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**AN EVALUATION OF CIRCULAR DESIGN FOR
THE APPLICATION OF INTERIOR
ARCHITECTURE**

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Master's Thesis

Supervisor

Asst. Prof. Dr. Can UZUN

Istanbul, 2023

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Signature

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DEDICATION

It would be my ultimate pleasure to dedicate this thesis to my beloved Father firstly, since he was the greatest support and motivation for me to achieve what I have done until now, then to my Guardian angel, my Mother who always surrounded me with her prayers and love, and a great appreciation to my elder brother Ibrahim, my backbone, who was always there for me in my hard times, who supported me emotionally and financially in every step of my journey. A special thanks to my sister Dr. Riham and to my beloved aunt Dr. Arch. Noha who encouraged me to take this step which I was always hesitant to take, and a dedication to my youngest siblings Loubna and Abdul Aziz to whom I want to inspire and encourage to pursue their way in life with greater success than mine, and to my closest friend, Marwa I would never leave you out of a special occasion in my life, your support and prayers were always with me thank you from a sincere heart.

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I hope I can be up to your expectations all, and I promise you I will keep on going as long as it takes to make you proud.

ABSTRACT

AN EVALUATION OF CIRCULAR DESIGN FOR THE APPLICATION OF INTERIOR ARCHITECTURE

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The modern life presents many obstacles to humans, especially after inflation, environmental crises, and economic crises all over the world. Products and services are becoming unaffordable and materials and resources are decreasing in quantity with time. The circular economy came to present some solutions and strategies that can help people solve some of these problems by following the principles of sustainability and circularity in all aspects of human life, among the agenda of the circular economy the circular design strategies and regulations were formed. The circular design practices and solutions also involved architecture, interior design, and furniture design along with many other products needed for everyday life, these solutions were very effective in the USA, many European countries, and many other parts of the developed world to the extent that some designers and activists started the NEB movement to support the circularity and sustainability. This thesis aims to show the awareness of the CD and the effectiveness of the solutions presented by the circular economy and circular design among the participants living in Lebanon and Turkey by studying the relationship between problems presented in this area and the ways people deal with them and comparing them with the solution of circular design and its services within users, designers, and the market.

Keywords: Circular Design, Circular Economy, Modern Life, Interior Architecture, Design, Sustainability, User-friendly.

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ABBREVIATIONS

CE	:	Circular Economy
CD	:	Circular Design
CfC	:	Cards for Circularity
DfDc	:	Design for Deconstruction
DfS	:	Design for Sustainability
DfDs	:	Design for Disassembly
LCA	:	Life Cycle Analysis
EoL	:	End-of-Life
FaaS	:	Furniture as a Service
PSS	:	Product-Service System
MD	:	Modular Design
SM	:	Smart Design
NEB	:	New European Bauhaus
GST	:	General System Theory

1. INTRODUCTION

The world around us is in continuous change, the resources that humanity once knew and thought will never end are becoming less, and even the lands and spaces for living are being occupied with buildings and projects to the extent where new generations are finding it hard to locate new places to build in the future (Terrapass, 2022). To add up on all that, the inflation is now a worldwide crisis which is making people reconsider their way of living, because it is not compatible with the situation of this era (weforum, 2022). Now, and more than ever, people are finding it hard to have a place to consider home. The accommodation has become one of the biggest worries for any family (Humanity, 2022); That is why most people are renting houses and apartments to settle in, which forces them to move and resettle at least every few years, and sometimes yearly or even every few months (Humanity, 2022). Moving the furniture, appliances, décor, accessories, tools and belongings every time costs a lot, and needs a lot of effort, in addition to the possibility of causing a lot of damage and waste (Schoeman, 2020). To solve these issues some people and designers suggested the concept of renting furnished houses (TheGuarantors, 2021), while others suggested using minimalistic modular furniture (BluentCad, 2022), and modular houses (Association, 2007) which will allow people relocate their space of living and their old furniture with less cost and less hustle because the modular houses are adjustable, faster to construct and cheaper to buy (Association, 2007), while the modular furniture is cheaper, more sustainable and adjustable into different shapes and sizes by using more or less units (viakgroup, 2021). Despite the advantages of the previous solutions suggested to solve the issues of the housing crisis, there are still some inconveniences that can't be solved unless a fundamental and common solution is presented. Therefore, with the previous suggestions showing the lack of possibilities of sustainability, low cost, personalization and user-friendly type of customization designers found themselves in a situation where they need to innovate and invent new solutions which can effectively work for the economy, users and sense of design and creativity. That is when the need of circular economy appeared more important than before, and the urge of creating a movement that encourages sustainability and circularity was greater than any other time. And even though the circular economy concept was presented long ago since the 1990's (k.Winans, 2017), realizing that the linear economy was not sustainable and was seriously harming the environment and the economy was the breaking point that demonstrated the necessity for a circular economy (KUNZIG, 2020).

Designers and people started thinking of ways to lower the costs, create more opportunities for better living and more spaces to invest in, but with the lack of resources (Humanity, 2022) they found out that the best way is to work with what is already available in their reach like old buildings, old furniture and old products in general and they learned that the linear design was only leading to more waste and more lack of materials (vermes, 2015). At that point the circular economy concept started to become more popular, understood and accepted and integrated into circular design for sustainability in architecture, interior design and everyday life, and it inspired a lot of designers in Europe to start the movement of the New European Bauhaus based on the old Bauhaus movement to mix between the positives of the modular designs, smart design and the circularity (Iles, 2021) which made it possible to reuse, reshape, assemble, disassemble and reassemble every product very easily, while they can also get some additional parts, change the design, the style, materials and even the function all from small lightweight modules, which can be used to make many products, and most importantly it can be assembled even by hand without any additional tools, nor labor expertise (Dix, 2021). Therefore, the statement question for this thesis is: How efficient are the solutions that circular design is providing for interior architecture in our modern life? Are these solutions and ideas practical way for users in the middle east? In what way?

1.1 IMPORTANCE OF CIRCULAR DESIGN

For an architect, being up-to-date and following new trends, technologies, and innovative concepts is mandatory. Falling behind on these things will result in a lack of competency and competition, which will also affect his or her creativity and the value and efficiency of his or her designs. Each era requires different approaches and different solutions to the updated obstacles generated by the new lifestyles of modern people and by the new situation of the time and place as well as the resources. One of the newest concepts arising is the Circular Economy and its effects on the quality of life, but unfortunately, this concept doesn't have enough exposure yet, even though it is giving many solutions to modern life and its obstacles. Since the lack of resources and environmental deterioration are affecting the way of life of most people on earth, architects and designers must guide the users to a better lifestyle by giving them houses and products that are more eco-conscious and sustainable at the same time.

This thesis will try to give more exposure to circular design and orient people, especially architects and designers, to their need for a more sustainable way of living that is eco-friendly, cost-friendly, and flexible, which is exactly why adopting the circular economy and Circular Design concepts can give many solutions to these problems for users and designers, in addition to proposing some adjustments and suggestions to the parts where this concept is not efficient.

1.2 PROBLEM STATEMENT

The world is moving and evolving so fast, and the population on planet Earth is in continuous increase, and according to the UN statistics it is estimated to reach 10.4 billion by the end of the century (Roser & Rodés-Guirao, 2019); therefore, people's need and demand for resources are infinite and constant. With the shortage of nonrenewable resources and the deterioration of the environmental situation, even the renewable resources are in danger (Terrapass, 2022), which makes it even harder for humans to adjust as easily as before. Resources are getting more expensive and rare to find, and the costs of living and manufacturing all necessities are rising (MBN, n.d.). Designers and architects are having fewer options for creating new designs and products (Dokter, 2021), while on the other hand, customers are struggling to afford the costs of buying these services and products (Robinson, 2022); in fact, they are even struggling to afford the costs of living in general (Robinson, 2022). At the same time, the evolution of new concepts and technologies is trying to give a lot of solutions (Twilio, 2022), but the lack of exposure and education about these new solutions is making them neglected and non-effective, even if they were in fact efficient and helpful technically and conceptually, just like in the case of Circular Design. Therefore, this thesis answers in details these questions:

- i. What exactly is the circular economy, and circular design?
- ii. How will it help humans make their life cost-friendly, user-friendly and eco-friendly?
- iii. How is circular economy affecting design and interior architecture world?
- iv. What makes the circular design better than the Linear Design?
- v. What is the relation between Circular Design, Modular Design and Smart Design?
- vi. How is Circular Design affecting the Furniture Value?
- vii. Who is the main role player in the adoption of the concept of Circular Design?
- viii. How to involve the users, designers and manufacturers in the sustainability program?

1.3 AIMS AND OBJECTIVES

This thesis explains the solutions of Circular Economy and Circular Design for today's problems. It shows to what extent these solutions are efficient and tries to find the obstacles and shortcomings that are leading to the inefficiency of this concept. By creating more exposure and explaining what the Circular Economy concept is, this thesis shows how designers and architects create Circular Design products and services to improve human life. In addition, it relates and compares the circular design to similar concepts that have more popularity among people recently, making the idea of a circular economy clear. In the process of developing this thesis, one of the main goals is to create a more appealing approach to the way users and designers are looking at circular design by giving exposure to the fact that there are new leads such as organizations, manufacturers, and supply chains that are contributing to the spread of this concept by offering some facilities and financial and technical support to all those who want to adopt this concept as a rule of work. This will encourage new architects to join this current movement and enlighten the users about the new possibilities and worth of the new solutions in terms of current life solutions and future sustainable ways of reducing all the waste of effort, resources, and energy.

