the achieved outputs and same purpose, for the Second Dissertation Projects, the following projects will focus on applying the idea of the product-to-product relation using the objects' physical property weight. With the previously achieved outputs and gathered conclusions, the Third Dissertation projects

will focus on applying the idea of a product-to-product relation using both shape and weight of common technical objects, to develop the final products for specific purposes around the domestic space.

Lastly, this research will show to the contemporary designers a different direction from the conventional design process of developing a solution, that can improve future products designed for the domestic space, by going beyond the design solutions that primarily engage with the user, and considering also the relation between objects and their characteristics for the final products.

Keyword: Product-to-product relation, Industrial Design, Domestic Space

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Chapter 1. Introduction

1.1 Overview

A comprehensive introductory overview of the thesis' main components is presented in this chapter. Here will be presented the following topics:

Problem Statement, where the issues approached in this research are presented. Research Purpose, where the purpose of this research and main questions of research are introduced. Methods of Research, where are described and justified the strategies, processes, and techniques utilized to develop this research.

1.2 Problem Statement

With the world's evolution and new global epidemic situations, the human's sense of home has changed as a valued space to create history, interaction and improve their well-being. ^①

Despite this, societies became more consumer-oriented and surrounded themselves with various products, contributing to problems related to a crowded living environment, such as clutter, physical and mental problems. ^②

Although high consumption is a big issue, Marie Kondo, a famous Japanese specialist in spatial relationships between objects and people in living spaces, believes that high consumption is not the only factor that leads to disorderly living spaces. Based on Marie Kondo's book *The Life-Changing Magic of Tidying Up*, domestic spaces often do not embrace the object's physical properties, whereas undefined spaces for objects promote

^① Marcus, *House as a Mirror of Self*, 1997.

^② Roster & Ferrari, 2019, 923 – 44

spatial problems, such as clutter, stress, and depression.^③

Using design to overcome such a phenomenon means considering the object's physical properties in the design development by increasing the physical relation between both objects' attributes and users' needs in the domestic spaces. With this design philosophy the objects and the value of their physical properties, which are often neglected, become crucial elements in the design development.

In summary, to improve the constant disorderly lifestyle in domestic spaces it has become relevant for design professionals to explore the potential of technical objects and the physical relation of their characteristics to offer solutions that can reeducate users' organizational practices and personal relationships with their objects.

That is to say, it has become necessary to go beyond the design solutions that focus primarily on the user with the purpose to create new solutions that are capable to lead the user to an organized balance in the domestic space.

1.3 Research Purpose

Without intending to eliminate the problem of having a big amount of objects in a living space, but to explore how a spatial imbalance between objects and domestic space can be addressed to improve the users' lives, this research proposed, while accounting for the object's physical properties, that if the designer considers the functional physical relation of object's physical properties in the design process, it will be possible to create solutions that decrease the disorderly living spaces around objects.

Consequently, this research seeks to understand how a development concept that values the physical relation between objects and their physical properties, such as product-to-product relation, can be applied to generate unique design solutions that address issues related to imbalanced

^③ Kondo, *The Life-Changing Magic of Tidying Up*, 2014

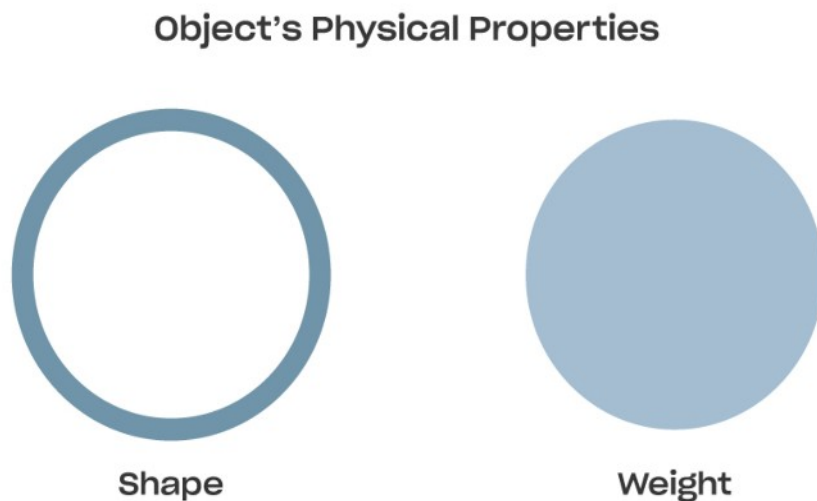
relationships between users and their belongings within domestic spaces
The foundation of this research will be centered on three main research questions (RQ):

RQ.1 (Why): Why is relevant to consider the objects as we consider the user in the design process?

RQ.2 (What): Is it possible to consider both objects equally important as the users in the design process? Are there examples of solutions that use the idea of the product-to-product relationship to create useful solutions for users' lives in the domestic space?

RQ.3 (How): In the field of design, how can the relationship between objects and their physical properties create differentiated but also appropriate solutions for the domestic space?

To narrow the field of research, and based on the spatial importance that the physical property shape and weight of objects have in a living space environment, only these objects' physical properties were considered in the design practices (*Fig.1*).



[Fig.1] Objects' physical properties used as development approaches in this research

1.4 Methods of Research

The methodological procedures adopted to carry out this research were different in relation to the different steps defined for the execution of the thesis.

Since this research explores a design concept that differs from conventional existent concepts, some limitations were expected when searching for technical information. However, the analysis of existing study cases, that uses the relation of physical properties of technical objects as a design approach, was the way to overcome this limitation and achieve relevant information.

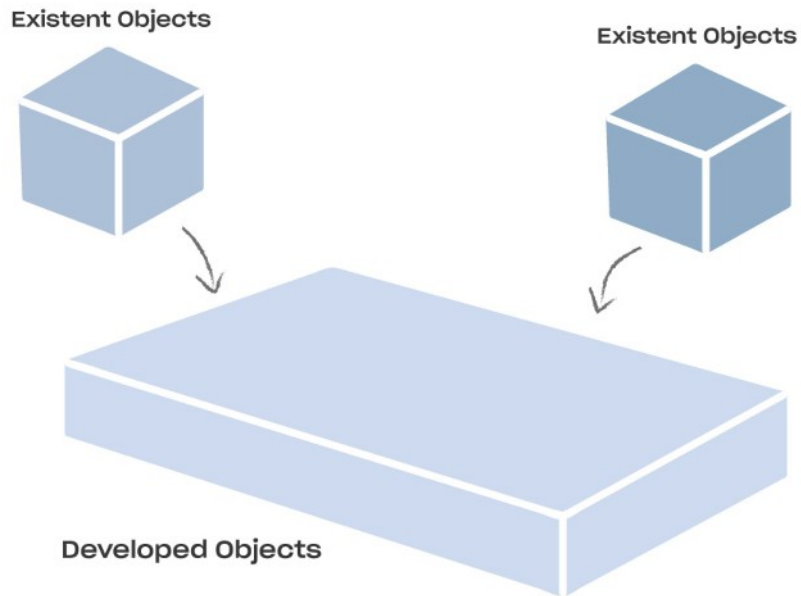
Among the challenges faced in the research, for the collection of reliable information related to the concept being researched, were analyzed reference books about product design and interior design, as well as, viable articles and dissertations that explored topics related to the interaction between products and the usage of object's characteristics to develop new solutions. It was also used the internet as a tool to gather more information on relevant websites, forums, and academic repositories for the development of the research.

For the second stage of this research, I started exploring the concept of product-to-product relation as a design approach. After initial brainstorming, research, and sketches, new design solutions were developed by combining the explored concept's features with the physical properties of technical objects (shape, weight). In the first phase of the design practice, the first projects were developed around the shape of a group of objects selected through the initial research. Then, the property weight of the same technical objects was used to gather more outputs, and to deepen the concept explored in this research.

In the prototyping and experience stage, it was used several tools that are in line with the basic principles of sustainability, to develop the design practices' projects. Some of them were computer programs related to vectorial creation (Adobe programs), 3D modeling (Rhinoceros and

Grasshopper), and rendering (Keyshot). Related to the production phase of the models, It was used the 3D printer and CNC, for the experiments and definition of the final products. The development of the intended projects, using the mentioned sources, allowed me to visually demonstrate the behavior of the product-to-product relation concept as a design approach.

With that in mind, this research process was oriented towards developing solutions around the relation and physical properties of existing objects in the domestic space, such as weight and shape (*Fig.2*).



[Fig.2] Illustrative Approach Method of this research

1.5 Glossary

Domestic Space: Singular generic term to describe the private space of the house, home, or household as opposed to the exterior public space.

Functional interaction between products: Concept defined as the association between the subsystems with strong functional interaction, where each subsystem shares similar functional aspects to be able to realize other functions.

Physical Properties: A physical property is a characteristic of an object that can be measured or observed with at least one sense. Colour, size, shape, smell, and form are examples of observable physical properties. Weight and temperature are physical properties that can be measured.

Product-to-Product Relation: Term used to describe a concept that not only considers the relation between objects and the user, but also the relation between products/objects, and their characteristics, as a design method to create new solutions.

Technical Objects: Any object manufactured with some kind of technology by humans, from natural or synthetic resources, whether organically or inorganically, for a specific purpose.

1.6 Structure of Thesis

The thesis structure will now be presented, providing an overview of the remaining three chapters:

Chapter 2. Product-to-product relation. Will be discussed relevant information about the object's attributes, the idea behind product-to-product relation compared with study cases, and this concept's position around the user.

Chapter 3. Design Projects. The projects developed to achieve the outputs of the research will be shown and explained.

Chapter 4. Final Conclusions. The key points of the thesis will be reviewed and final observations will be exposed.

Chapter 2. Product-to-Product Relation

2.1 Overview

The second chapter provides relevant information to the research, where studies on the fundamental elements of an object, what is and what it is not the product-to-product relation idea, how it differs from other approaches, examples of existing products that succeed in using the relation between objects, the relevance of the approach product-to-product relation to the domestic space, and the position of the user inside of this approach will be discussed.

2.2 Objects & Properties

Since the beginning of human history, people surrounded themselves with objects they produced. Such objects have been changing over the years and helping us physically or mentally, making us understand our needs and improving our lives.^④

According to the Cambridge Dictionary, the main definition of an object is “a thing that you can sense but is not usually a living being.” It can be characterized by having an Identity (each object is a distinct individual), a State (it has various properties, which might change), and a Behavior (it can do things and can have things done to it).^⑤

The object’s characterization also includes the physical properties defined as an object’s characteristics that can be measured or observed with at least one of our five senses. Such properties include color, size, shape, smell, form, weight, and temperature.^⑥

^④ Riede et al., 2018, 46–59.

^⑤ “What Is an Object?”.

^⑥ Jenner, n.d.

Nowadays the type of objects that society most use and purchase are denominated by technical objects. The term "technical object" describes any object manufactured by humans from natural or synthetic resources, whether organically or inorganically, for a specific purpose.^⑦ Therefore, a technical object is any object made by some kind of technology, which means that most of the objects that surround society in contemporary life are defined as technical objects (bags, clothes, phones, computers, etc.).

Looking into the importance of physical properties, across design fields, such as space and product design, some attempts have been made to incorporate the physical properties of objects into design solutions. Most designs, however, are focused primarily on the appearance of the objects and rarely considered other objects' characteristics,^⑧ such as both the shape and weight of the objects.

Considering the importance of the shape of objects for the domestic space, according to a developed research^⑨, the interaction with real shapes involves understanding the visual world around ourselves (mostly what can be seen). So in spaces such as domestic spaces, this interpretation of visual information is an important element to cause, to understand changes in our space, and to help the user deal with realistic problems typical to many areas; from simple everyday problems such as organization to problems in architecture, design, engineering, etc.

In the case of the physical property weight that measures gravity's force on an object^⑩, although this property is often underestimated by designers, it has become an essential element for establishing visual hierarchy, symmetry, balance, and harmony when applied strategically.^⑪ Additionally, a US neurological study found that attributes such as weight can influence how people perceive a space^⑫, making weight a key factor to

^⑦ "Objeto Técnico: Qué Es, Características, Tipos, Ejemplos,".

^⑧ Giaccardi et al., 2020, 235 – 48.

^⑨ Steen, 1990, 139–140.

^⑩ Bradley, 2014.

^⑪ Craig, n.d.

^⑫ Collegio et al., 2019, 40 – 47.

consider when designing interior environments.

Due to its characteristics and ability to visually balance spaces, objects' weight shows to be a useful tool for creating design systems that can improve the domestic environment and human well-being within these spaces.

2.3 Definition of Product-to-Product Relation Concept

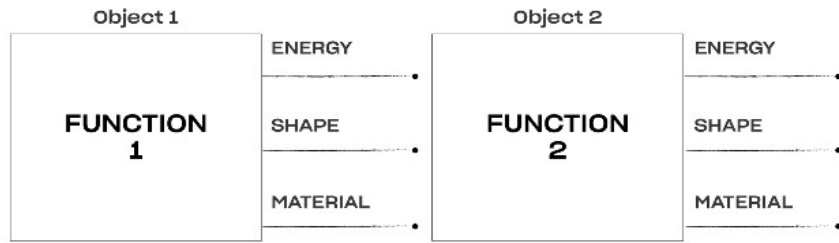
The idea that the world could be viewed and transformed around objects started to be explored in early human history by the Greeks and in the seventeenth century by Descartes, observing that humans naturally apply an object-oriented view of the world.^⑬

The term product-to-product relation was created as an idea to express a design approach that connects two or more objects in a space while taking into account their characteristics and users' needs to create differentiated solutions. Being product-to-product relation a new concept, such does not have an official definition defined. However, considering the term product-to-product relation as a concept that creates solutions with functional engagement between objects, became relevant to look into the concept of *functional interaction between things*.^⑭

According to this concept, to incorporate objects' properties and achieve functional solutions, each object in a system must share similar functional aspects to complement other objects' functions. For a similar functional aspect, an object's properties must be incorporated into another object's structure to create a functional product-to-product relation and facilitate a functional outcome (Fig.3).

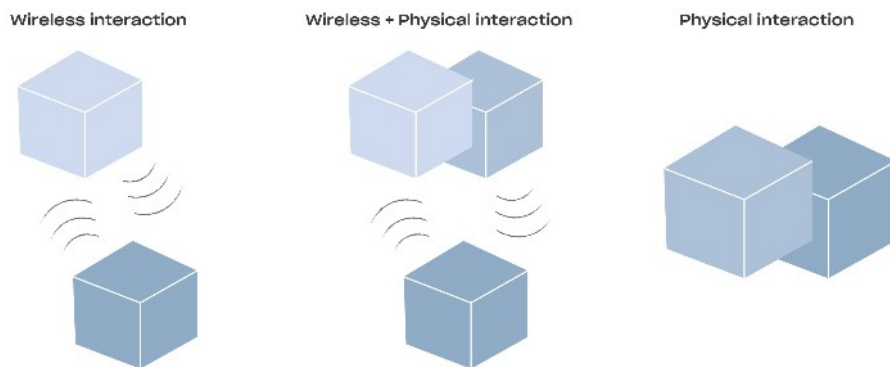
^⑬ Booch, 2007, 39 – 40.

^⑭ 강성우, “Quantifying Functional”, 269–281.



[Fig.3] A structure representation of a functional interaction between things

Inside a functional interaction between objects, there are three possible types of functional relations (*Fig.4*): wireless relation, wireless-physical relation, and physical-physical relation. Such relations can be seen in common household objects such as decoration, technological equipment, or even furniture pieces.

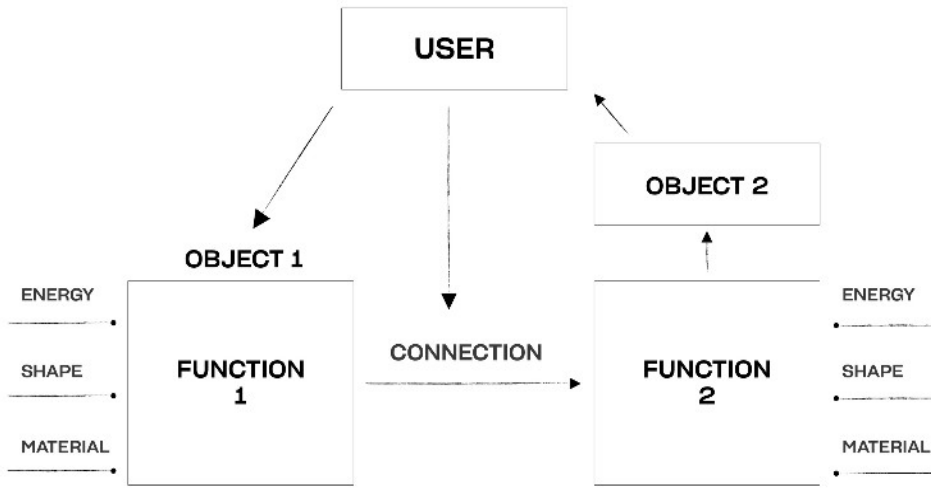


[Fig.4] Types of interactions between objects

In this research, the term product-to-product relation became a design concept to support the idea of adding the physical relationship between objects and their physical properties into the design process. Such a notion was developed based on the previously mentioned conception of creating a functional relation between objects, and by Marie Kondo's conceptual idea that considers the physical relation between objects' properties as a valuable tool to respond to spatial domestic problems.

Connecting the representative graph of a functional relation between objects (*Fig.3*) with the product-to-product relation concept, it was pos-

sible to create a graph that explains the main process idea of the product-to-product relation concept (*Fig.5*).



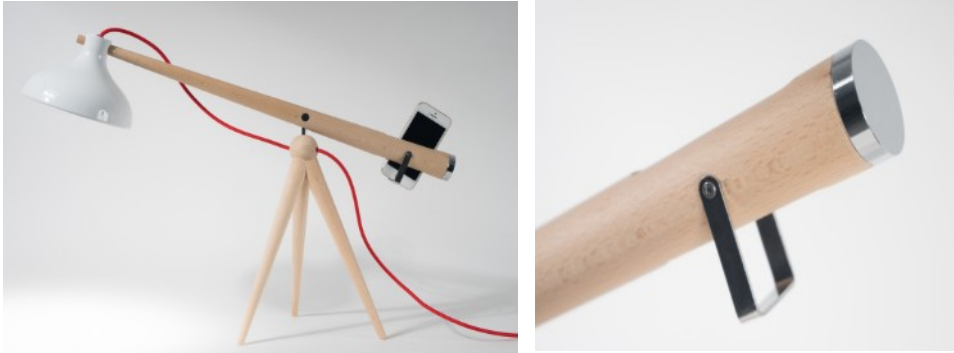
[Fig.5] Representative graphic of product-to-product relation concept

The process idea of the product-to-product relation is defined as a process that values both users' and objects' physical interactions in a given situation. In this process, based on the relationship between objects physical properties, two or more objects are selected (objects 1 and 2) to share with each other new functions capable of framing in the domestic space and to respond to user needs. With the engagement, between the objects that developed similar physical attributes (functional relation between objects concept), new functions assigned to one of the object's structures are demonstrated and returned at the end to the user to be enjoyed.

In the product design field, Balance Lamp by Studio Yuue[®] is one of the found examples that demonstrate the process idea of using object's attributes and the physical relation between them, as tools to develop a new product (*Fig.6*). The Balance Lamp is a lamp designed to address smartphone addiction in living spaces. With the incorporation of the smartphone's physical characteristics into the wooded structure of the Balance Lamp, a holder system at the end of the lamp was created to al-

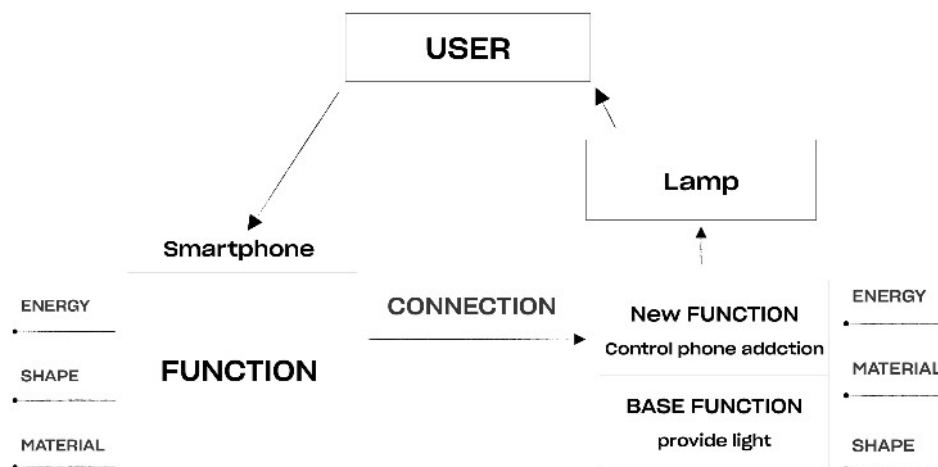
[®] "Balance".

low the placement of the technological object to turn on and off the lamp.



[Fig.6] Balance Lamp by Studio Yuue

Connected to the concept of the functional relation between objects, the consideration of the smartphone characteristics became an essential tool to help incorporate the technological object into the lamp structure, and create a physical similarity between both objects with the holder system. The addition of the lamp holder system allowed the smartphone to be adopted as a constructive object to provide light as well as addressing smartphone addiction in living spaces (*Fig. 7*).



[Fig.7] Representative graphic of functional relation between objects in the Balance Lamp

Thus, besides the fact that in this thesis this concept only explores the

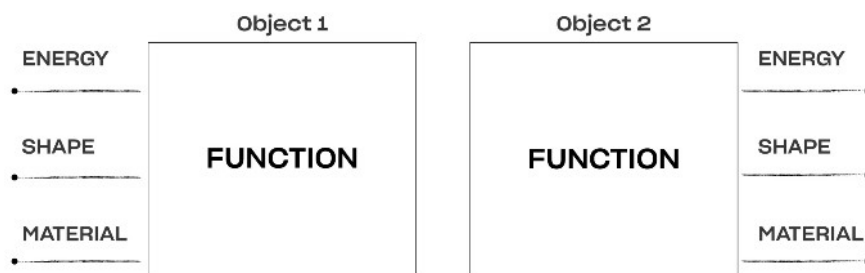
physical relation between objects in a specific space, as the first representative graph demonstrate the product-to-product relation concept aims to be an organized design method to explore how the relationship between objects and their physical properties can potential create unique and appropriate solutions in the design field.

2.3.1 The Fundamentals of product-to-product relation approach

Deconstructing the previous graphic (*Fig.5*), which represents the main process idea behind the product-to-product relation concept, it is possible to define some of the primary fundamentals of this design concept. In addition to helping to conceptually understand this different concept, the fundamentals shown below must also be taken into account by the designer and reader as crucial rules when this concept is implemented in a design solution.

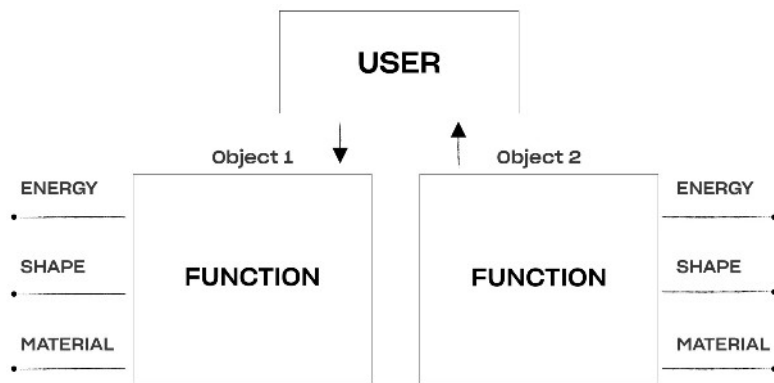
In the product-to-product relation concept:

- Values the objects and their characteristics (e.g space, function, weight) as part of the solution development (*Fig.8*).



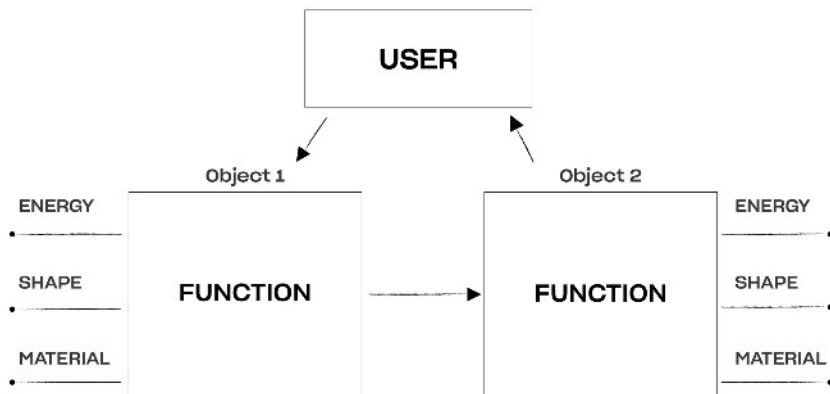
[Fig.8] 1 ⊕ Fundamental

- Provides equal value between users and objects in any stage of the design development (*Fig.9*).



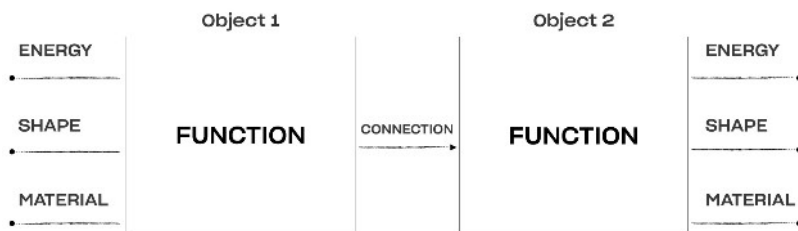
[Fig.9] 2 ⊙ Fundamental

- Both the user and object involved in the design process are analyzed and acknowledged (*Fig.10*).



[Fig.10] 3 ⊙ Fundamental

- The relation between objects has to evolve 2 or more objects, depending on the purpose (*Fig.11*).



[Fig.11] 4 ⊙ Fundamental

2.4 Product-to-product Relation as a Design Approach

This section reviews a collection of projects demonstrating the physical relationship between objects and their physical properties in the design process. The projects were selected based on their functional and conceptual similarity and how they relate to the product-to-product relation concept. The exposed projects in this part of the chapter will make the comparison of each example, easier to understand and to relate to the concept of product-to-product relation as a design approach.

Before presenting the collection of projects that are inserted in the concept of the product-to-product relation, the following tables (*Table 1 & Table 2*) will be presented the standard identities and categories of common small technical objects and big objects, visible inside the domestic spaces.

[Table 1] Standard examples of common small objects seen in the domestic spaces

Objects Category	Small Technical Objects – Lamp, Speakers, Organizer, Clock
Standard examples of the following objects	

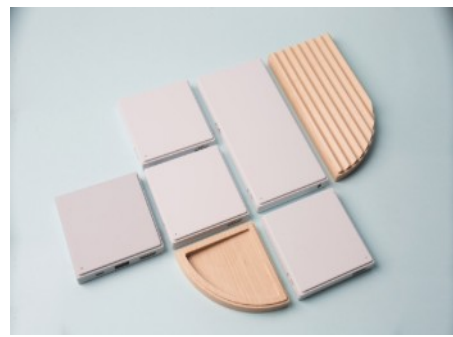
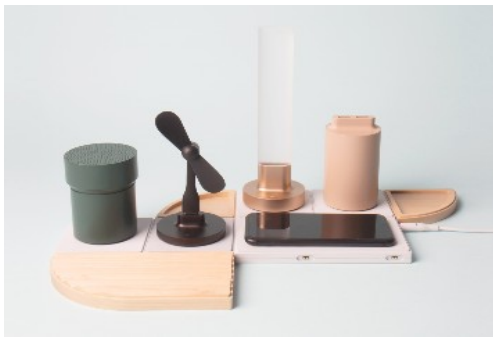
[Table 2] Standard examples of common furniture seen in the domestic spaces

Objects Category	Big Technical Objects (Furniture) – Desk, Table
Standard examples of the following objects	

2.4.1 Study Cases related to product-to-product relation approach

Focusing on the selection of examples around the domestic environment and common technical objects visible in it, the collection of projects was divided into “standardized” small and big objects. In particular, the examples that will be shown in the small object category, are *Fig.12–Fig.14*, and in the big object category are *Fig.15–Fig.17*.

A. Small Technical Objects



[Fig.12] Wireless charging island by the startup Mobileisland
| versatile lego type of tray made up of a series of wireless chargers, and a range of electric accessories. |



[Fig. 13] Dream Tools by Eugeni Quitllet
| clear organizer that uses object's shape to achieve an organic and unique organize system |



[Fig.14] Ball Lamp by Joe Fentress

| lamp that address the problem of using too much the phone by using the weight and the shape of the phone to turn on the light |

B. Big Technical Objects



[Fig.15] Scrittoio Orix office desk by Vittorio Parigi and Nania Prin

| desk that uses the shape of office objects to create a differentiated work environment |



[Fig.16] The SNOOZE by Subin Cho

| side table with a wireless and organization space prepared for the contemporary needs |



[Fig.17] Paper Table by Matt Gagnon

| side table made of paper, with a negative space inside of the table structure to achieve transcends function and organization |

2.4.2 The Advantages of using Product-to-Product Relation Approach

Conceptual ideas that also take into account the physical relation and physical properties of objects show to help understand the creation of different interactions between the user, multiple objects, and their experiences to respond to specific needs. In addition to creating new spatial relationships between objects and users, the following projects demonstrated other advantages associated with using the relation between products to create functional designs.

- **Optimized forms to create different interactions.**

The Ball Lamp by Joe Fentress^⑩ exemplifies the internal and external organic structure of a lamp designed to take into account the shape of a circular object. This lamp designed around the features of a small ball allows this object to enter through the top of the lamp and end on the opposite side to turn it on or off. Its optimized form around the circular object makes the action of turning on and off the lamp more interactive and different from what the user is normally used to (*Fig.14*).

- **Enhanced functionality in the products.**

The project Wireless charging island by the startup Mobileisland offers additional advantages.^⑪ With the implementation of a wireless-physical relation, while considering the physical attributes of surrounding objects, the designer was able to create differentiated interconnected pieces of the organization to achieve a smarter and multi-functional organizational island for the space-office (*Fig.12*). This can also be observed in the SNOOZE side table^⑫, where the same type relation was adopted, along with the same consideration, resulting in a table with more functionalities to be enjoyed by the user (*Fig.16*).

^⑩ “Ball Lamp”.

^⑪ “Mobile Island – Modular Wireless Charger”.

^⑫ “Snooze”.

- **Increased value for the products with interactive experiences.**

As mentioned previously, Balance Lamp by Studio Yuue is a great example of a project that explores the notion of putting a higher value on a common product, like a lamp, in an experimental manner (*Fig.6*). Influenced by the balance scale, the lamp goes down when it is off and turns on when the user inserts his smartphone into the lamp's structure. By including the weight and the shape of the phone, the lamp became more than just a lamp and get more value by becoming more interactive with the use of the smartphone as the key to lighting up the lamp.

- **Organized implementation of objects in user life**

The advantage of careful implementation of objects in our life can be seen in the clear organizer from the collection Dream Tools by the designer Eugeni Quitllet.^①

This project uses the physical property shape of common office items to design an organizer with defined spaces and shapes in its structure resembling silhouettes of selected writing objects. This means that the organizer's structure is a precise and strict organizational system that allows only objects with specific silhouettes into its organizational space. Hence, if the user incorporates a different object in a place that was not defined for the organizer to embrace, it won't fit properly (*Fig.13*). The shape of a pencil, for example, is similar to the shape of a stick, so they may occupy the same space in this organizer. However other objects with different shapes, might not follow this principle.

The same advantage can be seen in the project Paper Table by Matt Gagnon,^② where through the use of reading objects' shapes it was created an organizational system using defined spaces and shapes resembling the negative space of books (*Fig.17*).

^① "Dream Tools".

^② "Tables".

- Differentiated solutions.

Scrittoio Orix office desk by Vittorio Parigi and Nania Prin is a unique desk that demonstrates an additional advantage. In contrast to the usual simple linear desk, the Scrittoio Orix office desk relies on the shape of the office objects to provide a distinctive organizational system.²¹ Different partitions were molded specifically for the objects on the desk in order to organize and embrace them. With its unique shape, this desk presents a differentiated structure based on the consideration of the physical relationship between the common office objects and the desk (*Fig.15*).

²¹ “Vittorio Parigi and Nania Prin ‘Scrittoio Orix’ office set”.

2.5 Product-to-Product Relation & the User

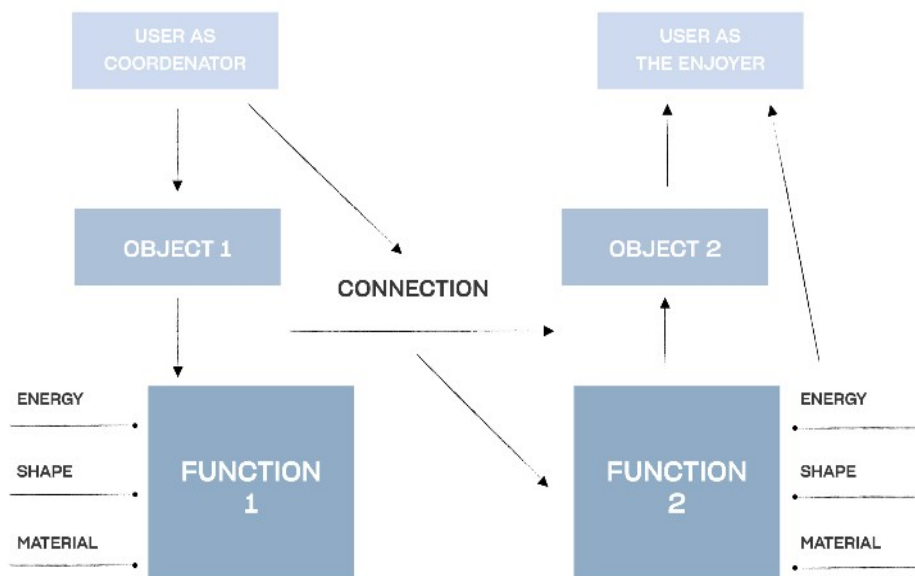
As demonstrated before, in the product-to-product relation concept, there is an equal value between the user and objects to achieve more appropriate solutions for the domestic space. However, since this research emphasizes the object, its physical properties, and its physical relations, it is necessary to clarify the position of the user in this type of approach.

To explain the user's position within the product-to-product relation concept, the project Balance Lamp, designed by Studio YUUE (*Fig.6*), and the Wireless charging island project by the startup Mobileisland (*Fig.12*) are used as a reference.