1.4 RESEARCH METHODOLOGY

1.4.1 Framework of Research

This thesis aims to reveal the effectiveness of circular design on modern architecture and people's contemporary lives by providing an extensive literature review on the main daily life problems and the solutions that circular design and the circular economy suggest to solve them. By referring to the collected information from the literature review, a framework of research was built, assuming that the circular design concept is helpful to solve the contemporary housing and inflation crises (Association, 2007). By incorporating data collection using surveys and questionnaires to ask people about the studied topic and analyzing this information, this thesis uncovers the relation between the studies in the literature review and how relatable they are to the contemporary life of our generation; therefore, the thesis reveals to what extent the theory given is correct (Trochim, 2006). Moreover, the quantitative methodology is the most common approach when it comes to social sciences-type topics (Coghlan, 2014). The framework of research in Figure 1.1.

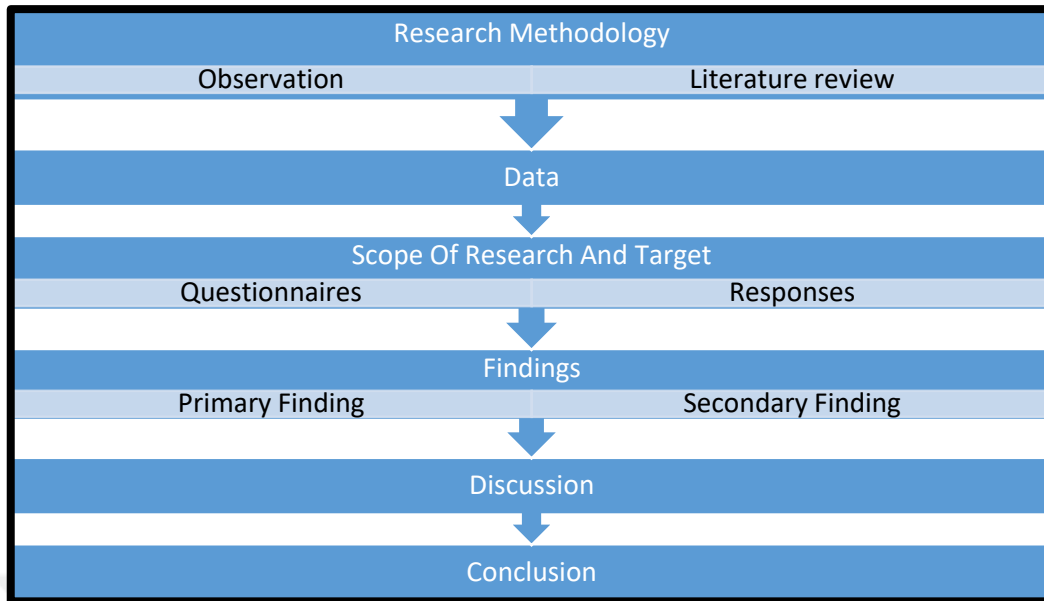


Figure 1.1: Shows How the Data Gotten From Scope of the Research Following a Specific Target Together Make the Research Methodologies to Reach the Desired Results (Edited by Author).

1.4.2 Research Type

The quantitative method is utilized in this thesis; this method is mostly used to get information about social studies, psychological research, and economic research. The main purpose of most quantitative research is to collect information and generate a better understanding of a specific topic, specifically in the social world, for example, the way of life of some individuals or the effects of some culture or a new concept on certain communities or individuals (Allen, 2017). In this thesis, the quantitative methodology helps collect data through questionnaires. The questionnaires are presented to three groups according to their roles or relationships with the concept of circular design. The first group is the group of users, which can include any person from all specializations as long as he buys the products and services and uses them regardless of his knowledge about them. The second group is the group of architects and designers who must have more knowledge and exposure to the concept of circular design and its principles and benefits. The last group is the group of manufacturers and providers. This group must have a hint of knowledge about the circular economy and information about the products and services they provide, which gives them the privilege of creating influence and change. These groups participation helped to observe, measure using scientific inquiry, and collect the data that shows which group is playing the major role in the acceptance and effectiveness of the circular design in solving today's issues (Allen, 2017).

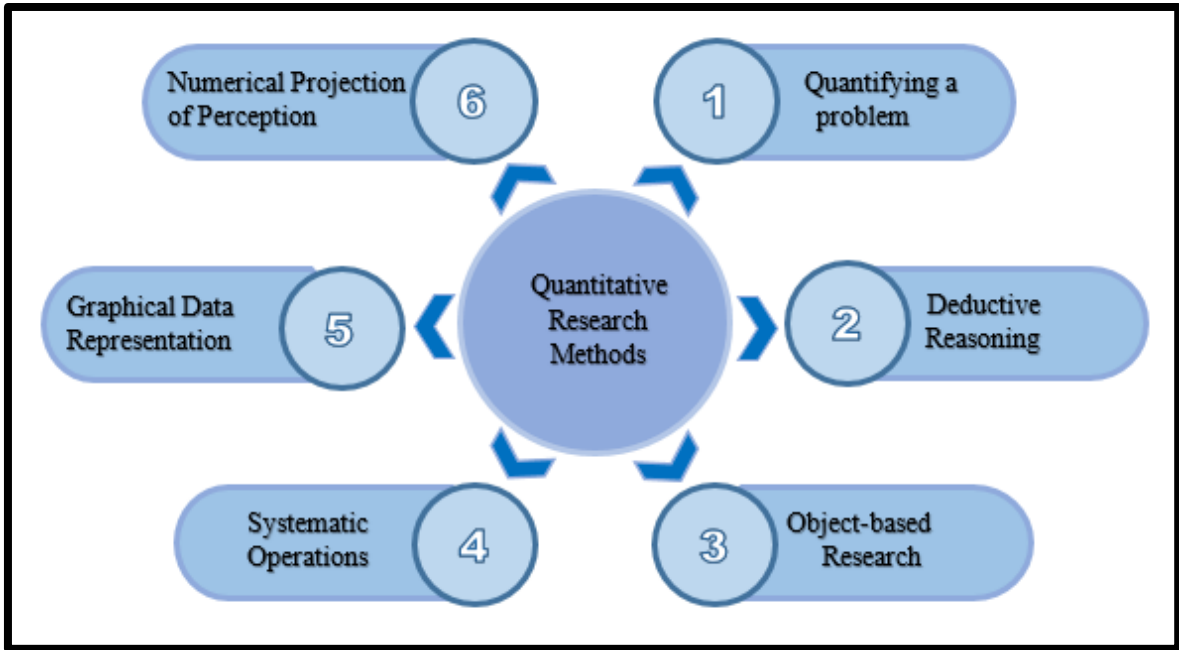


Figure 1.2: Shows the Different Ways How Quantitative Research Methods Collects and Analyses the Research Data (Edited by Author).

Quantitative research questions are objective questions that provide detailed knowledge about a research topic. The data obtained with quantitative research questions are numerical that can be examined statistically (Babbie, 2010), it also allows the respondents to answer concisely (voxco, n.d.) and helps in understanding the research issue by examining trends and patterns. In addition, presenting numbers and statistics increases the reliability of the data, so since quantitative research generates exact data with numbers, the information produced is more trustworthy and valid. (Babbie, 2010).

There are three different types of quantitative research questions, each one of them helps with a specific kind of response needed to follow up in the topic desired to learn about. The descriptive research question focuses on one variable which the researcher wants to study among a big number of participants (Voxco, 2020). The comparative research question empathizes on 1 variable and how it changes within the context of 2 or more different groups of people (voxco, n.d.). And lastly the relationship-based research question uses the word relationship to study the association of group of people with some variable or new trend (voxco, n.d.). This makes the quantitative method the most reliable method to get the desired results in a thesis where the effect of a specific trend or concept, such as the circular economy, is the aim of study on a distinguished groups of people and their own effect on the trend itself. All three types of quantitative research are used in this thesis to collect, compare

and relate between the responses gotten from the three groups of participants to acquire the desired results.

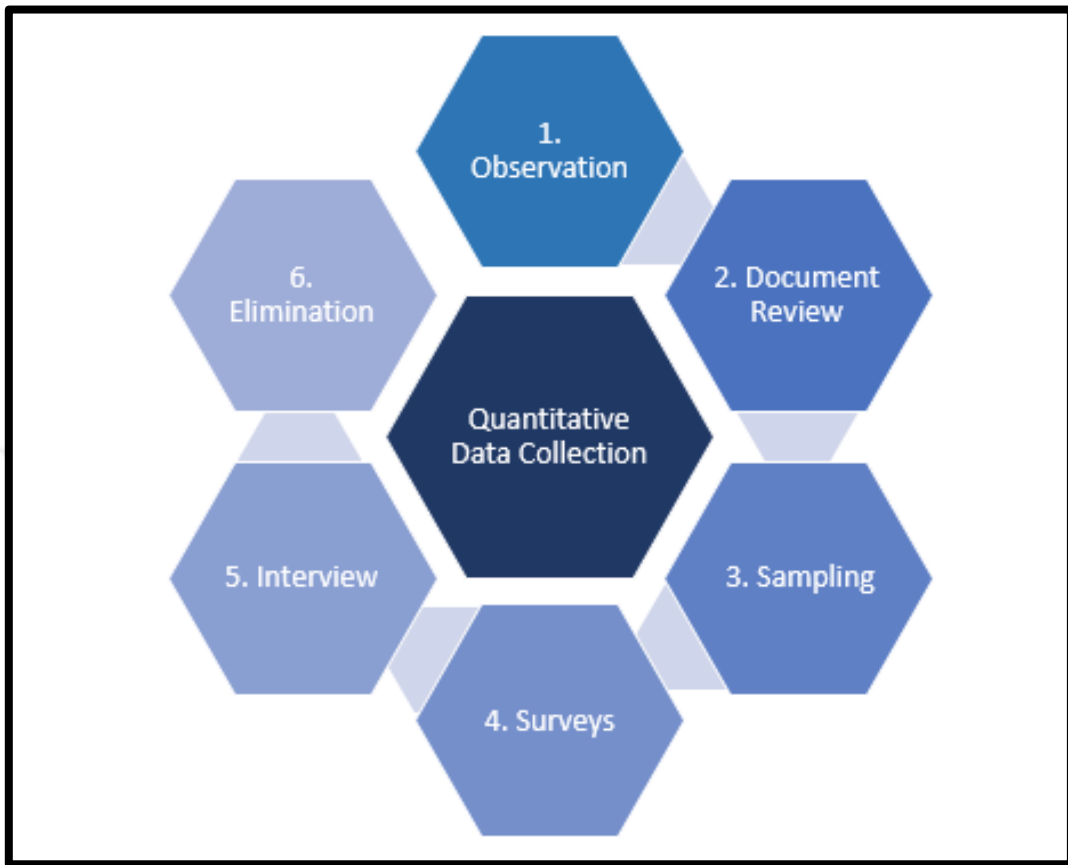


Figure 1.3: Shows the Data Collection Methods that Can Be Used in a Quantitative Research (Edited by Author).

1.4.3 Survey

In the process of designing this thesis and specifying the desired results many factors were taken into consideration to plan and form three questionnaires and surveys to collect the data. the first category was designated for the users, the second category is for designers and the third category was for the market. The participants in the questionnaires were people who live in Turkey and Lebanon, with multiple nationalities. The questions were designed carefully to be close ended to simplify the answers and clear the orientation of all three categories. In addition to making the questions close ended avoiding biased questions was a very important point to take into consideration in order not to lead the participants to the desired results, that way the authenticity and reliability level of the thesis can be higher (Grand.Canyon, 2021). The three questionnaires included similar questions in different

syntax to be closer to the understanding of each category. Some of the questions were general to study the demography of the area and participants, while other questions were specific about the circular economy, circular design and the environmental decisions related to the lifestyle and common knowledge. Some of the questions were more specific to each group where for example the designers group have questions related to their practices and design strategies and preferences, while the market group have questions about their strategies and marketing and sales plans, and finally the users group had some questions related to their lifestyles and daily decisions and struggles with the current economic situation. After filtering the usable responses, a comparison between the data received generated the final result which showed if the theory made at the beginning of this thesis was accurate or wrong by checking the statistics and numbers in the results since the questions were close ended, objective and numerical (Grand.Canyon, 2021). Then the findings will be discussed and related to the literature review and the previous research that helped in forming the main theory. Few conclusions will be stated and discussed with some suggestions for future research can be given to solve and enhance the solutions for the malfunctioning of the studied topic.

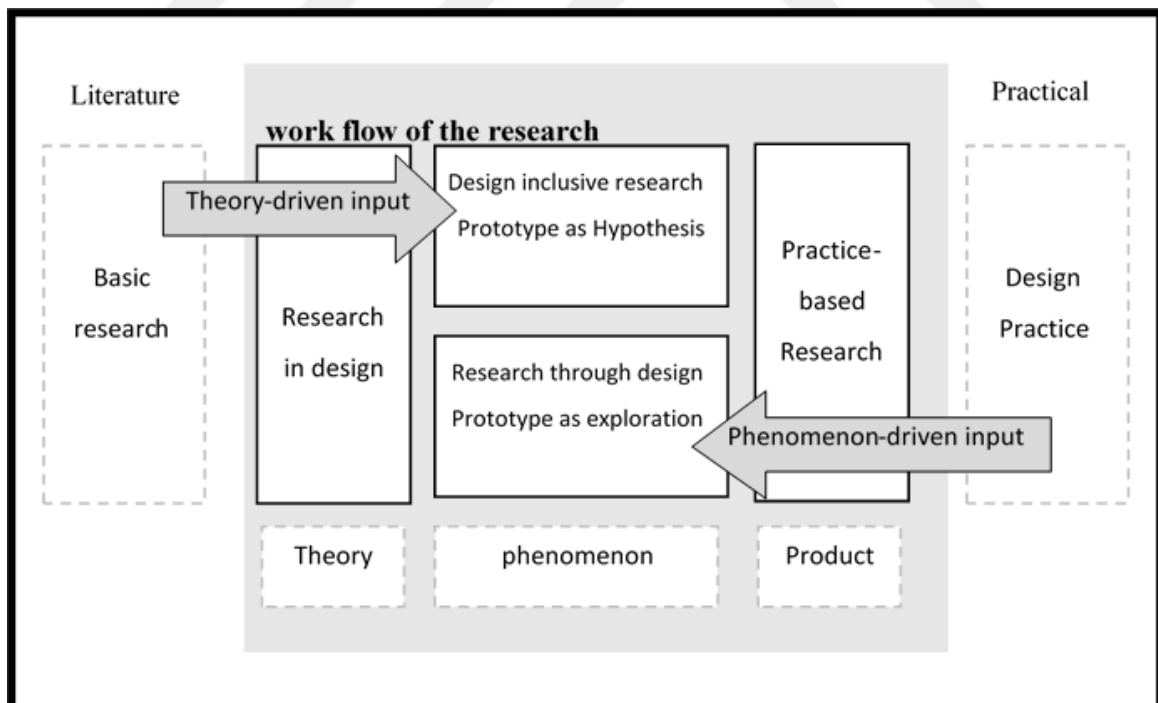


Figure 1.4: Shows the Work Flow of the Research Method (Edited by Author).

1.4.4 Justification of Using the Survey Methods

surveys and questionnaires type of research provides more information when making decisions, which might let the researcher be able to complete better and more reliable results. There are many advantages of using the questionnaire research approach, including: Strong variable control, Broad application across fields, Specific results, Actionable results, Early identification of market trends and Foundational use in further experimentation (DeFranzo, 2019). Survey research is about asking a group of individuals various questions, then examining the answers to learn more about them, it is a versatile tool for gathering data that can be utilized in a wide range of research projects. And it is a common way to collect data across a wide range of industries, it is considered as a wise choice if you want to learn more about a group of people's traits, interests, viewpoints, or beliefs. For example if you want to know the opinion of a customer about a specific product or if you want to know about a group of people's behavior or experience or lifestyle (Cherry, 2020).

2. CIRCULAR ECONOMY

2.1 DEFINITION OF CIRCULAR ECONOMY

According to the “News European Parliament” website (Europarl team, 2015) the definition of circular economy is: “a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended.” (Europarl team, 2015) Therefore, the circular economy is adopting a style of living where recycling and eco-friendly behaviors are valued. It is the process where every piece of synthetic or organic material is either reused, or borrowed or repurposed until it cannot be reused again, in a way that all kind of waste is eliminated (Europarl team, 2015). This type of behavior starts to become like a life style that adopts the rules of circular economy represented by the notion of 7R’s of sustainability that include 7 acts: rethink, refuse, reduce, repurpose and reuse, refill, recycle and the last one is rot (Auclair, 2021), figure 2.1 demonstrates this notion.

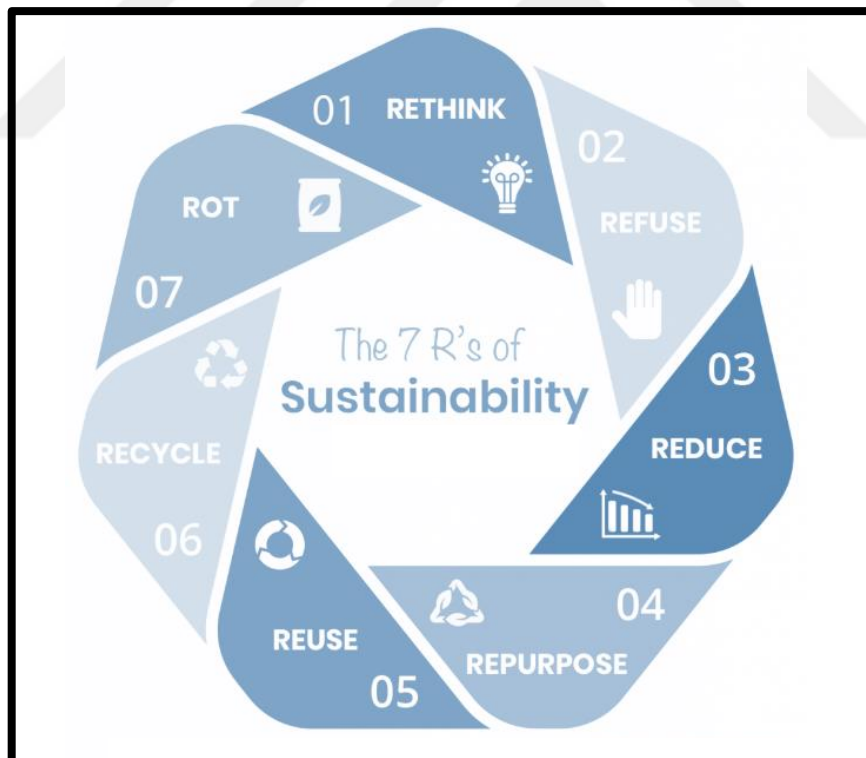


Figure 2.1: Shows the 7R's of Sustainability (Ann, 2018).

Under the framework of SMM (sustainable materials management), a circular economy approach shows continuity in the focus on reducing the critical lifecycle effects of raw

material, which include climate impacts, limiting the utilization of waste pollutants, and switching from material usage to economic wealth and meeting needs of the public, this lifestyle affects not only the environment, but the economy as well in many aspects (EPA, 2022). The materials used in this type of design is very accessible and cheap, and because it is cheap it will help the economy by not forcing people to buy or outsource some materials that are not available in most of the countries, and mostly the none renewable materials, like plastic, metal, rubber and others (Ibrahim Iman Abdelshahid, 2020). An infrastructure that has been designed according to the rules of circular economy, for example, maximizes value over time by maximizing resource utilization and minimizing waste throughout every phase of its life cycle, from design and building to maintenance and repair and deconstruction and disassembly instead of full demolition which saves a lot of valuable material from going to landfills and total waste (Bates, 2022). A summary of all what was mentioned is explained in the CE butterfly diagram presented in figure 2.2.