Balance Lamp, as explained before, uses a smartphone's weight and shape to incorporate smartphone addiction into living spaces. This project emphasizes the connection between products, as the user turns the lamp on and off using an object rather than the hand. Therefore, the smartphone is the “star” of the project in this case; however, without the user, the smartphone would never be in contact with the lamp, and consequently, the lamp would never work.

We can verify the same situation by looking at the Wireless charging island project by the startup Mobileisland, where the user is in charge of connecting the objects and enjoying the results. As previously mentioned, the Wireless charging island is a lego type of tray composed of a series of wireless chargers, and a range of electric accessories, that gives the user the freedom to create or not a connection between the objects. If for some reason, the user does not allow the objects to connect, the modular island will not show its functionality.

Hence, the product-to-product relation cannot be built without a user being alongside the objects, the key element capable of coordinating the formation of physical relations between objects. However, at another level, the user also has the position of the enjoyer, who has the freedom to decide whether to benefit from the solutions derived from the physical connection between objects (*Fig.18*).



[Fig.18] User position in the product-to-product relation approach

Chapter 3. Design Projects

3.1 Contextualization

This part introduces the beginning of this research's experimental phase. To develop the project, desk, table and shelf were selected, the most common and sought-after furniture pieces in the domestic environment.

These pieces were selected through an online research that identified the most sought-after pieces of furniture on the internet.^②

This research applied the product-to-product relation concept as it relates to the selected pieces in different situations, using the physical relationship between objects and their shape and weights to create design solutions that respond to issues related to imbalanced relationships between users and their belongings within the domestic space.

The decision to use only shape and weight as the physical property to develop the design practices was highly influenced by the importance of both physical properties in the visual perception of the living environment and by its weak consideration in the design development stage.

The design practices will be divided into two development approaches located in the physical properties of technical objects. The first approach will be focused on the object's shape, and the second approach focused on the object's weight.

In the end, preliminary conclusions around the two first design practices will be collected and the final projects will be developed around the product-to-product relation concept.

^② "What Is the Most Popular Furniture? According to Pinterest, The Top Trends".

3.2 First Dissertation Projects: Overview

In the first dissertation projects is introduced the first experimental phase of the ongoing research. The developing projects will be focused on the shape of the objects selected through the initial research, as an approach method to develop the final designs.

Due to their large dimensions, the following designs will be shown as usable products, where the concepts are analyzed and explained with sketches, technical drawings, and renders, however without the produced real models.

The following projects in this chapter are:

3.2.1 Desk I

3.2.2 Table I

3.2.3 Shelf I

DESK I

DESK I

(embrace)

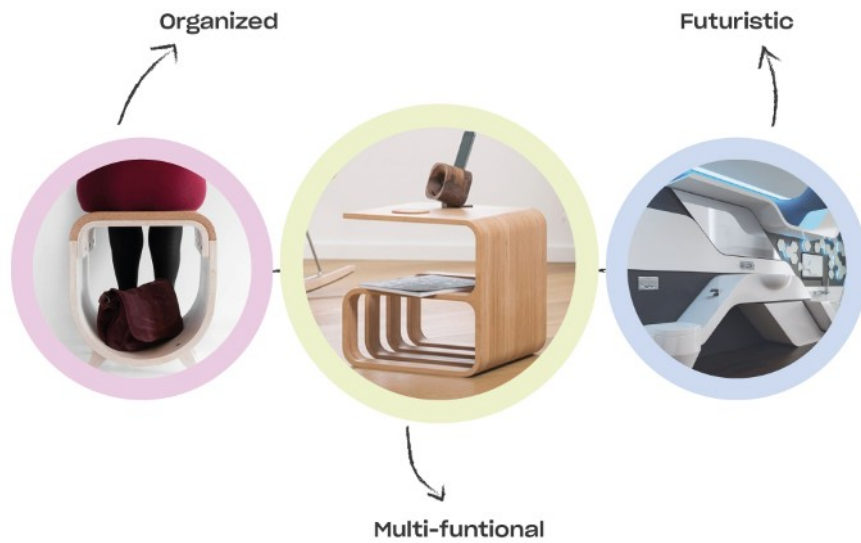
DESK I

DESK I

[Fig.19] Introduction content to the Desk I project

3.2.1 Desk I

Concept



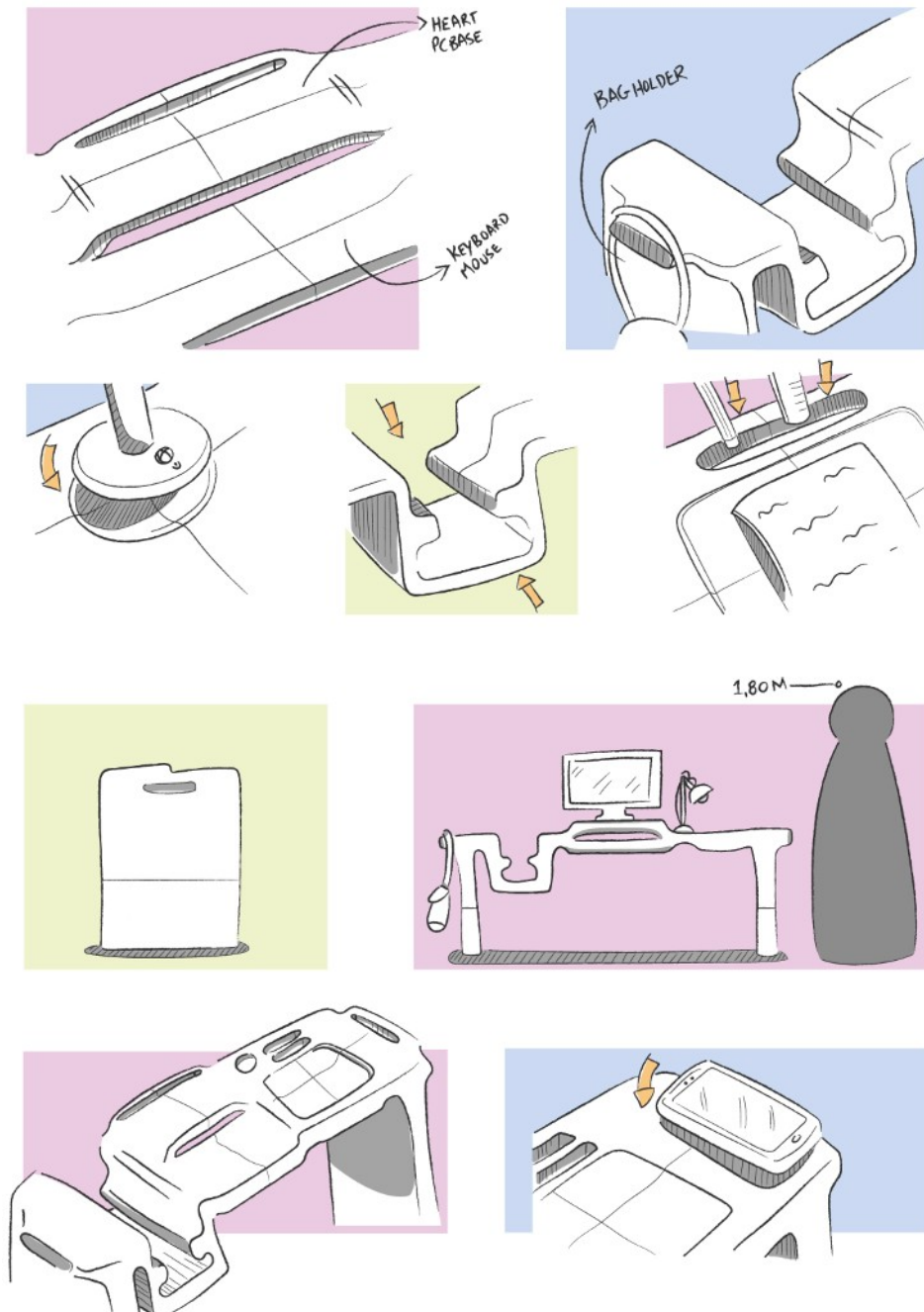
[Fig.20] Desk I Concept

Moodboard



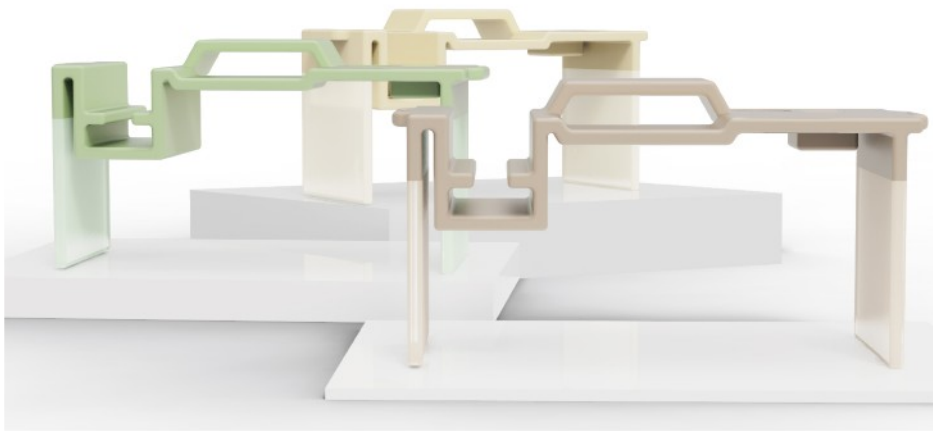
[Fig.21] Desk I Moodboard

Sketches



[Fig.22] Desk I Sketches

Renders



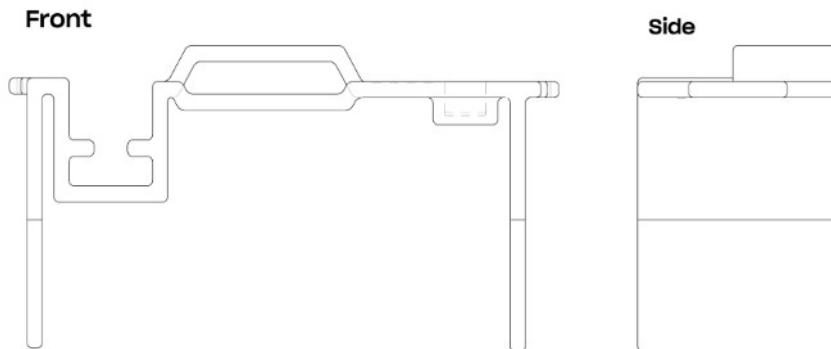
[Fig.23] Desk I Renders

Product Description

The Desk I is an object-oriented desk designed to help users organize their work environments more intuitively, with levels and outlines around specific objects. Its design concept follows the necessity of a functional organized space between the user's contemporary lifestyle and his belongings present in these types of environments.

As the desk being considers one of the most disorganized areas, and the most difficult to organize, this project aims to create a unique desk with specific spaces for each possible object that the user may have or let interact with the desk, using the 1st approach outlined in the product-to-product relation approach (shape). Therefore in this project, with the proposal to explore 1st approach of the product-to-product concept, the Desk I explores in its form the idea of developing a desk that embraces not only the user but, as well the shape of the technical objects commonly seen in it, with the purpose to improve the user's working life at home (Fig.24).

From a technical point of view, the desk is made of 3mm thermo-plastic, which combines clear and solid aspects in it, providing a lighter image but stable structure. Available in 3 different colors, (green, brown, and cream) allows the framing of this piece of furniture in different types of tastes and styles of domestic spaces.



[Fig.24] Desk I front and side view

Product-to-product relation Analysis

Understanding that the product-to-product relation concept takes into consideration not only the user's needs but also the technical objects and their characteristics for the development process, is possible to analyze the previous project and compare such with the advantages and fundamentals of this concept, as not only a process to understand the position of the product-to-product relation concept in this project, but also a way to analyze and demonstrate the application of previous mentioned characteristics and advantages of this concept.

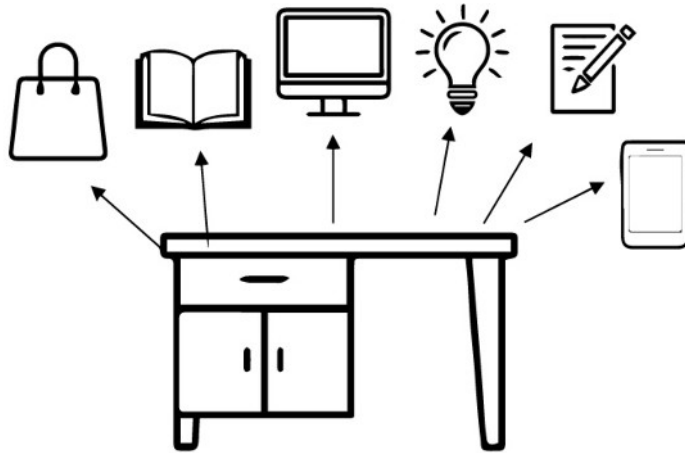
STANDARD GROUND: Piece of furniture with a flat or sloped surface and typically with drawers, at which one can read, write, or do other work. ^②

PROJECT CONCEPT: Object & user-oriented desk with an organic organization system to help users organize more intuitively their home offices.

TYPE OF RELATION: Physical Interaction

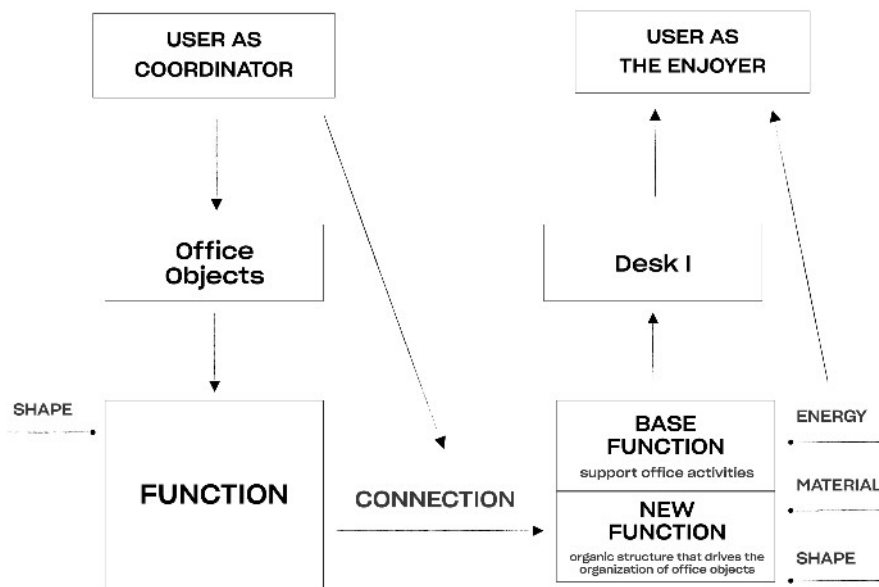
With regard to Desk I, the concept of product-to-product relation revealed the importance of taking into account the physical relationship between objects and their shapes in order to create a desk with special features that address the feeling of unproductiveness, distraction, and clutter in the home office. Physically connecting the desk to selected objects (*Fig.25*), not only helped it become capable of storing more precisely technical objects in a vertical perspective, but also, provide vertical balance, where is embraced the physical relation between the office space, technical objects, and the user.

^② Oxford Languages “*Desk*” Definition



[Fig.25] Selected objects used to create desk's form

In light of the advantages of applying the product-to-product relation in connection with the object's shape, it is possible to observe that physical relationships between objects and their physical properties led to a desk solution that emphasizes the value of the form of technical objects in their structure. Through the constant contact between objects and their shapes, Desk I facilitates the creation of a design system that integrates and drives the organization of office objects on the desk (*Fig.26*).