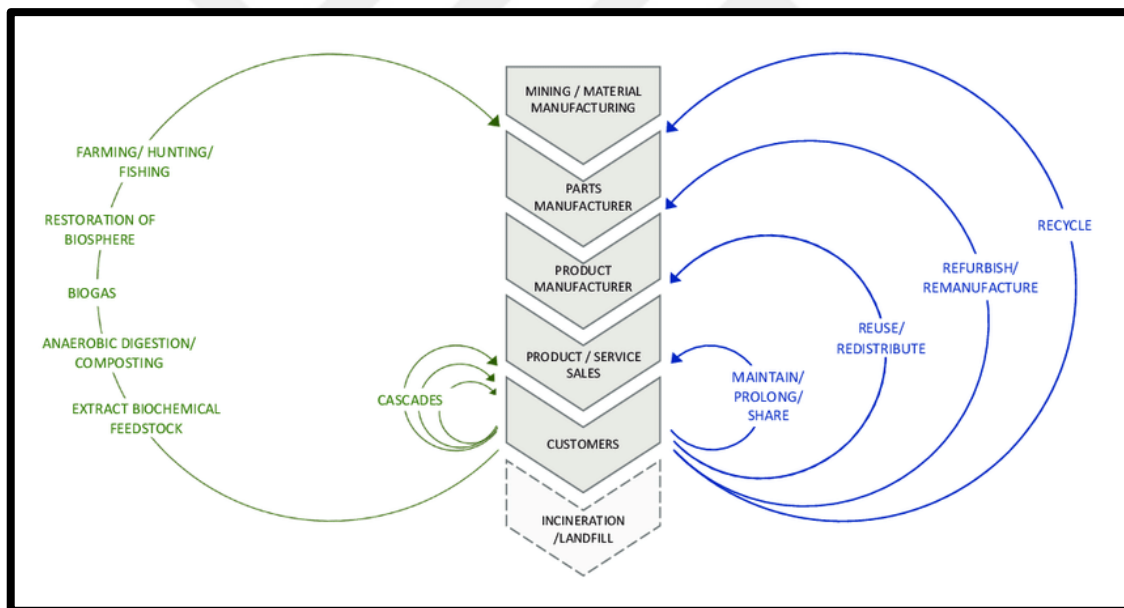


Figure 2.2: Shows Circular Economy Butterfly Diagram (EllenMacArthur, 2017).

2.2 HISTORY OF CIRCULAR ECONOMY

In reaction to economic expansion and the exhaustion of natural resources, the idea of a circular economy has developed over the decades, but it has earned substantial attention and acceptance in the past few years. The general systems theory, which biologist Ludwig von Bertalanffy developed in the 1930s, is the foundation of the CE (wikipedia, 2021). Then the

circular economy has its origins in the 1960s and 1970s, when scholars and philosophers began to question the old economy's sequential "take-make-dispose" model. And later the concept gained popularity in China in the 1990s (k.Winans, 2017). The OECD issued a study on the circular economy's implementations and effectivity in 2020, which later encouraged several nations to accept it worldwide (Paul Ekins, Teresa Domenech, Paul Drummond, Raimund Bleischwitz,, 2019). For both open and closed state systems, the above theory takes development and energy into account. Ellen MacArthur created a foundation in 2010 to collaborate with companies and education to speed up the transition to a circular economy. After that time, the circular economy has grown and got popular, with more companies implementing circular concepts. The foundation founded by Ellen MacArthur issued an analysis in 2015 asking for a "global circular economy" through which items have been developed to be reused and recycled. More than 100 CEOs and political leaders across the world have approved the report (Wautelet, 2018). The CE has also received a thorough analysis by the Ellen MacArthur Foundation, which details its advantages for industry, civilization, and the ecosystem (Allen, 2017). Even though the CE has a lengthy history that may not be attributed to a particular author or time period it served as a foundation for the spread of the sustainability practices and the emergence of the NEB (new European Bauhaus) movement in Europe and after that around the world. (Circular Taiwan Network, 2021). The NEB movement was one of the first contributors in the spread of circular economy in Europe by spreading knowledge of the benefits of circular design, promoting its use. It may encourage designers and architects to apply circular design ideas to their work by presenting cutting-edge projects and encouraging discussion among stakeholders (Kubus , Bustillo, & Bustillo, 2021). But unfortunately this knowledge of sustainability and circular design still did not reach the middle east as wide and strong as in Europe and the advanced world.

2.3 CIRCULAR ECONOMY FOR SUSTAINABILITY

Design has been integral to the evolution of society and the economy ever since the start of the Industrial Revolution that is why it is important to give a quick review of the overall evolution of concern for the environment and sustainability within the design profession before investigating the involvement of the CE for the different design disciplines (Mike Press, Rachel Cooper, 2016). Due to the influence of influential designers like Buckminster

Fuller and Viktor Papanek, the design professions began to become more aware of sustainability issues in the middle of the twentieth century. Papanek criticized design as a "harmful profession," claiming that when all constraints are removed and everything is possible, design can easily turn into an endless search for novelty innovation and uniqueness, until novelty for the sake of novelty replaces all other criteria and the designer risks alienating themselves further from general public and the functional complex (Papanek, 1972). However, design is frequently regarded as being crucial in the shift towards more sustainable forms of consumption and production as evidenced by the claim that 80% of a product's environmental effect is determined during the design phase (European Commission, 2014c, 2020). Some others have also debated the role of design, noting that it is merely one component of consumerism and that designers are frequently seen as terms of investment and commercial pawns who respond to customers and users first and are educated to "bring value" to companies but not design in particular (Thorpe, 2010).

Table 2.1: Sustainability and Circular Economy Competencies for Design (Sumter, De Koning, & Bakker, 2020).

Competencies	Sustainability
Systems thinking competency	the capacity to jointly assess complex systems across several sizes and domains (e.g., society, environment, economics) (local to global)
Anticipatory competency	the capacity to jointly assess sustainability-related challenges and frameworks for tackling sustainability problems, as well as to create rich future "pictures"
Normative competency	the capacity for negotiating, reconciling, and mapping collaboratively sustainable ideals, principles, aims, and targets
Strategic competency	the capacity to jointly plan and carry out sustainability-oriented interventions, transitions, and transformative governance methods
Interpersonal competency	the capacity to promote group problem-solving while ensuring a respectful and sympathetic interchange of viewpoints and activities and dealing with disagreement.

Various design for sustainability (DfS) methodologies, such as eco-design, cradle-to-cradle, and bio-mimicry, have been created over time to address sustainability challenges at the

design stage. DfS methodologies have changed over time, moving from solitary to innovative system design (Dokter, 2021). The emphasis has switched from isolating sustainability issues to more systemic approaches, including sustainable product-service system (PSS), which involve several participants and a high level of complexity. In parallel, designers' responsibilities have changed from object-centric instructional design to more system-based methodologies in design. Designers are increasingly challenged to play strategic roles, create future visions, promote strategic conversations between actors, and include and involve a variety of players in the design processes (Dokter, 2021). It is not surprising, given these developments, that the designer's role has grown increasingly linked with that of other stakeholders and actors such as the developers, manufacturers and supply chain owners (Peter Joore, Han Brezet, 2015). The DfS tactics listed above aid design initiatives for sustainable development, but they may also be seen as essential for design practice within the context of the switch to a CE (F. Ceschin, Gaziulusoy, 2016).



Figure 2.3: Shows the SGDs Sustainable Development Goals of the UN to Improve Life on Earth (United Nations, n.d.).

3. CIRCULAR DESIGN

3.1 DESIGN AND CIRCULAR ECONOMY

Before starting the discussion about circular design (CD) and how important it is for CE, it is crucial to define design in general to understand that relation. In short, Design is creation done with purpose and intention (EllenMacarthurFoundation, 2022). In other words, and according to The Montreal Design Declaration (Graz Unesco city of design, 2020) design is “the application of intent: the process through which we create the material, spatial, visual and experiential environments in a world made ever more malleable by advances in technology and materials, and increasingly vulnerable to the effects of unleashed global development”. Everything around us, our clothes, our laptops and phones, the buildings and houses we live in, even the methods by which we collect our food have all been created by someone. That leads to the conclusion that design plays a crucial role in our daily life which makes it a main affecter on the CE (EllenMacarthurFoundation, 2022) because when you say economy it means social science, and social science is the study of people and their way of living and their daily activities and habits, their needs and necessities, it investigates how products and services are produced, distributed, and consumed (HAYES, 2022) as well as how people make decisions regarding these matters (EconomicsOnline, 2020) it concentrates on peoples’ behavior and how they deal with the problems around them (Suman, 2020) that makes the design a major role player in affecting economy according to the definitions mentioned previously, and that is why everything needs to be redesigned, including the linear systems that have been in place for centuries as well as cities, business strategies, and products to achieve Circular Economy. This learning path examines the four stages of circular design and presents six ways for incorporating the concepts of circular economy within current designs. It also discusses the importance of design in fostering a circular economy (EllenMacarthurFoundation, 2022). The CE presents particular challenges for designers, including the need to gain a greater understanding of materials, that considers multiple lifecycles, simultaneously develop product and business model designs, adopt a systemic perspective on resources and their lifecycles, and foresee the existence of a different way to an alternative economy (Dokter, 2021). The figure 3.1 shows how CE can affect all aspects of life from cities, to building, parks, products and even components.