[Fig.26] Representative graphic of product-to-product relation concept in Desk II

TABLE I

TABLE I

(connect)

TABLE I

TABLE I

[Fig.27] Introduction content to the Table I project

3.2.2 Table I

Concept



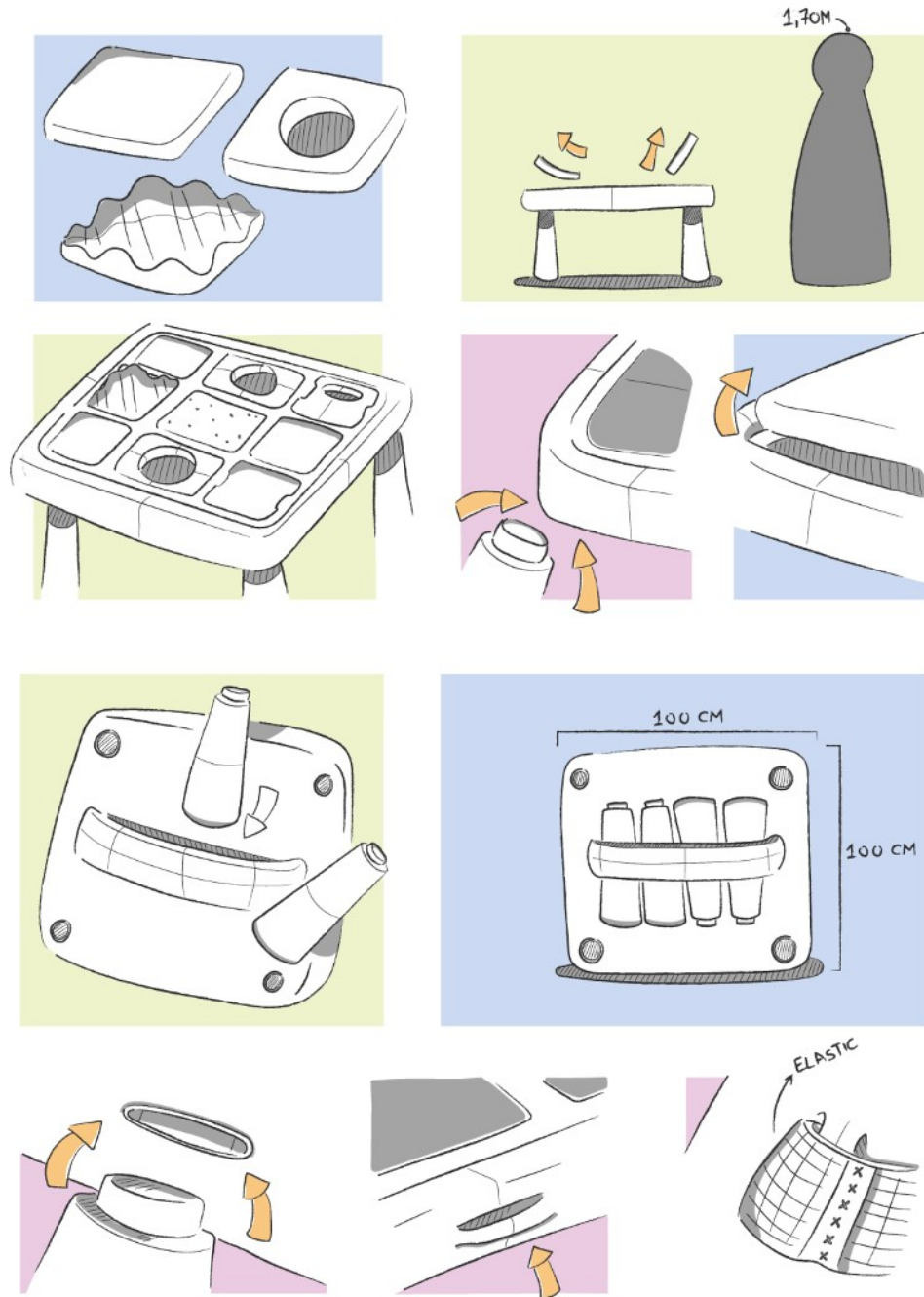
[Fig.28] Table I Concept

Moodboard



[Fig.29] Table I Moodboard

Sketches



[Fig.30] Table I Sketches

Renders



[Fig.31] Table I Renders

Product Description

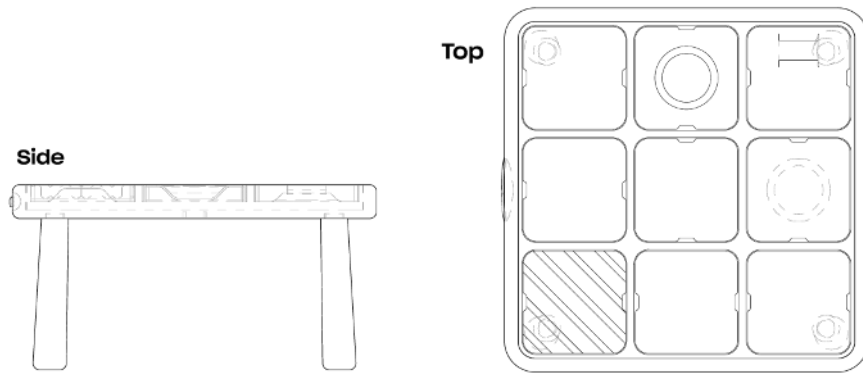
Table I is a furniture piece capable of adjusting to any domestic occasion or need. With several dividers using a puzzle style, this table is able to offer more versatility and more efficient organizational systems, compared to the ones that the market currently presents. This project concept arises around the need of contemporary society to have more than just the static table that easily gets disorganized with everyday products. So by applying the product-to-product relation approach, was possible to achieve an entertaining, unexpected, versatile, and portable table to be used anywhere.

Through the puzzle style used in this project, the product-to-product relation approach is visible through the use of the outline of technical objects, commonly seen interacting with this type of furniture.

This furniture piece provides a group of squared dividers with different shapes, such as the plate-shaped divider for placing users' favorite foods, or even the undulate divider for placing technology. Such a set of defined elements are capable to help the user keep the top area of the table organized for longer.

To use Table I in different types of spaces, this table has magnets on the feet that allow the user to easily remove and store the feet, using the tape under the table. So if the user needs a higher table, just grab the extra leg pieces and bring the table legs to the magnets located under the table.

The exterior body of the table is made of thermoplastic, and each divider is made of silicone to improve its grip with it and make it easier to maintain. This project offers four color variations (black, brown, green orange), and each element of it can be changed independently and personalized as the user desire.



[Fig. 32] Table I Top and Side view

Product-to-product relation Analysis

Considering that product-to-product relation takes into account not only the needs of the user but also the characteristics of the objects surrounding it, for the purpose of gaining an understanding of the concept's place in this project, the previously mentioned characteristics and advantages will be analyzed and demonstrated in this project.

STANDARD DEFINITION: Piece of furniture that provides a surface on which objects may be placed.²⁸

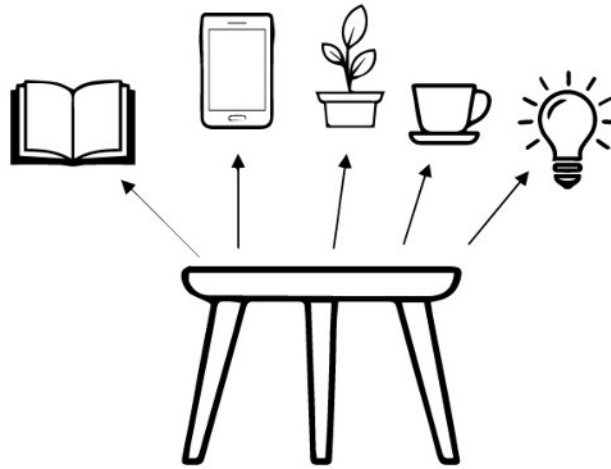
PROJECT CONCEPT: Versatile and fun table capable of adjusting to any domestic occasion or need.

TYPE OF RELATION: Physical Iteration

In this project, the table uses the product-to-product relation by observing the outline of the selected objects (*Fig.33*), along with their physical relationship with each other, in order to create a product that addresses

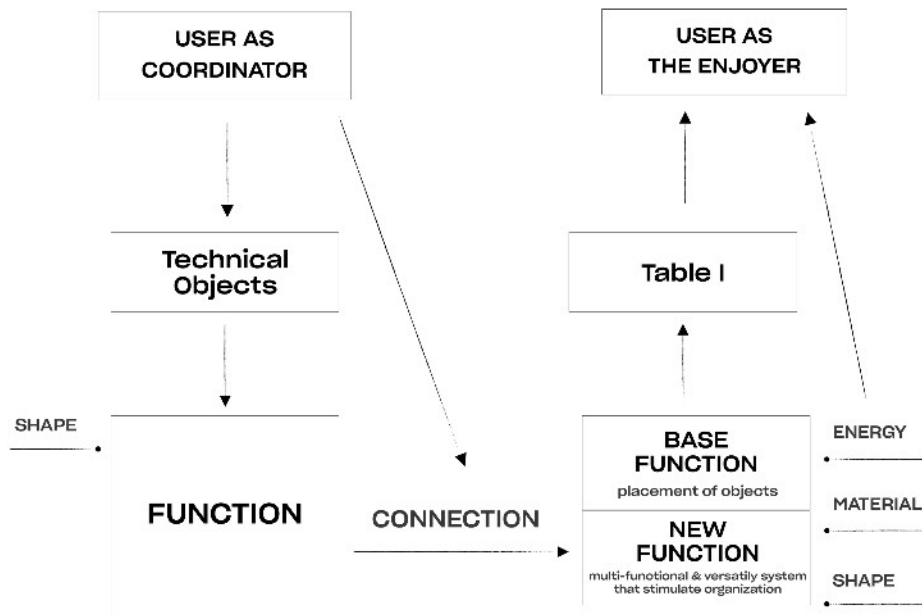
²⁸ Oxford Languages “Table” Definition

the lack of flexibility and stimulation necessary for the user to interact with each other belongings and spaces more significantly. Using the attributes of technical objects as a basis for the table's structure, its structure gained a new function with organic elements and independent functions, providing the user with a constant adaptation to their surroundings.



[Fig.33] Selected objects used to create table's form

Due to the relationship between objects and their physical properties, in this case, shape, a puzzle-style solution was created to ensure versatility and functionality for both users and technical objects. Unlike traditional flat tables, Table I recognizes the importance of interactive experiences for the home environment, each with its own organizational system, providing new possibilities for physical interaction between the table, users, and their belongings (*Fig.34*).



[Fig.34] Representative graphic of product-to-product relation concept in Table I

SHELF I

SHELF I

(integrate)

SHELF I

SHELF I

[Fig.35] Introduction content to the Shelf I project

3.2.3 Shelf I

Concept



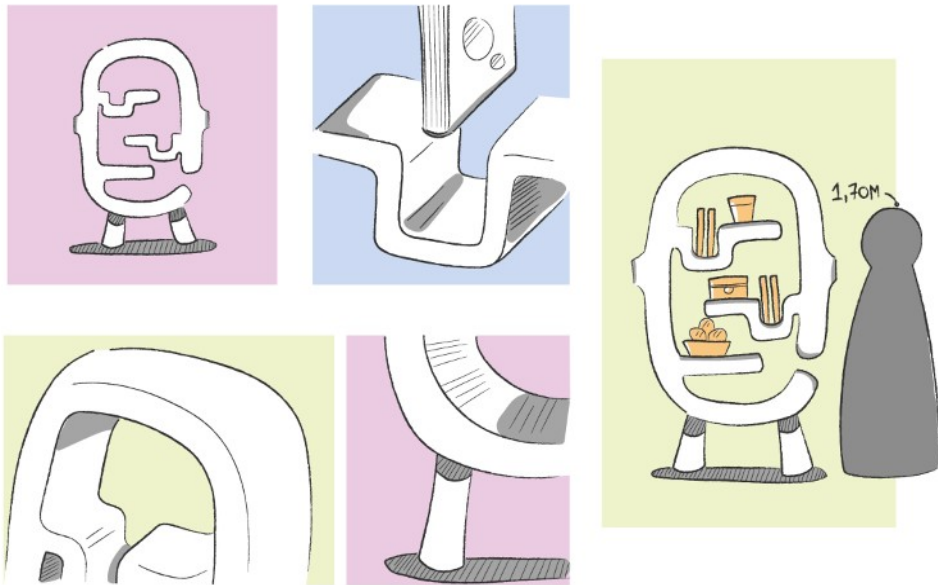
[Fig.36] Shelf I Concept

Moodboard



[Fig.37] Shelf I Moodboard

Sketches



[Fig.38] Shelf I Sketches

Renders





Fig.39] Shelf I Renders

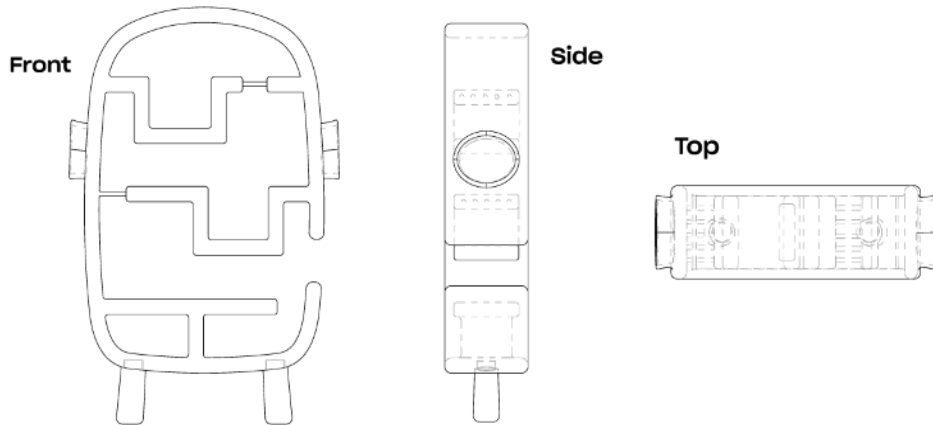
Product Description

Looking at the current shelving market, most of the structures available appear to be very straight and without any definition of spaces for certain objects. Being a shelf one of the furniture pieces widely used in domestic spaces, and an organizational piece that most connects with technical objects was evident the necessity to create a less monotonous solution with a new concept, that could better respond to the contemporary organizational user's needs in the domestic space.

With 1,80cm the Shelf I is a unique playful furniture piece that presents several partitions and spaces to embrace each daily-life technical object. The design concept focused on creating and promoting a new personalized and differentiated side of the shelving category works together with the product-to-product relation concept, where the objects commonly seen in this type of furniture and around it are taken into account in the development of the form.

Unlike other straight shelves on the market, Shelf I has multiple levels developed around the outline of technical objects common to this type of furniture, providing a more ludic and organized system with specialized spaces. On the sides are visible unique circular spaces that allows the user to store small technical objects, that usually end up getting lost (eg. Keys). In addition, the shelf has a lower Lego fixing system that makes it easy for the user to attach the upper part of the piece of furniture to the legs (*Fig.40*).

Like the other proposals, the Shelf I has 3 versions of warm colors that are capable of integrating any type of space style. This shelf is made of clear thermoplastic material with fun notes of different colors that make it even more unique.



[Fig.40] Shelf I Front, Side and Top view

Product-to-product relation Analysis

As the product-to-product relation concept takes into consideration not only the user's needs but also the objects and their characteristics around it for the development process, to understand the position of this concept in the project, it will be analyzed and demonstrated in this part of the design practices the characteristics and advantages previously mentioned.

STANDARD GROUND: Flat length of rigid material, attached to a wall or forming part of a piece of furniture, that provides a surface for the storage or display of objects.[Ⓢ]

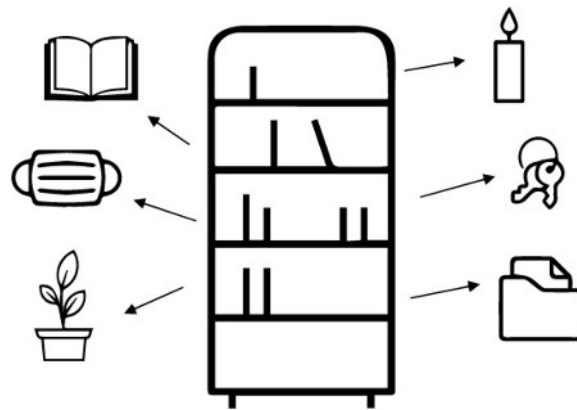
PROJECT CONCEPT: Peculiar furniture piece promoting a new personalized and differentiated side of the shelving category.

TYPE OF RELATION: Physical Interaction

Applying the concept of product-to-product relation on Shelf I, a differentiated shelf was created, with a linear organization system that allows

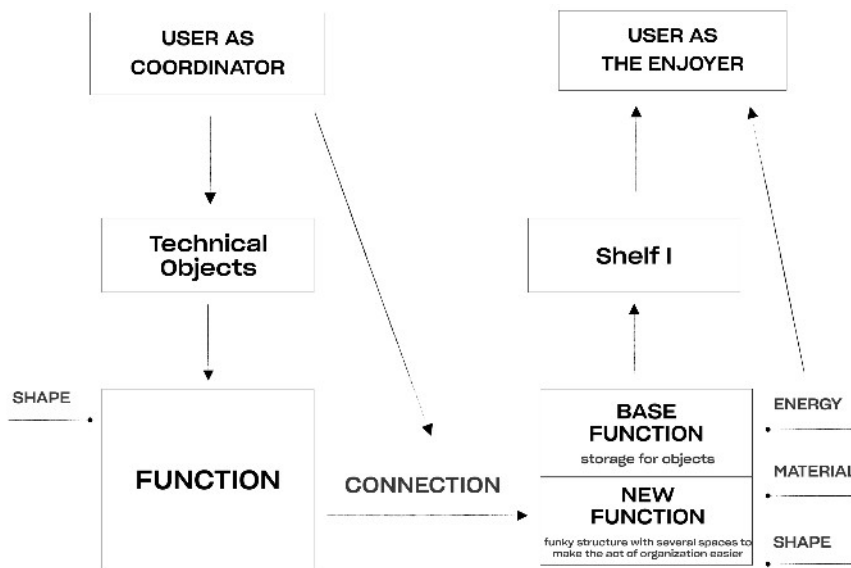
[Ⓢ] Oxford Languages "*Shelf*" Definition

the user to enjoy not only a functional piece of furniture but a unique shelf with regard to the shape of the selected objects (*Fig.41*).



[Fig.41] Selected objects used to create shelf's form

The use of object shapes in this project provided an organized system with upper and lower levels that embrace and require a physical relationship of objects to achieve a cleaner space. With the ability to change the way users typically accommodate technical objects, this piece can lead to a more personal and enriching interaction within the domestic space (*Fig.42*).



[Fig.42] Representative graphic of product-to-product relation concept in Shelf I

Considering the relationship between objects and their form of physical property, it is possible to observe that this relationship led to creating a solution with a unique structure that supplied the lack of flexibility that such furniture demonstrates around users and the shapes of their technical objects. With additional functionality through its unique system of organization, it offers new possibilities for physical interaction between the shelf, the user, and the objects normally seen in contact with this piece of furniture.

3.3 Second Dissertation Projects: Overview

In the second dissertation projects is introduced the second experimental phase of the ongoing research. The developing projects will be focused on the second approach of this thesis, the weight of the objects selected through the initial research, as a method to develop the final designs.

The following designs will be shown as usable products, where the concepts are analyzed and explained with sketches, complementary drawings, and renders, where some of them had their prototypes produced.

The following projects in this chapter are:

3.3.1 Desk II

3.3.2 Table II

3.3.3 Shelf II

DESK II

DESK II

(balance)

DESK II

DESK II

[Fig.43] Introduction content to the Desk II project

3.3.1 Desk II

Concept



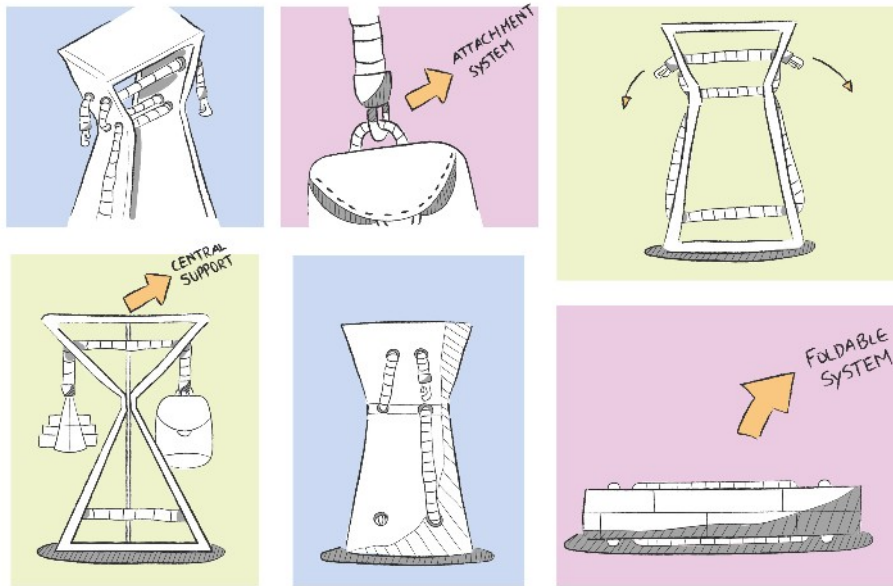
[Fig.44] Desk II Concept

Moodboard



[Fig.45] Desk II Moodboard

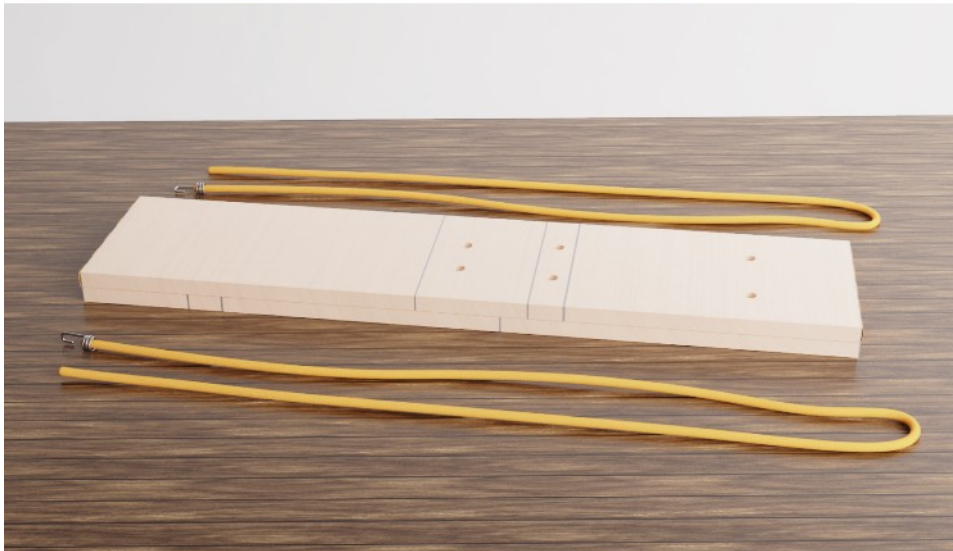
Sketches



[Fig.46] Desk II Sketches

Renders





[Fig.47] Desk II Renders

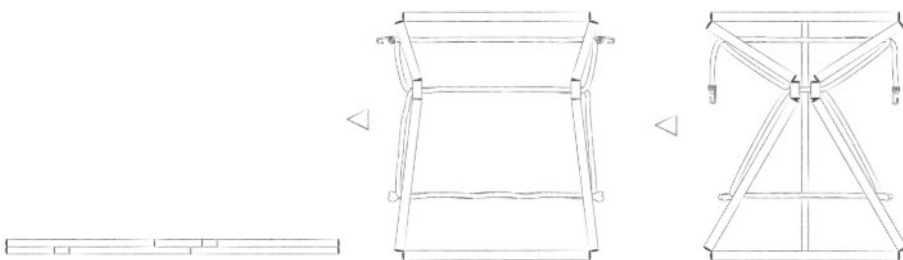
Product Description

The Desk II project idea started by understanding the spatial issues of living in small spaces. While houses are getting smaller with the population growth, human spatial needs remain the same or increased (United Nations, 2021). With the users surrounded by their belongings in such small spaces, it became important to develop organizational solutions that embrace the space capacity and consider the physical relation between users' belongings without occupying much space.

Therefore, due to the space restrictions, Desk II was designed as a foldable and portable furniture piece, made of light 30mm thick wood connected by an orange rope 15mm in diameter capable of being assembled easily and adjusting to smaller rooms (*Fig.48*).

To create systems that embrace objects without wasting too much space, hooks at the end of the rope system were built to incorporate the weight of objects such as books or bags, creating added stability in the desk and more defined spaces to organize each user's object inside of it.

In this case, the objects inside the furniture and attached to the hooks became more than material objects and transformed into constructive elements that help stabilize the structure of the desk with their weight and make it more functional.



[Fig.48] Desk II Foldable System

Prototype



[Fig.49] Desk II Prototype

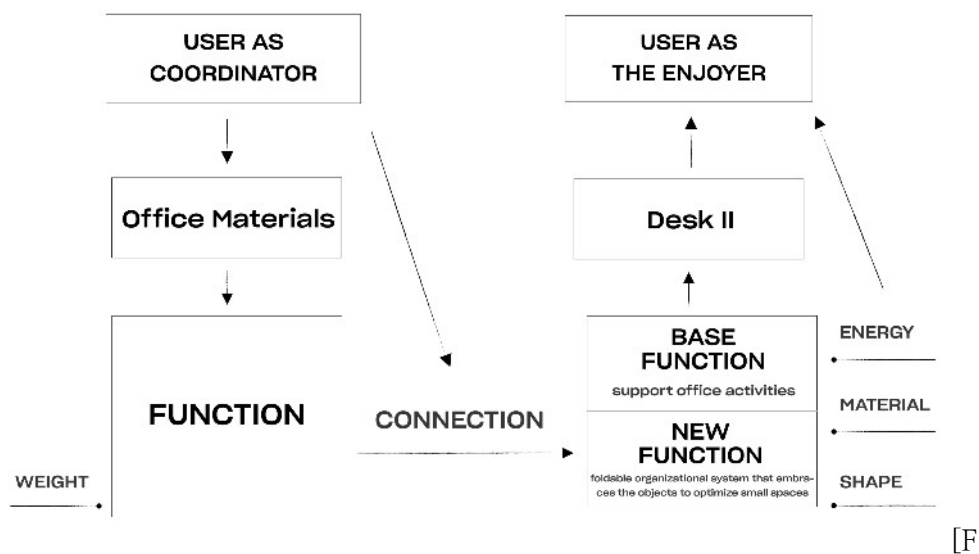
Product-to-product relation Analysis

As the product-to-product relation concept takes into consideration not only the user's needs but also the technical objects and their characteristics in the development process, to understand the position of the product-to-product relation concept in this project is possible to analyze and demonstrate with the Desk II project, the previously mentioned advantages and characteristics of this concept.

PROJECT CONCEPT: Foldable and portable desk, capable of adjusting to any domestic occasion or small space.

TYPE OF RELATION: Physical Iteration

Applying the concept of product-to-product relation to Desk II revealed that it is important to consider the physical relationship between objects and their weight to develop the new functions of the desk. This physical connection between the office objects and the desk structure not only creates the stability needed for the new unfolded function of the desk but also embraces the objects within it, creating a rope-based interior storage system that helps reduce the space possibly occupied by these objects (Fig.50).



[Fig.50] Representative graphic of product-to-product relation concept in Desk II

Bearing in mind the advantages of using the product-to-product relation with the objects' weight, it's possible to observe that the physical relationship between objects and their physical properties led to a differentiated solution with new functions that normally are not seen in the desk's market. Unique interactions between objects using their weights facilitated the creation of a design system that thoughtfully implements and organizes the objects on the desk and around the user's space.

TABLE II

TABLE II

(release)

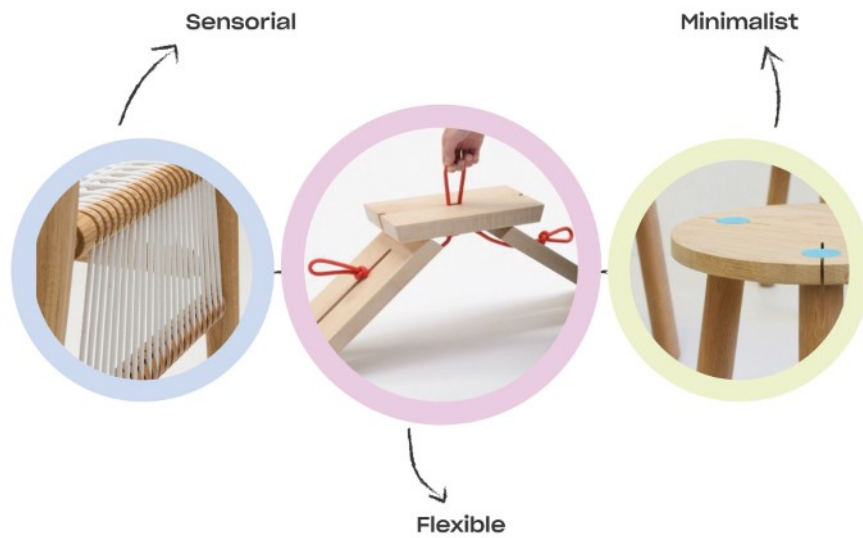
TABLE II

TABLE II

[Fig.51] Introduction content to the Table II project

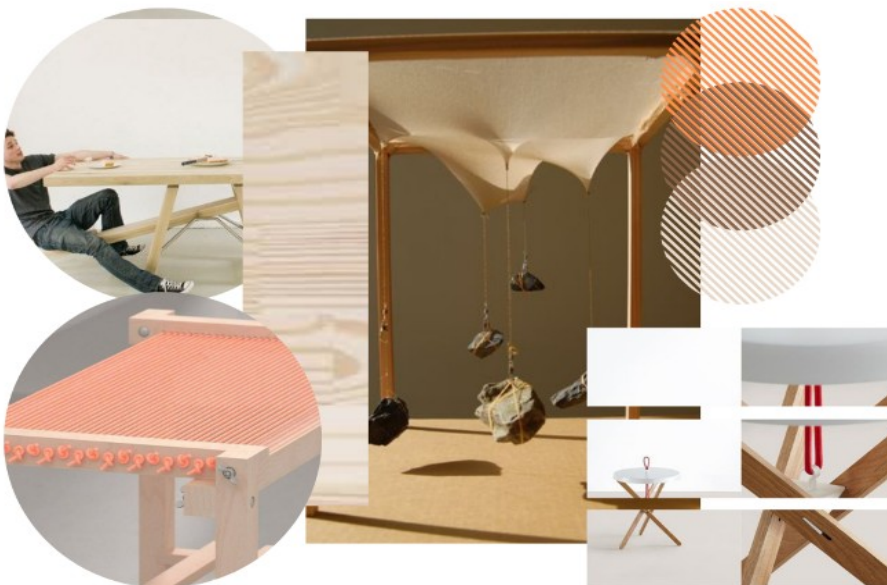
3.3.2 Table II

Concept



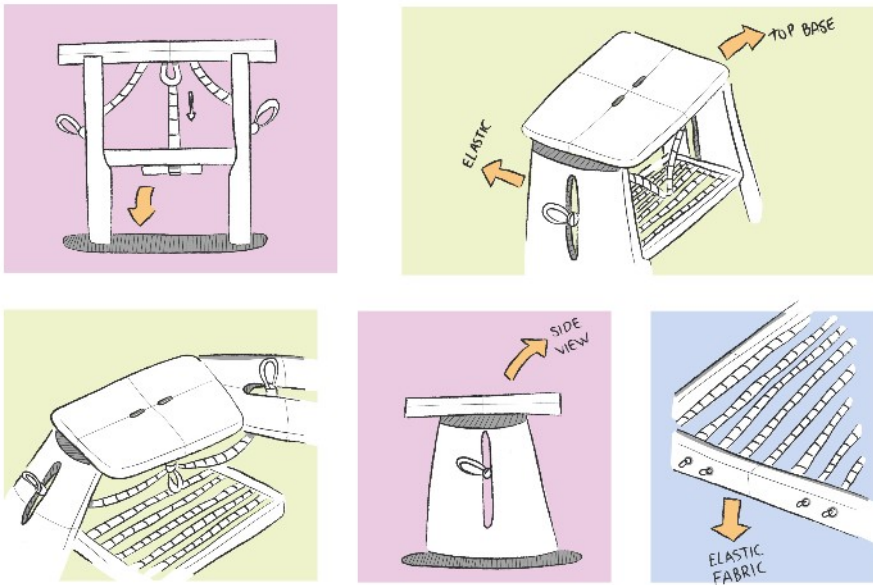
[Fig.52] Table II Concept

Moodboard



[Fig.53] Table II Moodboard

Sketches



[Fig.54] Table II Sketches

Renders





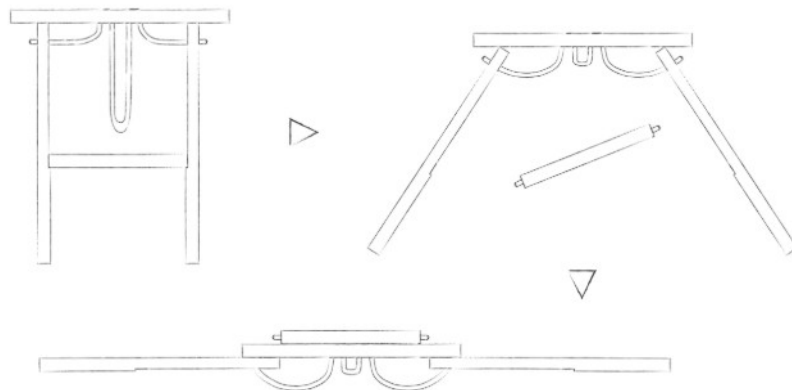
[Fig.55] Table II Renders

Product Description

Recognizing that technological objects are increasingly present in people's lives in the contemporary era, Table II was developed for those who are constantly on their mobile phones in their domestic spaces.

With a mounting system based on tension and forces of 10mm diameter strings, Table II encourages the user to use the mobile phone not as an entertainment element but as a construction element for this table. However, without these construction elements, the user cannot enjoy the usability of this piece (*Fig.56*).

The simple and wooden individual pieces can be taken to any type of domestic space, being easy to dismantle and assemble through the rope system and use of the mobile phone. If for some reason the user does not have the cell phone with him, he can always use another belonging of his that fits in the fixing space, located between the legs of the table.



[Fig.56] Table II disassembly system

Prototype



[Fig.57] Table II Prototype

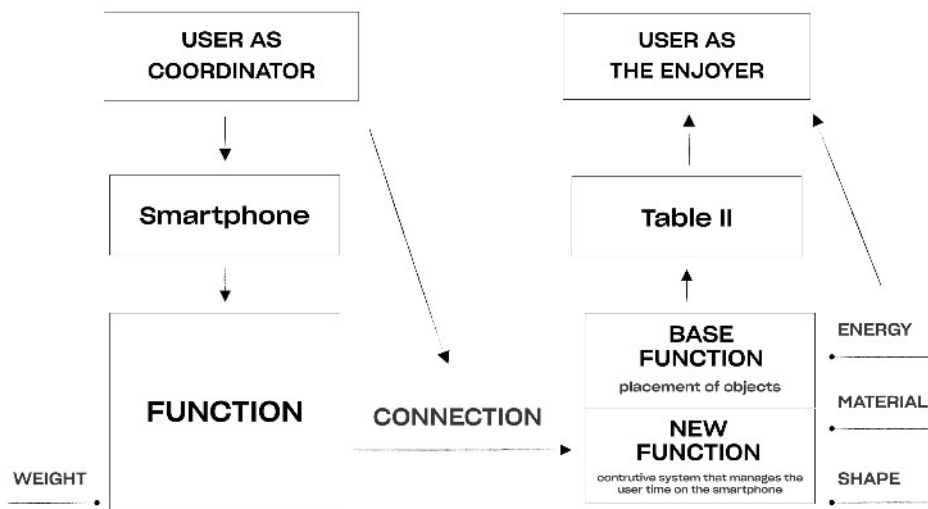
Product-to-product Relation Analysis

As the product-to-product relation concept takes into consideration not only the user's needs but also the objects and their characteristics around it, for the development process, to understand the position of this concept in this project is possible to analyze and demonstrate with the project Table II, the previously mentioned advantages and characteristics of this concept.