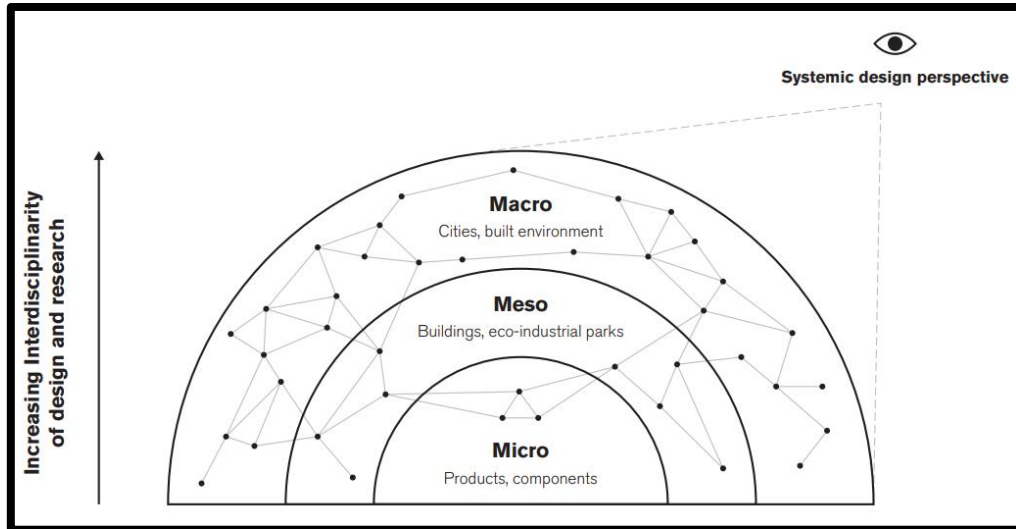


Figure 3.1: Shows How the CE Mandates that Designers Adopt a Systemic Design Viewpoint and Take into Account the Interactions Between Various Implementation Scales. (Dokter, 2021).

3.2 DEFINITION OF CIRCULAR DESIGN.

The Circular Design is the result of the acts and procedures which have as a priority the goal of orienting designers to a process that develops services and products for the circular economy (Iberdrola, 2023). There are four steps to achieve a Circular Design, which are guided by techniques like design thinking and human-centered design, these techniques can be summed up under the following titles: Understand, Define, Make and Launch (EllenMacarthurFoundation, 2022), this is presented in figure 3.2.

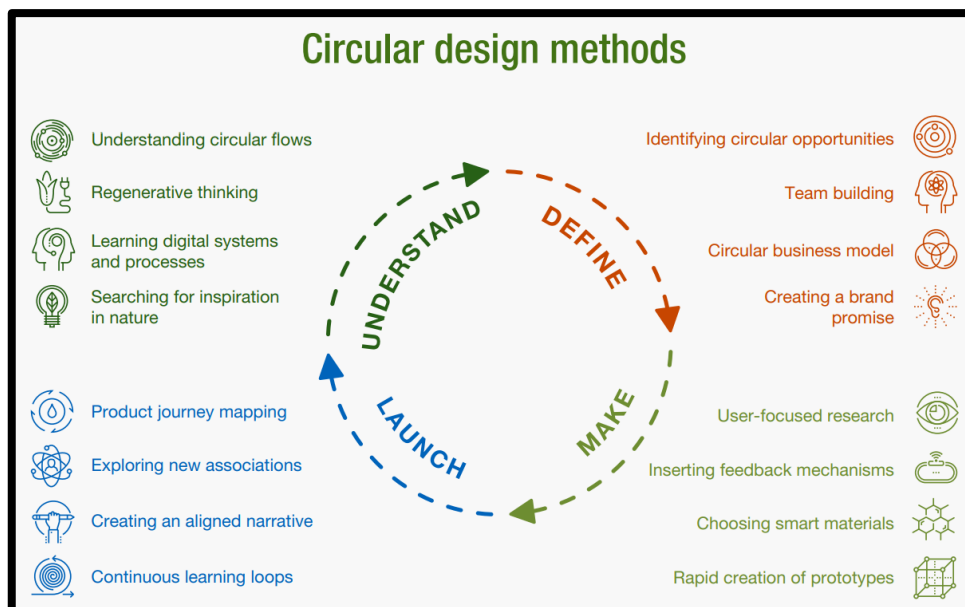


Figure 3.2: Four Methods for a Circular Design (EllenMacarthurFoundation, 2022).

The first step starts by understanding the surrounding of the designer and learn about the circular flow, the systems and processes adopted already in this area and from that input search for inspiration. The second step is to define and know what are the opportunities that can help him achieve his goals, draw a clear idea for his circular business or new brand which follow the standards of CE and most importantly build a team who will achieve these goals with him. Third step comes Making, the point where all the magic happens by choosing the right material, designing the prototypes and making them, and giving more than one solution or variation to each prototype. And last but not least comes the phase of launching or releasing the product to the market and trying to attract customers and then boost loyalty among them by telling a captivating tale, and later this may as well increase partner investment (EllenMacarthurFoundation, 2022).

Whatever the products are, circular design revolves around the materials used (Ferris, 2022) and aims to enable society to coexist in harmony with nature (Thomas, 2021). It necessitates shifting attention away from the product and toward material flows, production conditions, and factors of use and reuse (circular-design.eu, n.d.). In addition to following the 4 steps to achieve a circular design product or service, there are 5 important principles to keep in mind; the first principle is low weight, which means that there will be a use of fewer resources while manufacturing a product by carefully dimensioning the parts and optimizing weight. This lessens the environmental burden, particularly when production numbers reach the thousands of pieces and units. Reduced cost of transportation, both financially and environmentally, are also another benefit of light weight. In the notion that products are carried and handled by people for a long lifetime from generation to another, low weight also provides a health benefit (Ferris, 2022). The second principle is fewer components, which means that the simplest solutions are frequently the finest. The quantity of tools needed, the diversity of resources that may be required, and the time needed to produce and assemble an object can all be reduced by creating functioning objects from as few pieces and components as possible. In addition to keeping weight low, this will also cut down on the resources required to make tools and the energy used during production and assembly (Ferris, 2022). The third one is the right choice of materials, and that plays a very important role as mentioned before because it is genuinely circular to use recycled materials like post-consumer plastic and aluminum. Recycled materials have a far lower environmental impact than virgin raw materials since they use less energy during processing, which will not only

help minimize the quantity of garbage that ends up in landfills (Ferris, 2022). The fourth principle is long lifespan, this principle empathizes on making durable, high-quality products can help save a lot of resources, both in terms of the materials used and the energy required to replace them. A real circular product is made to make it simple to repair worn-out sections, and spare parts are inexpensively available (Ferris, 2022). While the last principle is designed for disassembly, in this principle the main rule is creating a design which can be simple and easy to disassemble that makes it is essential to enable the deconstruction, sorting of raw materials, and manufacturing for recycling after an object reaches the end of its useful life. It can be exceedingly difficult to separate and sort components that are permanently fused altogether (either by glues or inaccessible screws/fittings), and thus are more probable to end up in landfills that is why designing for disassembly saves the valuable materials from being wasted (Ferris, 2022).

An example of a CD project will be presented in the following pictures.



Figure 3.3: Shows a Photo by Kimmo Raisanen to the Little Finlandia in Helsinki Is a Modular Conference Venue Held Up by Pine Trees as an Example of Circular Design which Aims to Use and Reuse Materials without Harming the Environment by Manufacturing and Creating Too Much Carbon Emissions (Barker, 2022).



Figure 3.4: Shows the Adaptable Interior Space of the Pikku Finlândia Hall with the Pine Trees as Pillars with Fewer Branches not to Disturb the Interior Space (Barker, 2022).

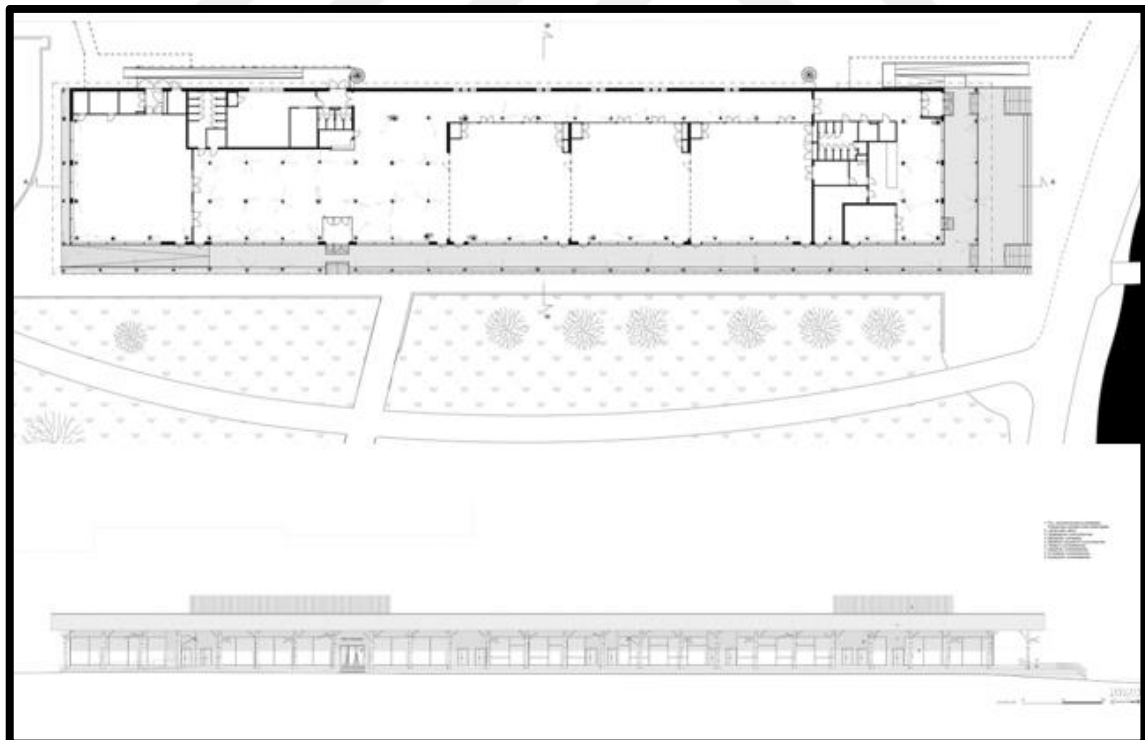


Figure 3.5: Shows the Plan and Section of the Pikku Finlândia Hall Project that Shows the Modularity and Simplicity of the Design Which Make It Easier to Repurpose and Maintain (Barker, 2022).

Another example of Circular design which was nominated for the Mies van der Rohe Award 2022 is the “Resource Rows” which is all about upcycling and reusing materials.



Figure 3.6: Shows a Facade of the Resource Rows Project Located in Copenhagen and Designed by NREP,AG Group, and MOE in 2020 (Lendager, 2023).



Figure 3.7: Shows the Mass Plan of the Project Resource Rows (Lendager, 2023).

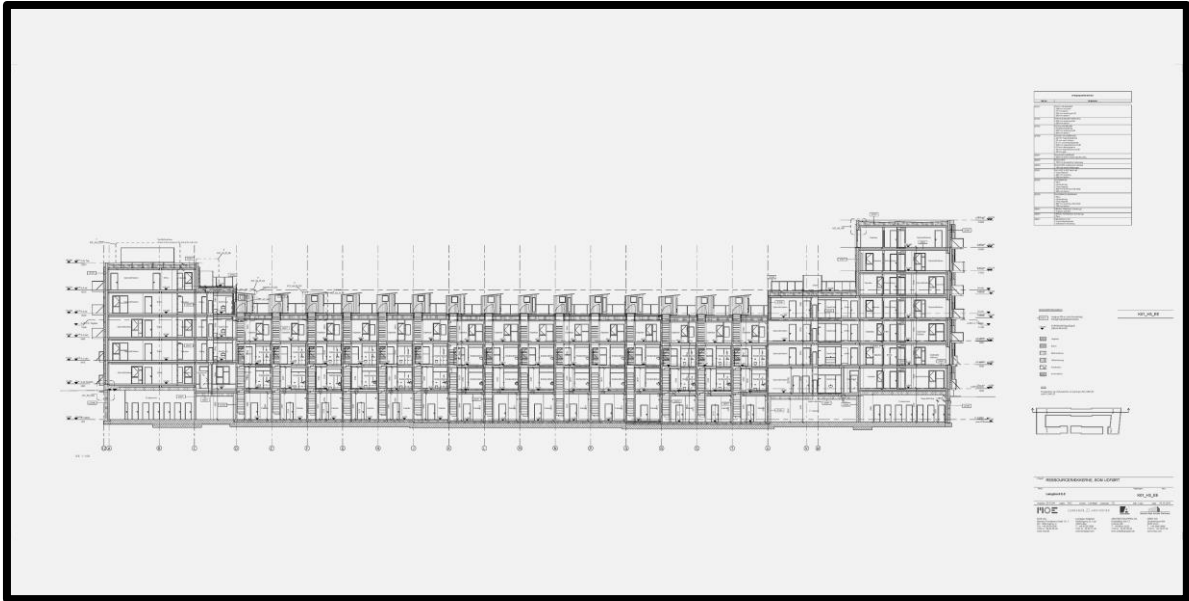


Figure 3.8: Shows a Horizontal Section of the Resource Rows Project (Lendager, 2023).

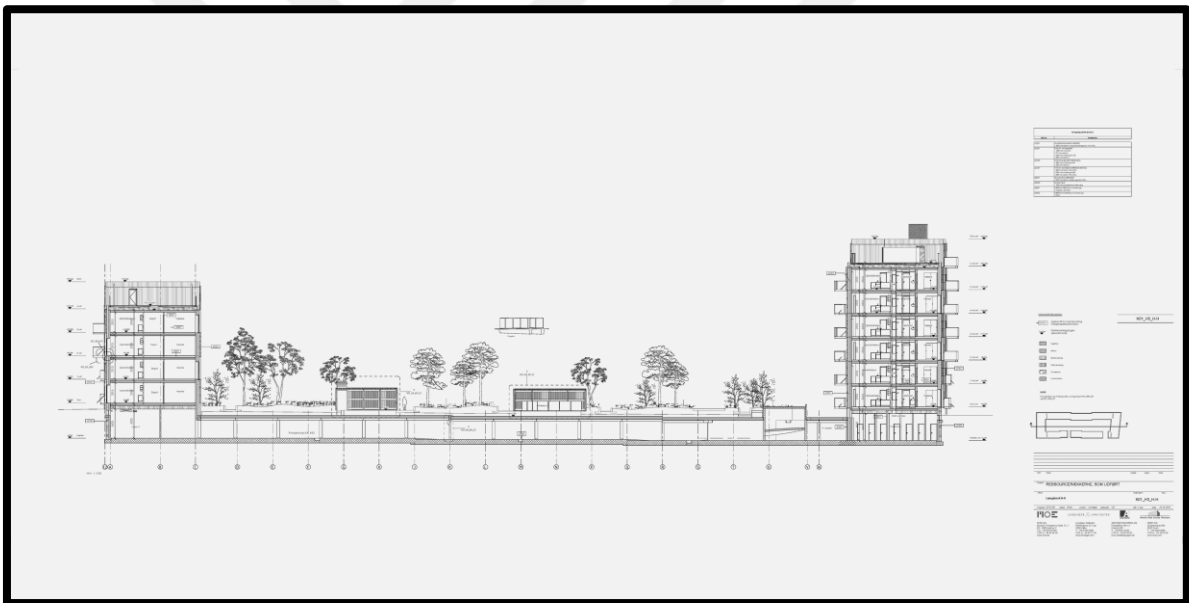


Figure 3.9: Shows a Vertical Section of the Project Resources Rows (Lendager, 2023).

3.3 CIRCULAR DESIGN COMPARED TO LINEAR, MODULAR & SMART DESIGN

A linear economy is a traditional "take-make-waste" model of production and consumption, where resources are extracted, used to create products, and then disposed of after their useful life has ended. In a linear economy, the emphasis is on maximizing production and consumption, with little consideration given to the environmental impact of these processes (The geographer online team, 2019). In contrast to the linear economy, a circular economy is a regenerative system in which resources are kept in use for as long as possible, waste is minimized, and the environmental impact of production and consumption is reduced.

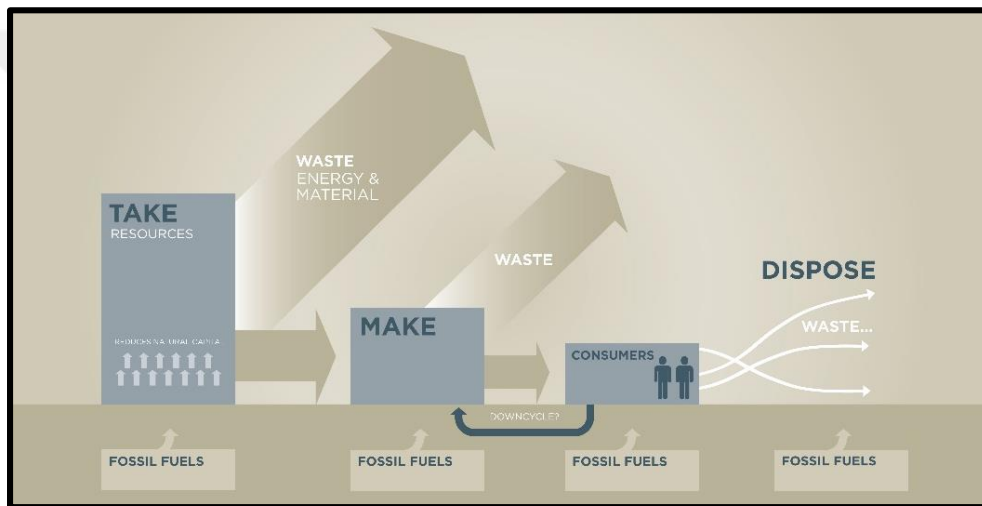


Figure 3.10: Shows the Life Cycle of Products Made According to the Concept of Linear Design (The geographer online team, 2019).

In the last decade, designers were playing a role in affecting the market and the production and even though it looks like they are trying to change the linear production and move to a more sustainable one, their attempts were not very successful because they were focusing on changing the trends very frequently which made the customers think that they need to change and replace their old products with new ones even if their EoL is not their yet in addition to designing products which are supposed to be modular which helps in their assembly and disassembly (Andrews, 2015), but still the assembly process is using some permanent glue and materials which makes it impossible to disassemble so they will be eventually disposable (Sanders, 1999). After all that effort from designers so many new concepts came such as green design and eco design which are considered better than the linear design but still not enough to solve the waste and economic issues (Braungart, McDonough, & Bollinger, 2007).

Then after all the trials and researches the circular design was derived from the circular economy concept which inspired the designers to find more solutions for less waste and more sustainability. Figure 3.10 shows the impact change between linear economy and CE.

Table 3.1: Shows the Different Impact of Circular Economy and Linear Economy on Many Aspects of Everyday Life and Topics (The Manutan Family, 2023).

	Linear Economy	Circular Economy
Resources	Resource depletion: The extraction of raw materials, which can lead to resource depletion and scarcity over time.	Reuse, repurpose, recycle of resources and materials for as long as possible, which reduces waste of valuable material significantly.
Pollution	Increasing Pollution	Decreasing Pollution
Climate	major contributor to greenhouse gas emissions, which are a leading cause of climate change.	Reducing the Carbon Gas emissions by reducing the construction waste and generation and by reusing materials by disassembly.
Consumption	Unsustainable consumption	Sustainable consumption
Economy	Economic inefficiency: by using resources inefficiently valuable materials are often discarded rather than being reused or recycled. Which costs the economy a lot not just money but also land waste for landfills and energy cost with less job opportunities to people also, which eventually causes economic failure.	By considering each element as a valuable resource, and by reusing the materials and old products, circular economy is reducing the costs of creation and demolition and the waste of land in addition to creating more job opportunities by adopting the concept of design for deconstruction.
Socio-economy	The linear economy can create socioeconomic disparities, as the costs of pollution and resource depletion are often borne by marginalized communities.	By helping people with crating more affordable and long life products the circular economy is reducing the gap between social categories.