PROJECT CONCEPT: Simple and easy to assemble table that promotes the balance of the use of objects in the domestic space.

TYPE OF RELATION: Physical Interaction

Analyzing the product-to-product relation in this project, Table II uses the phone's weight and its physical relation with the table to create a solution that addresses phone addiction in the domestic space. By connecting the phone attributes to the table structure, its structure achieved a new function that embraces the phone as an integral part of the table's functionality while reducing the time users spend on their phones by incorporating it into its structure (Fig.58).



[Fig.58] Representative graphic of product-to-product relation concept in Table II

Considering the relationship between objects and their physical properties, in this case, weight, it was possible to create a solution with distinctive features that address the excessive use of technological objects (mobile phones) inside domestic spaces. Compared to other tables in the market, Table II, with its unique assembly system, provides new possibilities for physical interaction between the table, user, and phone, transforming the phone into an indispensable part of the assembly.

SHELF II

SHELF II

(move)

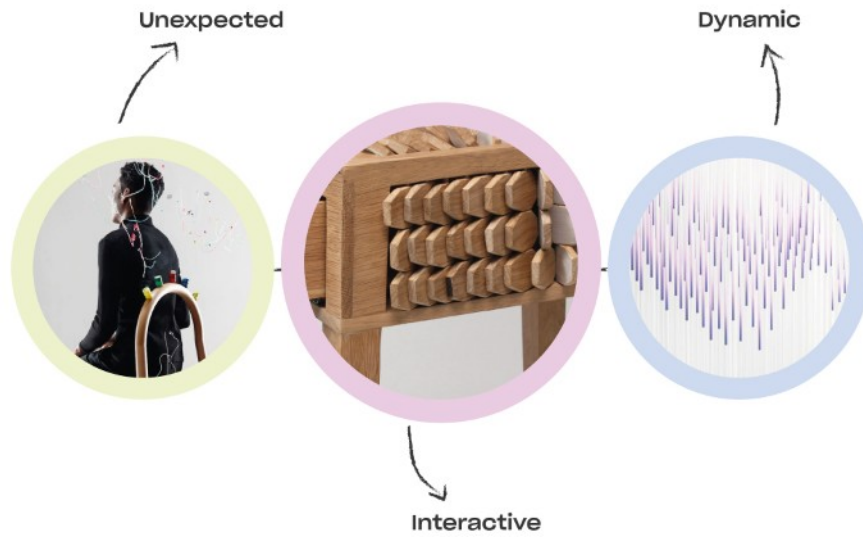
SHELF II

SHELF II

[Fig.59] Introduction content to the Shelf II project

3.3.3 Shelf II

Concept



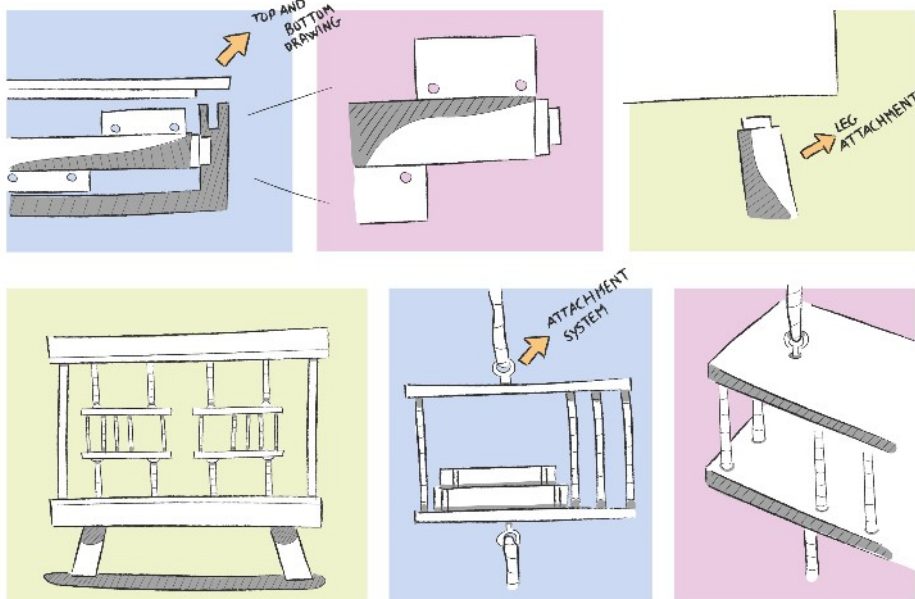
[Fig.60] Shelf II Concept

Moodboard



[Fig.61] Shelf II Moodboard

Sketches



[Fig.62] Shelf II Sketches

Renders





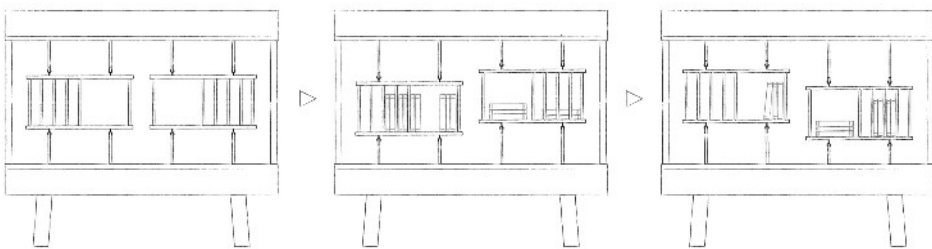
[Fig.63] Shelf II Render

Product Description

Understanding the necessity to create new experiences and fun environments for the happiness and comfort of the users in the domestic space, the Shelf II takes advantage of the weight of the technical objects, to create a dynamic and entertaining shelf piece. With a structure composed of ropes that moves up and down and are connected to a counterweight system, the user can be surprised by the unique relation that this piece and their belongings provide to the domestic space.

The Shelf II made mostly of light wood provides two long rectangular areas to place users' belongings. With the protection made of ropes that cover most of these rectangular spaces, the objects will not fall from the movement derived from their weight (*Fig.64*).

With the relationship between the weight of the technical object and the use of a counterweight system, it combines the dynamism of the movement of organizational spaces with the emotion associated with the unexpected, to provide a new experience in pieces of this category. With this, the shelf is no longer just a functional piece of furniture and becomes a performance piece to be appreciated in the domestic space.



[Fig.64] Shelf II movement provided by the counterweight system

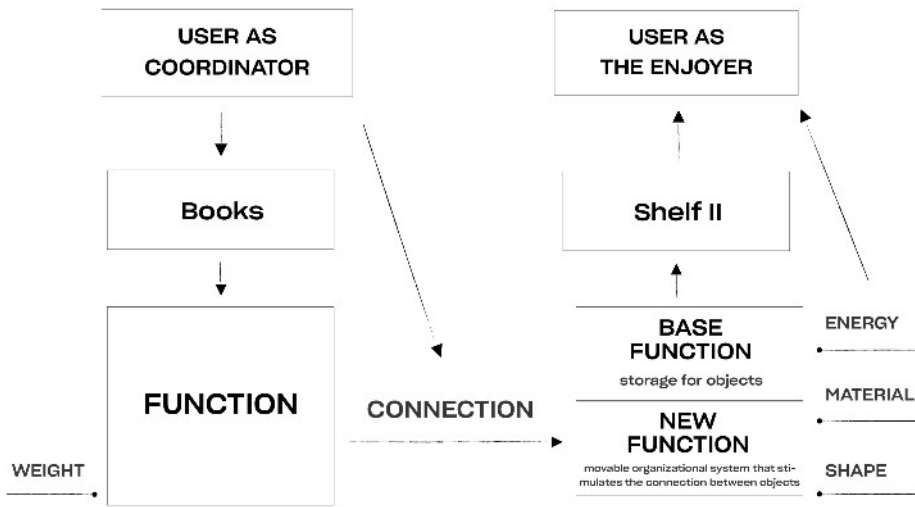
Product-to-product relation Analysis

As the product-to-product relation concept takes into consideration not only the user's needs but also the objects and their characteristics around it, for the development process, to understand the position of the product-to-product relation concept in this project is possible to analyze and demonstrate with the Shelf II project, the previously mentioned advantages and characteristics of this concept.

PROJECT CONCEPT: Dynamic and interactive shelf to bring an unexpected experience when organizing objects.

TYPE OF RELATION: Physical Interaction

Analyzing the product-to-product relationship in this project, Shelf II shows the importance of considering the weight of technical objects to achieve a solution that goes beyond the normal functionality of the shelf for placing objects in space. With the relationship between objects and their weight, this project addressed the need for greater engagement between furniture, objects, and their users, in order to overcome the feeling of laziness that is commonly felt in domestic spaces (*Fig.65*).



[Fig.65] Representative graphic of product-to-product relation concept in Shelf II

As a result of using the product-to-product relation with the weight of an object, it can be seen in Shelf II that the physical connection between the weights of the user's belongings has led to the development of a unique counterweight system, which creates both an interactive and stimulating experience by encouraging the user to contact technical objects. Shelf II, compared to other shelves on the market, offers new possibilities for physical interaction between the shelf, the user, and technical objects, by considering these objects as a constructive element to expand the normal experience associated with this category of furniture.

3.4 Preliminary Conclusions

With the purpose to explore the product-to-product relation concept in this research, two approaches connected to the characteristics of the objects were used as development tools in the design practice period. In both stages of the design practices, the solutions developed for the domestic space were focused on using, and understanding the potential of valuing the physical properties of technical objects in the design process.

For the first stage of the design practice, the object's physical property used as a development tool was the shape. Consequently, for the second stage of the design practice, in the same category of the object's characteristics, the weight was considered and used as a development tool. With the first two design practices, some conclusions were able to be gathered. Later in this research, such conclusions will be taken into account to help develop the final design practices around the product-to-product relation concept.

From the developed projects it was possible to understand that flexible and moldable materials were the materials that best fitted the production of solutions when applying the product-to-product relation approach. Such flexible and moldable materials can be thermoplastic, textile, or even elastic materials such as rope

Also discovered in the first stages of design practices, was the advantage of using a product-to-product relation approach to develop new and differentiated relations between technical objects and between users. Such advantage found can be added as another advantage of the usage of this approach in the design field.

Upon analyzing both approaches created in these design practices, some similarities emerged along with some differences. Both the objects' physical properties displayed in the first and second approaches presented a differential position with respect to the user, objects, and form development. The shape in the design practices has changed from playing only a visual role to showing a modeling role in the forms of the developed solu-

tions. On the other hand, the use of weight in the second approach developed a constructive character around the objects in the projects created, making these elements important elements for the creation of solutions and functionality.

As the objects' physical properties, like shape, created static solutions with interesting organizational systems, the use of the property weight created solutions with dynamic, moving, and unexpected actions.

These outputs will be considered in the elaboration of final projects that relate both the 1st and 2nd approaches to exploring the product-to-product relation concept.

3.5 Third Dissertation Projects: Overview

In the Third dissertation projects is introduced the final experimental phase of this research. The developing projects will be focused on both the first and second approaches of this thesis, the shape, and the weight of selected objects.

The following designs will be shown as usable products, where the concepts are analyzed and explained with sketches, complementary drawings, and renders, where some of them had their prototypes produced.

The following projects in this chapter are:

- 3.5.1 Desk III
- 3.5.2 Table III
- 3.5.3 Shelf III

DESK III

DESK III

(immerse)

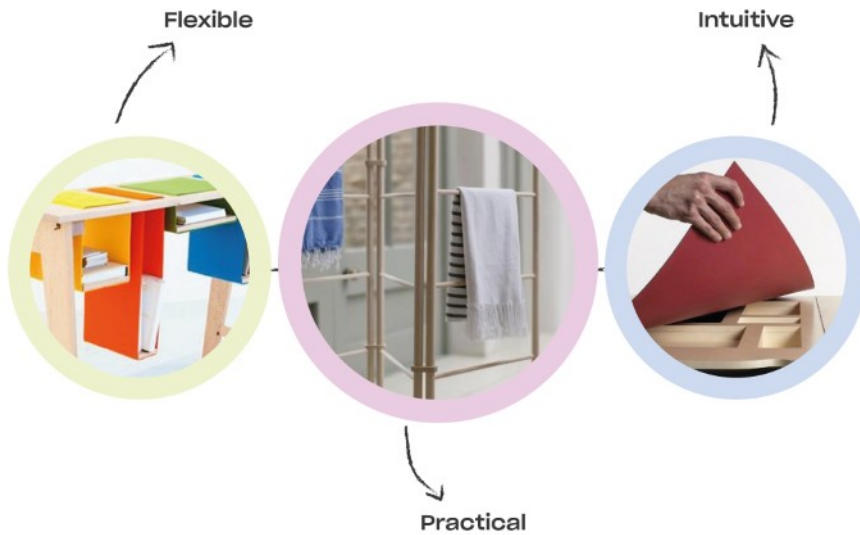
DESK III

DESK III

[Fig.66] Introduction content to the Desk III project

3.5.1 Desk III

Concept



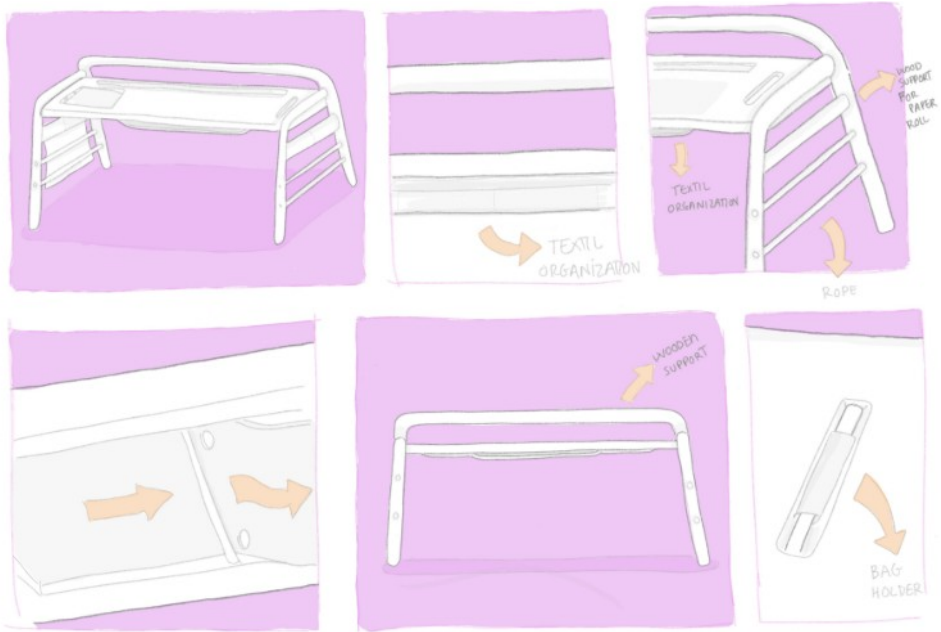
[Fig.67] Desk III Concept

Moodboard



[Fig.68] Desk III Moodboard

Sketches



[Fig.69] Desk III Sketches

Renders





[Fig.70] Desk III Renders

Product Description

Within the living space, the desk has become an essential piece of furniture that serves as a personal object space for reflection and concentration. However, due to the time and activities done in it, maintaining it clutter-free has become a great challenge.

Having in mind the problems that clutter can have for the user in an office environment (eg. distraction, low productivity, stress) the Desk III was designed as a piece of furniture that allows each user to arrange their space as they wish, without denying or hiding any necessary objects.

With the use of Desk I's different level surfaces and Desk II's concept of combining simple and flexible gestures to untangle constraints from the notion of organization, Desk III is designed with a balance of lines and curves (flat surface and flexible surface) that allows the user to organize the office objects in an easier and more accessible way, without clogging up space and minds. Therefore, by incorporating an immersive and emergent organizational system previously explored in Desk I with the shape and Desk II with the weight of objects, Desk III offers an intuitive way to illustrate the importance of the weight and shape of objects in bringing clutter-free functionality (*Fig. 71*).

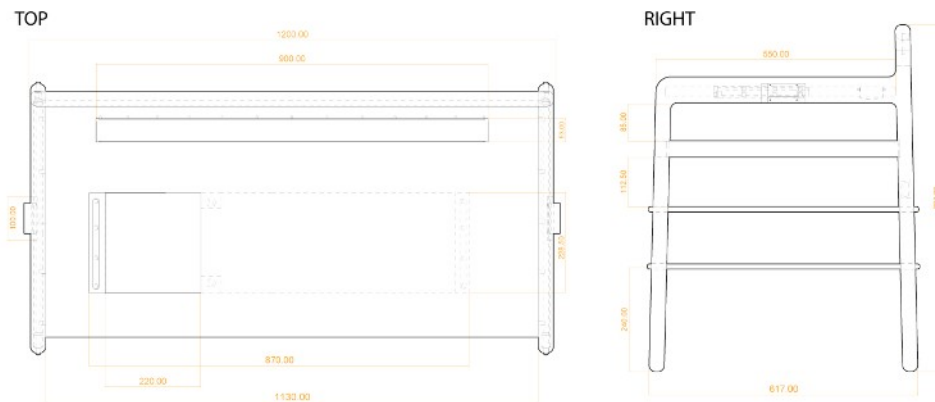


[Fig.71] Immerse system

From a technical point of view, the desk is made mainly of light wood and offers to the users the option of configuring two environments spaces with fabric stretched with the desk: one designed under the top, allowing to slide objects such as sketchbooks or mobile phone, and the other one

at the end of the desk top surface to organize and arrange tools and work.

On the sides to the feet of the desk, it is still possible to see a set of storage facilities to support drawing, reading, and even packing bags, which are in line with the ideas used in previous projects. The combination of light wood with hints of orange allows the framing of this piece of furniture in various styles of domestic spaces without being overwhelmed.



[Fig.72] Desk III Technical Drawing

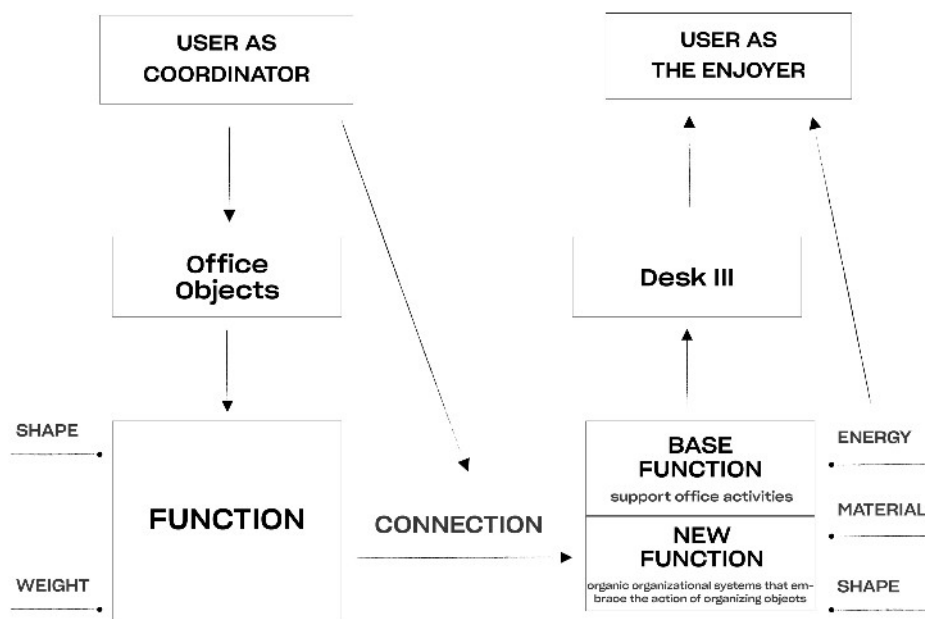
Product-to-product relation Analysis

In order to comprehend the position of the product-to-product relation concept in this project, it is possible to analyze and demonstrate the benefits and characteristics of the previously discussed concept by using the Desk III project, which takes into account not only the user's needs but also the objects and their characteristics around it.

PROJECT CONCEPT: Flexible Desk with an immerse/emerge organizational system to untangle the concept of constraint from the notion of organization.

TYPE OF RELATION: Physical Iteration

Analyzing the product-to-product relationship in this project, Desk III shows the importance of considering the shape and weight of technical objects to achieve a solution that goes beyond the normal functionality of the desk (support in work activities). Influenced by previous projects' physical relationship between objects and their physical properties, this project created a unique organization system with immerse and emerge actions to achieve a balanced oraganizational system within the home of-fice space (*Fig.73*).



[Fig.73] Representative graphic of product-to-product relation concept in Desk III

In this project, considering the advantages of using the product-to-product relation with the objects' shape and weight, it was possible to develop a solution with distinctive features that address clutter problems inside of the home office space. Due to its unique organizational system idea, Desk III provides new possibilities for physical interaction between desk, user, and phone, expanding the normal experience connected with this type of furniture.

TABLE III

TABLE III

(deform)

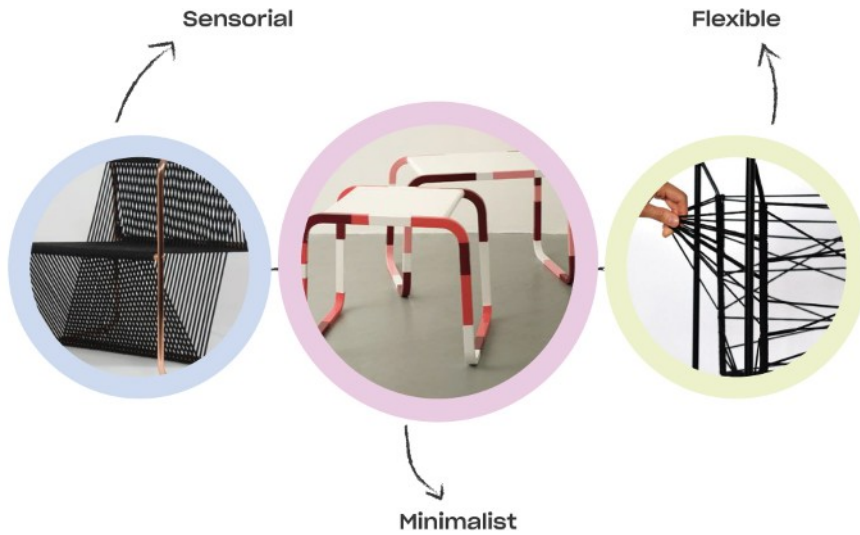
TABLE III

TABLE III

[Fig.74] Introduction content to the Table III project

3.5.2 Table III

Concept



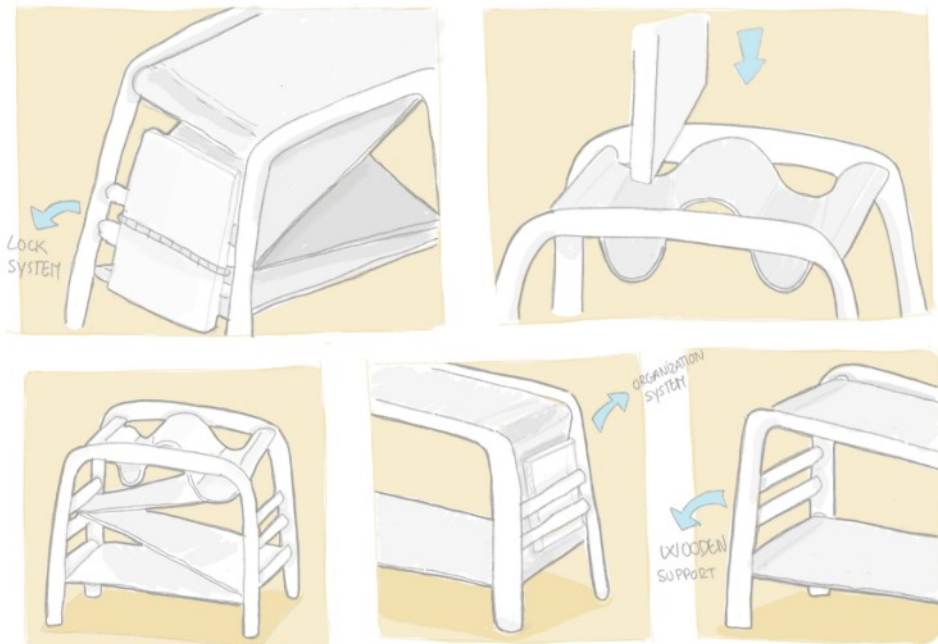
[Fig.75] Table III Concept

Moodboard



[Fig.76] Table III Moodboard

Sketches



[Fig.77] Table III Sketches

Renders





[Fig.78] Table III Renders

Product Description

Side tables in living rooms or bedrooms are often areas where all kinds of technical objects get piled, from late-night reading material, cups of water, glasses, mobile phone, and others. This type of tables show mainly designed with linear structures that don't follow the characteristics of objects and organizational needs. Therefore noticing this common problem with side tables, Table III was designed to promote the organized placement and engagement of technical objects characteristics through a flexible and versatile minimalist structure composed of unique materials (*Fig. 79*).



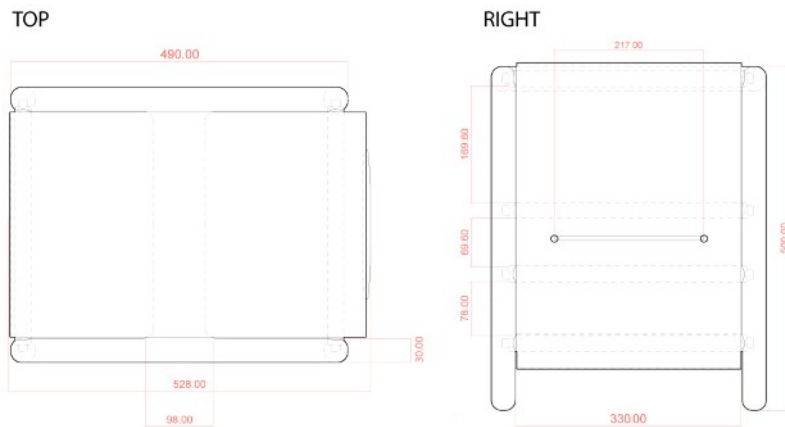
[Fig.79] Table III surface deformation

This light and airy table has a wooden organic structure that is supported by cylinders wrapped in fabric that function as transport bags. It is easy to assemble, disassemble, and move. Its flexible design made of wood with a natural finish has its fabric leather dyed yellow and the central elastic band in orange.

With the same versatile concept in form and function as the Table I, the use of elastic fabric surface is notched with the central elastic on the opposite side of the table frame, so that the fabric surface between the wooden frame can adjust and suit personal storage needs.

Based on the combination of the versatility of Table I and the object-dependent structure of Table II, this table can assume a group of configurations according to needs, as long as objects physically interact with each other. Therefore, such as Table II, the unique idea of this table allows users to play with different technical objects as key constructive elements

to create different organizational arrangements within the domestic space.

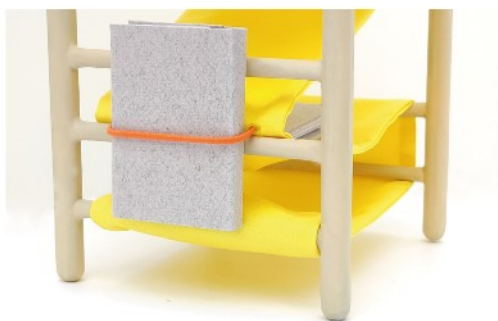


[Fig.80] Table III Technical Drawings

Prototype



[Fig.81] Table III Prototype Development



[Fig.82] Table III Prototype

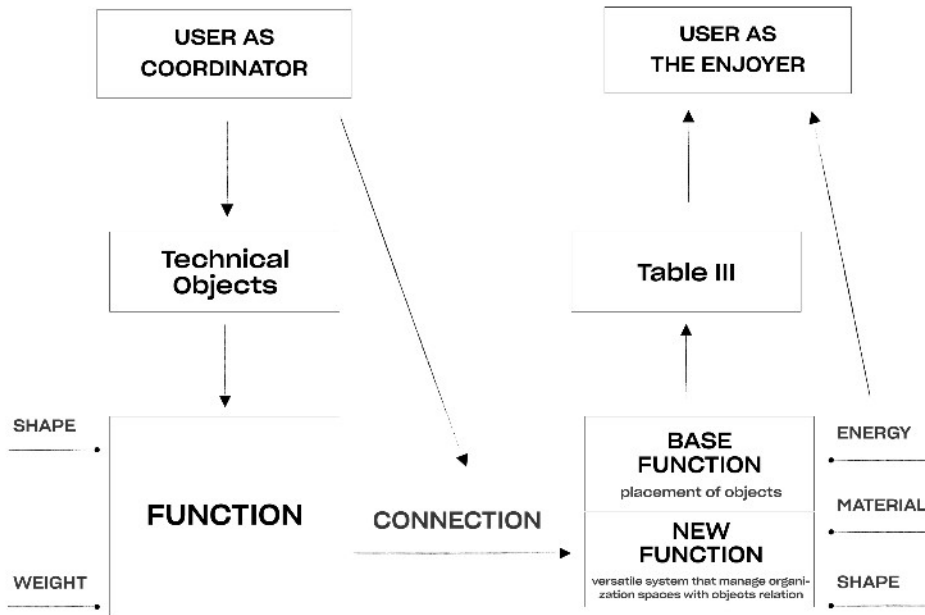
Product-to-product relation Analysis

In order to comprehend the position of the product-to-product relation concept in this project, it is possible to analyze and demonstrate the benefits and characteristics of the previously discussed concept by using the Table III project, which takes into account not only the user's needs but also the objects and their physical properties around it.

PROJECT CONCEPT: Versatile table that can adjust and suit personal storage needs in the domestic space.

TYPE OF RELATION: Physical Interaction

Using the concept of product-to-product relation in Table III reveals that it is important to consider the physical relationship between objects, their shape and their weight when designing new functions. This physical connection between the technical objects and the wooden table's structure not only creates the stability needed for the appearance of new forms but also demonstrates how can be adapted to personal storage needs (*Fig.83*).



[Fig.83] Representative graphic of product-to-product relation concept in Table III

Having in mind the advantages of using the product-to-product relation concept, it can be seen in Table III that the physical connection between the property weight and shape of technical objects has led to the development of a differentiated elastic system, that provides both interactive and sensory experiences that encourages the user to connect technical objects together. Compared to other tables on the market, the Table III offers flexible opportunities by considering these objects as constructive elements to expand the normal experiences associated with this category of furniture.

SHELF III

SHELF III

(create)

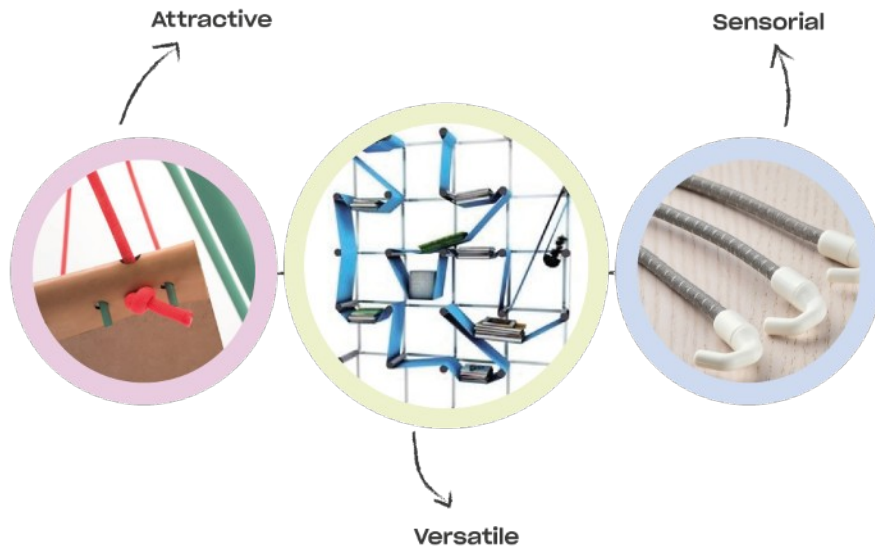
SHELF III

SHELF III

[Fig.84] Introduction content to the Shelf III project

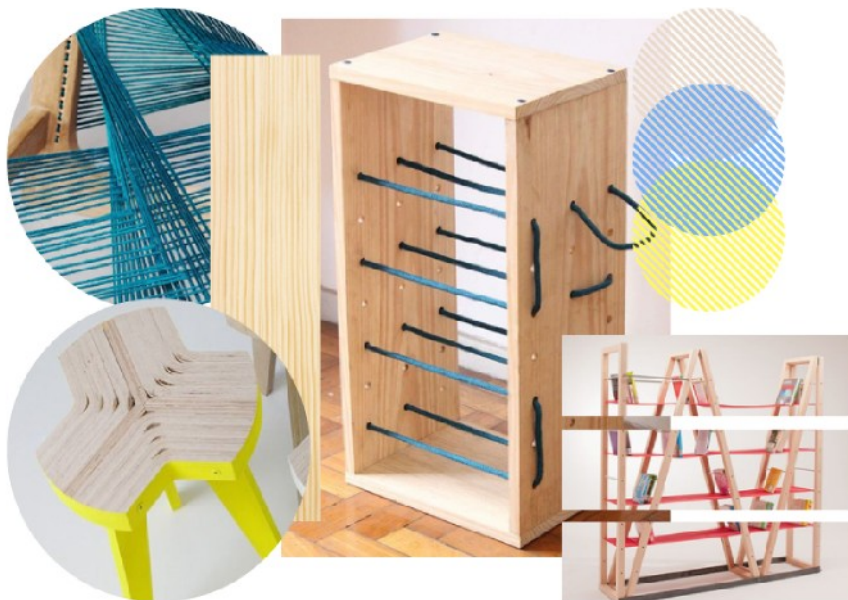
3.5.3 Shelf III

Concept



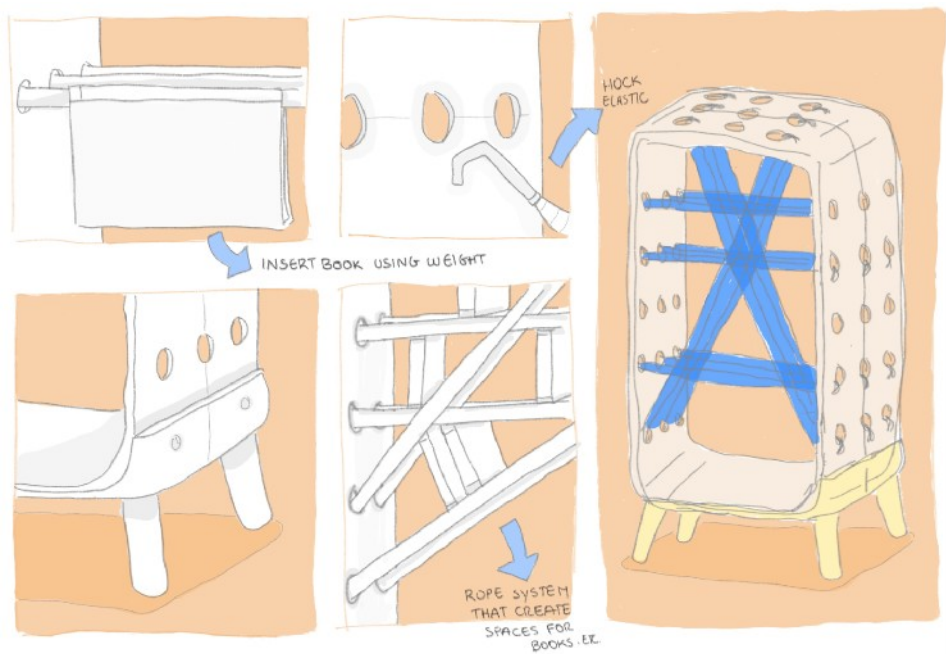
[Fig.85] Shelf III Concept

Moodboard



[Fig.86] Shelf III Moodboard

Sketches



[Fig.87] Shelf III Sketches

Renders





[Fig.88] Shelf III Renders

Product Description

In an accelerated era full of freedom of forms and changes creates new needs that invoke the versatility of objects.