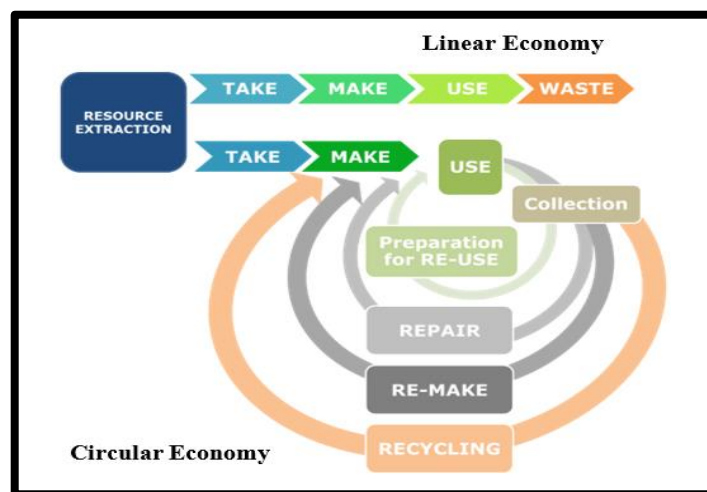


Figure 3.11: Shows the Difference Between the Linear Economy and Circular Economy (Danmark, 2016).

Modular Design vs. Circular Design

Circular design and modular design are two different design approaches that have different objectives and characteristics. Circular design aims to create products and systems that are closed loops, meaning that waste and resource inputs are minimized, and valuable materials are kept in use. The goal is to reduce the environmental impact of products and create more sustainable systems (Europarl team, 2015), while Modular design, on the other hand, is a design approach that focuses on breaking down complex systems into smaller, interchangeable parts or modules. The goal is to make products easier to assemble, repair, upgrade, and recycle. Modular design can also improve the overall efficiency and flexibility of systems by allowing for easy customization and scalability (Mitchell M. Tseng & Chenjie Wang, 2019). Both approaches have their own unique benefits and can be used together in a complementary way to create more sustainable and efficient products. The circular design can be considered as one of the branches of modular design but the difference is that the modular design makers were not worried about the eco-friendly side of the case. The modular design in general only cares about space saving, fast fabrication and fast assembling and sometimes low-cost (Meilani, 2019).

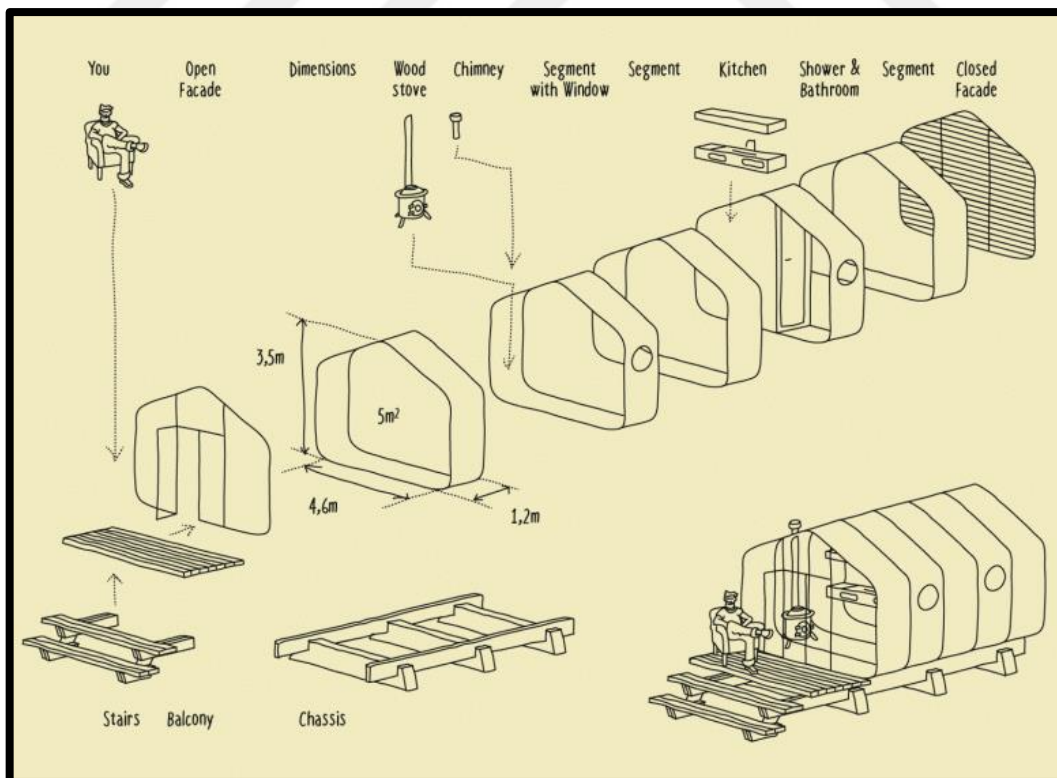


Figure 3.12: Shows How Wickelhouses Are Pieced Together out of Individual Modules, Like Building Blocks (Meilani, 2019).

The modular design concept works most in the commercial buildings (check figure 3.12), chain markets and fast industry, while the circular design is only used by people who care more about user-friendly things and recyclable items and materials, they try to lower the cost and above all limit the waste (Natalia Hartono, July 2019).

Circular design can result in reduced waste, lower environmental impact, and increased resource efficiency, while modular design can result in faster, more efficient assembly and disassembly of products, as well as easier customization and scalability. But the most important part to mention is that the circular design includes the modular design concept in its practices with a bit of modification specially in the side of sustainability and material choice, which makes it an alternative for modular design lovers who decided to take care of the economy and the environment (Meilani, 2019).

Some examples of the modular design project which also follow the principles of CD will be presented in the following pictures.



Figure 3.13: Shows One of the Formations That Can Be Made by Using the FREI_RAUM (Or: Free Room/Space) Modular Furniture (Weburbanist, 2020)



Figure 3.14: Shows One of the Formations That Can Be Made by Using the FREI_RAUM (Or: Free Room/Space) Modular Furniture (Weburbanist, 2020).



Figure 3.15: Shows One of the Formations That Can Be Made by Using the FREI_RAUM (Or: Free Room/Space) Modular Furniture (Weburbanist, 2020).



Figure 3.16: Shows One of the Formations That Can Be Made by Using the FREI_RAUM (Or: Free Room/Space) Modular Furniture (Weburbanist, 2020).



Figure 3.17: Shows One of the Formations That Can Be Made by Using the FREI_RAUM (Or: Free Room/Space) Modular Furniture (Weburbanist, 2020).

Table 3.2: Compares Between the Circular Design and Modular Design on Many Aspects
(Generated by Author).

	Modular Design	Circular Design
Complexity	Modular design can involve complex engineering and design to create a system that is easily assembled and disassembled. (Mitchell M. Tseng & Chenjie Wang, 2019)	Circular design can involve complex systems thinking and analysis to understand the entire lifecycle of a product. (Andrews , 2015)
Benefits	<ul style="list-style-type: none"> • Scalability • Flexibility • Cost effective • Simplified maintenance • Ease of assembly (Natalia Hartono, July 2019) (Mitchell M. Tseng & Chenjie Wang, 2019)	<ul style="list-style-type: none"> • Reduce waste • Increase sustainability • Improve resource efficiency • Creates business opportunities • Reduce costs • Ease of assembly and disassembly • Ability to reuse and repurpose • Increase of material value • Convenient maintenance (EllenMacarthurFoundation, 2022)
Applications	Modular design is commonly used in: <ul style="list-style-type: none"> • Furniture • Construction • Automotive • Electronics • Manufacturing (Europarl team, 2015) (Mitchell M. Tseng & Chenjie Wang, 2019)	Circular design is particularly used in: <ul style="list-style-type: none"> • Furniture • Construction • Automotive • Electronics • Manufacturing • Packaging • Fashion • Services • Any system with a lifecycle. (EllenMacarthurFoundation, 2022)
Inclusivity	Modular Design doesn't always follow circular design principles. (Natalia Hartono, July 2019)	Circular Design adopts Modular Design concept as one of its major traits and practices. (Mitchell M. Tseng & Chenjie Wang, 2019)

Smart Design Vs Circular Design

Smart design and circular design are closely related since both strategies strive to provide more sustainable and effective systems and products. In that meaning the smart design can be considered as another type or derivation of Circular Design and Modular Design, which can change form from a function to another or can be hidden in compact places to reduce the usage of space and materials at the same time by using the same structure to serve few functions (Paradise & Schwartz , 2022). Depending on the situation and use, circular design and smart design have distinct advantages, but at the same time they have so many similarities which makes them very similar in many aspects and it makes them complement each other while working for sustainability and environmental friendly contexts, this can apply on the modular design as well which was discussed in the previous section (Deltek, 2021).

In the following pictures a Circular design project that follows the cradle to cradle life cycle as well as using the smart design strategies and sustainability principles. The project is designed by GXN for the Hotel Ryttergarden in Denmark in 2015 as a hotel and conference center (GXN, 2015).



Figure 3.18: Shows the Facade of Conference Hall and Hotel by Green Solution House in Denmark (GXN, 2015).