Looking into the shelf options in the market, they have become linear and boring furniture piece that doesn't invoke any personal engagement between objects, itself, and users. Understanding the clutter problem associated with the laziness and lack of stimulation that this furniture piece places on the user, Shelf III was created to address this problem using the shape and weight of technical objects.

Taking into account how the shape of objects was used to create specific dividers in Shelf I and the weight of objects used to achieve dynamic interactions in Shelf II, Shelf III has been designed to be an attractive, flexible shelf with dynamic thread tension that can be adjusted to fit the needs of users and the shapes of their belongings. This project was thought to encourage the usage and organization of this type of furniture by increasing the experience/engagement between it and the user in the domestic space. Without a defined state and its sensory experience, Shelf III is capable of interacting easier with the user and her environment.

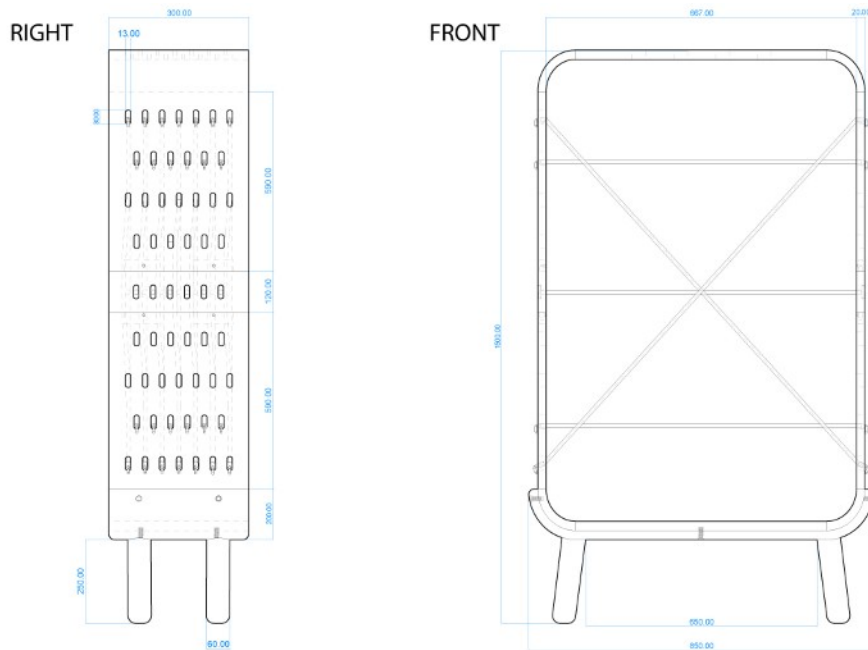
The Shelf III structure is composed mainly of light wood with holes throughout its systematic surface and versatile bookshelf divisions made of elastic textiles for external and internal personalization. This shelf can be mounted in as many different ways as the user imagines and need if there is a physical relationship between objects (*Fig.89*).



[Fig.89] Some of the possible structures on Shelf III

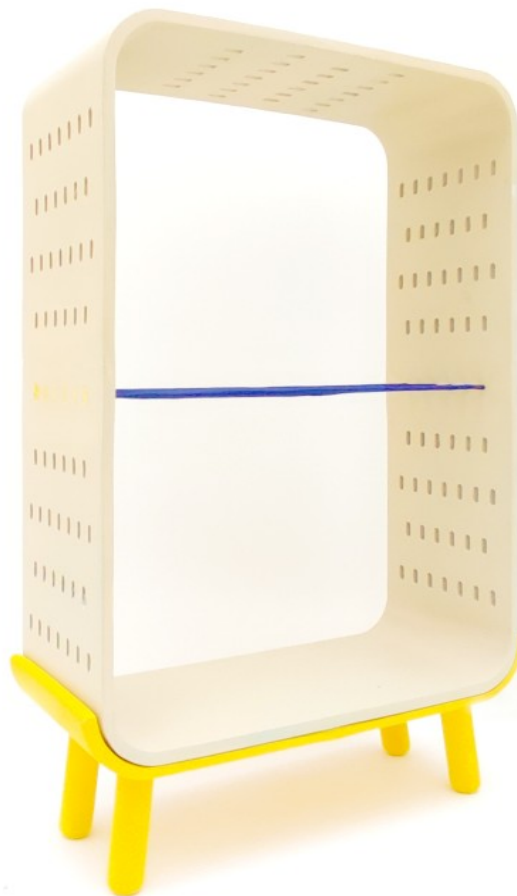
Its yellowish base, in addition to the aesthetic functionality, also supports the general structure of the Shelf and constant structural changes. Taking advantage of the dynamism of shape and deformation of previous projects, this piece considers the shape and weight of objects through blue elastics of 4 different sizes, where their placement along the body of the shelf provides a stable internal and external balance between the structure of the shelf and objects.

The combination of primary colors (blue of the elastics and yellow of the base) does not let the shelf go unnoticed, it becomes, even without a defined state, more than a piece of furniture, it becomes a type of installation in a constantly changing environment.

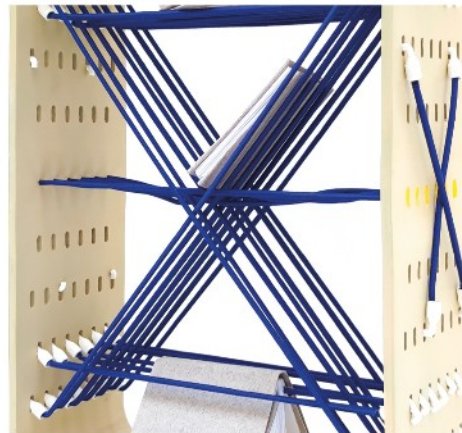
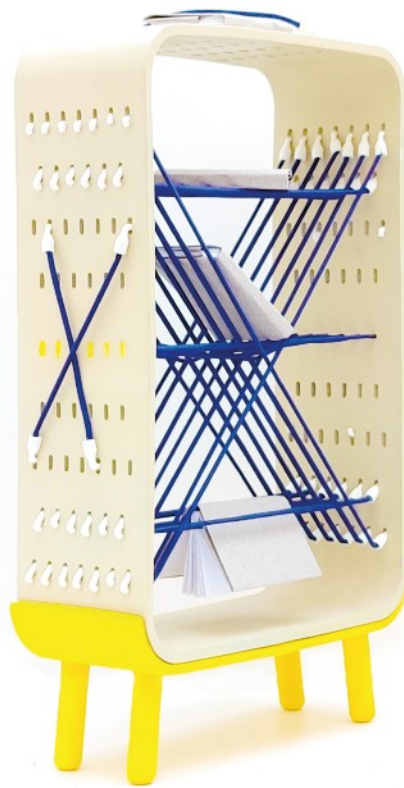


[Fig.90] Shelf III Technical Drawings

Prototype



[Fig.91] Shelf III Prototype Development



[Fig.92] Shelf III Prototype

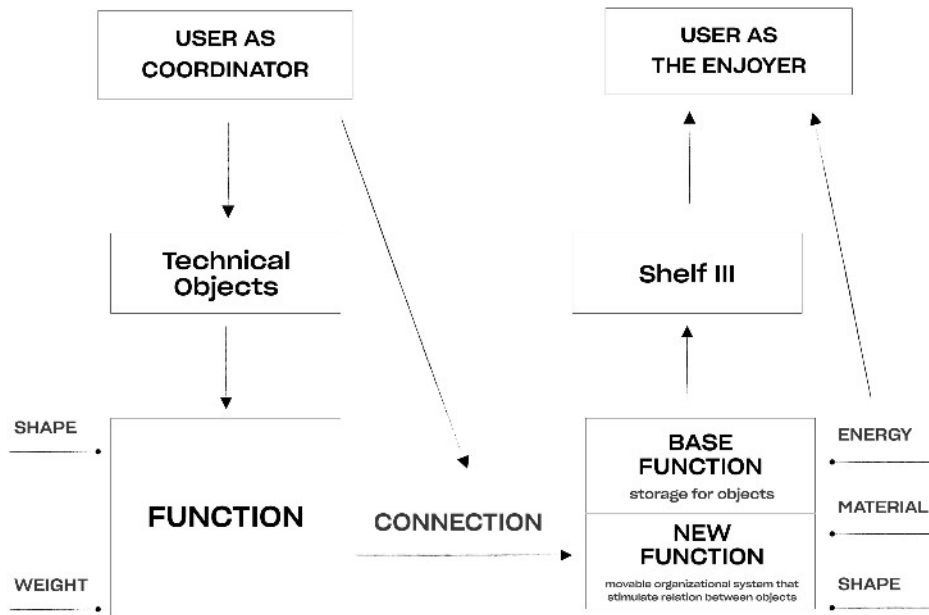
Product-to-product Relation Analysis

In order to comprehend the position of the product-to-product relation concept in this project, it is possible to analyze and demonstrate the benefits and characteristics of the previously discussed concept by using the Shelf III project, which takes into account not only the user's needs but also the objects and their characteristics around it.

PROJECT CONCEPT: Attractive shelf that can be changed according to users' needs and their belongings.

TYPE OF RELATION: Physical Interaction

The application of the product-to-product relationship concept to Shelf III revealed the importance of considering the physical relationship between objects and their physical properties to enable the creation of a differentiated solution with dynamic functions such as Shelf III for the domestic space. As a result of its ability to change the way users typically accommodate technical objects, this piece considering the weight and shape of technical objects allows for a more personal and enriching interaction between user, objects and domestic space (*Fig.93*).



[Fig.93] Representative graphic of product-to-product relation concept in Shelf III

Analyzing the advantages of using the product-to-product relation with the objects' shape and weight, it's possible to observe that the physical relationship between objects and their physical properties led to a differentiated solution with new engaging experiences that normally are not seen in the shelf category. Also through the unique interactions between technical objects that Shelf III demonstrate by using the object's weights and shape, facilitated the creation of a design system that thoughtfully stimulates the implementation and organization of objects on the shelf and around the user's space.

Chapter 4. Final Conclusions

This chapter will conclude the thesis research on the product-to-product relationship concept, presenting summarized answers to the investigated fundamentals, with the main research results in relation to the research objectives and limitations of the study. The future research opportunities will also be presented.

With the objective of this study to explore the design implementation of a concept that values the physical relation between objects and their physical properties, such as product-to-product relation, the results showed the capacity of applying this concept to create solutions that address both the problems associated with the domestic space, as well as daily needs of contemporary users in these spaces.

In terms of the investigate foundations **(RQ)** for this research, they have been answered as it is summarized below **(A)**:

RQ.1 Why is relevant to consider the objects as we consider the user in the design process?

A.1 In the context of a period in which objects dominate people's daily lives, considering the way objects contribute to how people perceive and feel in a space, can improve the relationship between the user and domestic space. As shown with the design practices of this research, using the physical relationship between objects with their weights and shapes in the field of design enables the creation of new products, which, combined with stimulating experiences and interactions, can lead to a more open and balanced view of the relationship between space, objects, and human beings as a whole.

RQ.2 Is it possible to consider both objects equally important as the users in the design process? Are there examples of solutions that use the idea of

the product-to-product relation to create useful solutions for users' lives in the domestic space?

A.2 The product-product relationship concept undoubtedly utilizes objects as a development tool to create solutions that go beyond the norm of functionality, however, the user still plays an important role in the design process. Although the object in this concept has become a constructive element to achieve new functions between objects, users' needs as well as the ability to coordinate the formation of physical relationships between objects are also necessary development elements in order for the final solution to address both problems associated with the domestic space, as well as the daily needs of contemporary users in these spaces.

In this research, analyzing study cases that use the idea of product-to-product relation, showed the possibility to implement this concept idea as a tool to develop useful and functional solutions to address users' lifestyle needs in the domestic setting. The selection and analyses of these projects were based on their functionality, uniqueness and conceptual similarity with the product-to-product relation concept. The research proceeded first, outlining the small and large “standardized” objects commonly seen in domestic spaces. Second, selected examples of products were ranked according to the demonstrated advantages associated with the use of the physical relationship between products to create functional designs.

RQ.3 In the field of design, how can the relationship between objects and their physical properties create differentiated but also appropriate solutions for the domestic space?

A.3 This research's content demonstrated that a concept such as the product-to-product relation can be used as a development tool to create differentiated design solutions for the domestic space. For instance with the research findings, the final design outputs focused on the concept of the product-to-product relation, offering unexpected features and experiences that were not commonly associated with three furniture elements selected. Throughout the research, by using the characteristics of the pro-

duct-to-product relation concept, the development methodology has been upgraded by requiring the projects to have a conceptual consideration of the objects' physical properties weight, and shape. The final projects developed with the previously achieved outputs, stand as examples of balance between the explored relation between objects' properties and the user's organizational necessities in domestic spaces. The final results resulted in differentiated products capable of embracing the objects and needs of the user for a balanced spatial environment.

Despite the benefits of such a concept, its application has some limitations, which designers should be aware of. For the solutions to work, the user must have the required objects. In addition, it will be more likely that a product using this concept will be object-dependent, as well as the choice of material will depend on the built system that embraces the selected technical objects. Consequently, due to the dependency on objects and their properties, a loss of focus on the user may occur during project development. To avoid this and have a correct implementation of this concept, designers must always know the defined fundamentals of this concept and its advantages to create useful solutions that improve the relationship between users and their belongings in their spaces.

In conclusion, the research provided a study on how contemporary designers can go beyond simply functional features of products using the physical relation between objects and their physical properties to design products that enhance the relationship between objects and their users in their domestic spaces on a personal and spatial level.

As far as the future of this research is concerned, there are still many topics to be explored. In this case, this research focused on exploring the creation of new solutions using the relationship between physical properties, weight, and shape of objects; however, the relationships of other objects and other properties such as volume or temperature can also be tes-

ted to deepen this concept.

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Abstract in Korean

지난 수십 년 동안 사람들은 점점 더 많은 개체에 둘러싸여 있었고 이러한 개체와 사용자 간의 상호 작용은 인정되었지만 개체 간의 관계에 대해서는 거의 관심을 기울이지 않았습니다. 선행 연구에 따르면, 공간에서 사물 간의 상호작용에 대한 고려의 부족은 혼란, 정신적 문제 또는 사용자와 사물 간의 불균형 관계와 같은 문제의 증가에 기여합니다.

주로 국내 공간에서 사용자를 참여시키는 디자인 솔루션을 넘어 제품 대 제품 관계와 같은 개념을 탐색하면 가정 공간과 관련된 문제와 일상적인 요구를 모두 충족할 수 있는 새로운 솔루션을 향상시킬 수 있습니다.

따라서 본 연구에서는 스터디 케이스와 객체의 관계를 분석하고, 제품의 특성과 위치를 포함하여 제품과 사용자의 관계를 정의하고, 객체의 물리적 특성(이 경우, 모양과 무게) 디자인 실습을 통해, 이를 활용하여 홈 공간에서 오브제와 사용자의 삶의 관계를 개선하고 디자인 분야의 솔루션을 개발합니다.

Design Practices의 첫 번째 논문 프로젝트에서 제시된 프로젝트는 공통 기술 개체의 모양을 사용하여 제품 대 제품 관계의 아이디어를 적용하는 방법과 이를 사용하여 국내 공간에 대한 관련 솔루션을 만드는 방법을 탐구하는 데 중점을 둡니다. 두 번째 논문 프로젝트의 경우 달성한 출력과 동일한 목적으로 다음 프로젝트는 물체의 물리적 속성에 가중치를 부여하여 제품 대 제품 관계의 아이디어를 적용하는 데 중점을 둡니다. 이전에 달성한 결과물과 수집된 결론을 바탕으로 세 번째 논문 프로젝트는 공통 기술 개체의 모양과 무게를 모두 사용하여 제품 대 제품 관계의 아이디어를 적용하여 국내 공간 주변에서 특정 목적을 위한 최종 제품을 개발하는 데 중점을 둘 것입니다.

마지막으로, 본 연구는 사용자가 주로 참여하는 디자인 솔루션을 넘어, 국내 공간을 위해 디자인된 미래 제품을 개선할 수 있는 솔루션을 개발하고 최종 제품에 대한 객체와 특성 간의 관계.

키워드 : 제품 대 제품, 산업 디자인, 국내 공간.

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