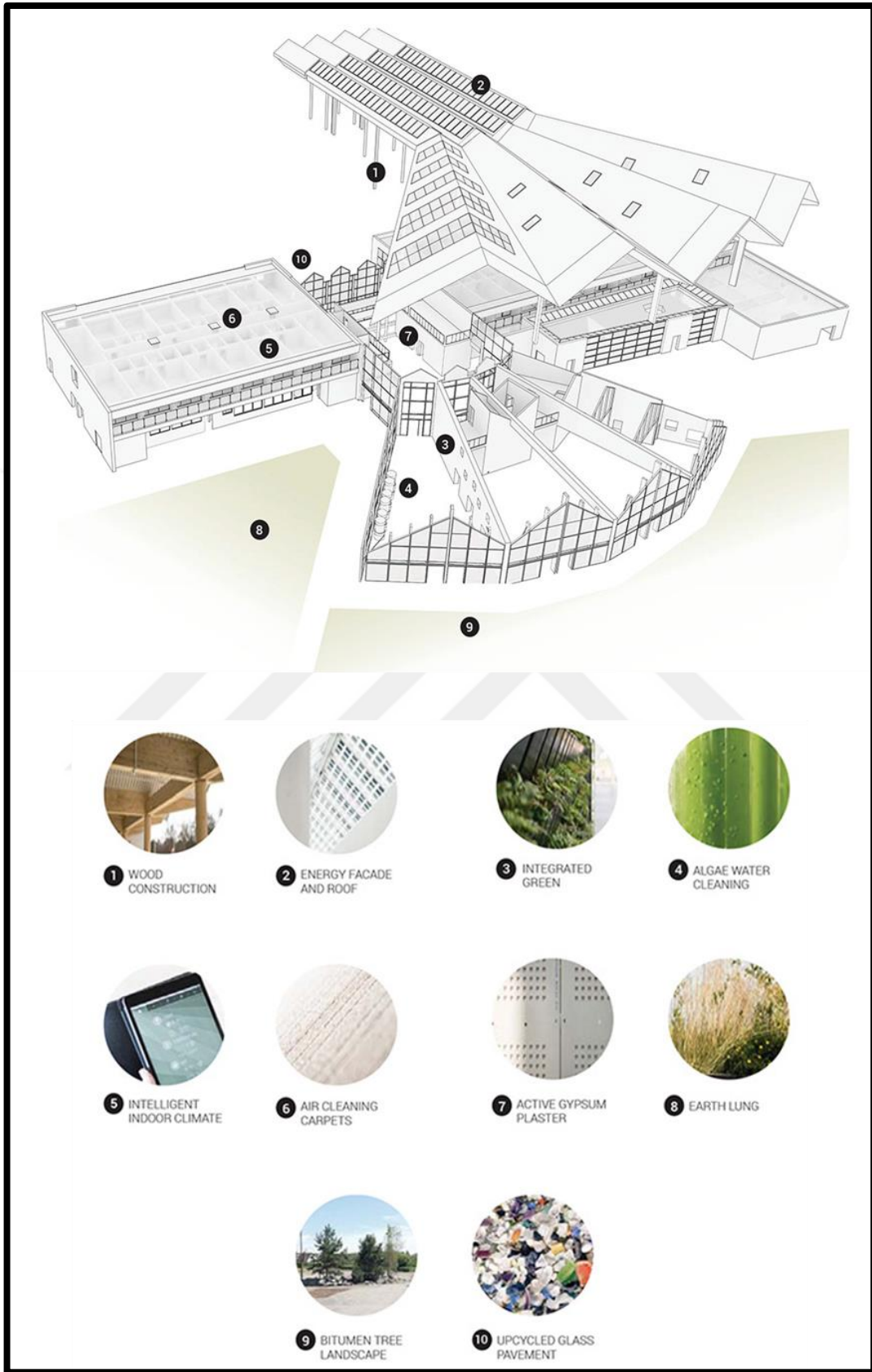


Figure 3.19: Shows the Aspects of Circularity, Sustainability and Intelligence in the Design of the Green Solution House (GXN, 2015).



Figure 3.20: Shows the Smart Aspect of the Green Solution House With the Intelligent Control Through Tablet and Touch Screen Display to Control Rooms Energy, Light, Air, and Water for Best Experience and Efficiency (GXN, 2015).

In the following table the circular design and smart design aspects of similarity and differences will show and most of them are considered as advantages of each strategy:

Table 3.3: Shows the Similarities and Differences Between the Circular Design and the Smart Design In Terms Of Advantages, Benefits and Uses (Created By Author) (Radius, 2019) (Paradise & Schwartz , 2022) (Deltek, 2021) (EllenMacarthurFoundation, 2022).

	Circular design	Smart design
Benefits	Reduced environmental impact	Reduced environmental impact
	Improved resource efficiency	Improved resource efficiency
	Increased durability	Enhanced safety
	New business opportunities	Data-driven decision-making
	Repurpose ability	Improved user experience
	Assembly and Disassembly	Compact and multipurpose product
	Increase Product Value	Increased Product efficiency
	Enhance the sustainability of products	Create sustainable products

Table 3.3: Shows the Similarities and Differences Between the Circular Design and the Smart Design In Terms Of Advantages, Benefits and Uses (Created By Author) (Radius, 2019) (Paradise & Schwartz , 2022) (Deltek, 2021) (EllenMacarthurFoundation, 2022). “Table Continued”

	Circular design	Smart design
Uses	The goal of the circular design methodology is to develop systems and products that function in closed loops, with minimal waste and ongoing resource reuse. (EllenMacarthurFoundation, 2022)	Smart design refers to the application of data and technology to enhance the effectiveness and sustainability of systems and products. (Radius, 2019)
	Energy efficiency	Energy efficiency
	Waste Reduction	Waste Reduction
	Furniture Design	Furniture Design
	Architecture	Technology
	Urban planning	Transportation
	Any type of product design	Product design related to technology

3.4 CIRCULAR DESIGN STRATEGIES IN INTERIOR ARCHITECTURE

Architecture and interior architecture is a branch of design that cannot be ignored in the concept of the CE which makes it a target for the modification and implementation of the CE-related design strategies. Implementing the concept of CE and Circular design in Architecture can be done by extending the life of buildings and structures by creating different and innovative design approaches with the design for deconstruction DfDc (G. Benachio, M. Freitas, S. Tavares, 2020), second approach would be design for reuse where the material used in the design is durable and strong in order to prolong the lifetimes of the product in its first lifecycle to prevent the waste for as long as possible and thirdly the approach of design for repair DfR and manufacturing which allows the users to repair the products easily by making them modular and lightweight with the idea of making QR codes for each module so that the user can just scan the code and be able to order the replacement easily (Minunno, O'Grady, Morrison, & Gruner, 2020), and last but not least the adaptive design approach which helps the users with the assembly, disassembly and reassembly by making it adaptable with them and not needing any tools to do so (Khan, 2022). All these strategies can be implemented in the interior architecture and furniture design as well. In

addition to the mentioned approaches by which the designers will abide to implement circularity in architecture there were discussions and suggestions of usage of new materials renewable and reusable to replace these of the linear design such as the mass timber products and lime mortar instead of the cement mortar to make bricks for example that would make the structural components of the space more flexible and valuable in terms of circularity (Cambell, 2018). Additionally digital technologies like digital twins (virtual replicas of systems or subsystems, such as products, buildings and furniture) and material passports, which are digital combinations of data characterizing and describing the materials and their components in products and systems, are also thought to be enablers of circular design because they can inform designers and decision-makers about the technical and structural reversibility of the product and how it can be used in the best way possible for as long as possible (Debacker, Manshoven, Peters, & De Weerd, 2017).

An example of the implementation of the CE in interior Architecture can be one of the suggested projects by an Architecture student in the Delft University of Technology that can show circular design application in architecture and interior architecture. The title of the suggested project is (1/2 Footprint 2/1 Comfort). This is a project designed by Melanie Berends for her master's degree presentation about a resident-perspective on circularity where she discussed and demonstrated the importance and advantages of using the circular design for both interior and exterior architecture (Berends, 2021). The project looks at circularity from the perspective of the user. A group that is largely unfamiliar with this environmental issue but is nonetheless a crucial link in the circularity chain, Residents are asked to not only design, but also assemble, disassemble, and reassemble the infill system, thanks to the circular solution of a Modular infill system. In this way, residents' intrinsic desire for circular solutions is enhanced. During the research, the requirements that the infill system should meet in order to be user-friendly for non-experienced builders were investigated. In addition, the concept addresses the current housing market-pricing mismatch by questioning and exploring a new balance of room to buy versus space to utilize. It does this through the dual usage of furniture incorporated into the Modular infill system, as well as the creation of a collective body, which encourages occupants to appreciate the merits of all building blocks in the ensemble. The project embeds itself by sharing its qualities with the people around it and nature through its creation, the use of minor modules, the plinth concept, and the utilization of the neighboring qualities (Berends, 2021).



Figure 3.21: Shows The Floor Plan of the Modular Design of 1/2 Footprint 2/1 Comfort Project (Berends, 2021).

The plans were designed in a way that each space has specific dimensions and modules (check figure 3.21), where the new inhabitant will choose the area needed for him to live in. The modules are designed as open spaces, prepared to be divided as needed with modular panels where the installation is completely premade. For example, each part of the existing walls has wholes that can be used to attach the other modular parts, the modular units can be various such as wall panels, prefabricated doors, windows, etc. This design is user-friendly because the new inhabitant can customize his house the way he likes with cheap, light and small materials that he can carry on his own without any help from transportation firm, or any experienced worker to assemble his furniture. The design is even made of parts like puzzles that can be fixed without any tools or extra accessories (Berends, 2021). Therefore, all that is needed for the person to move, install, fix or renovate his space is already available in the kit he already purchased without the need of any extra cost or any outsourcing for help of expertise, this can be demonstrated in the list below which includes all the guidelines, the items, modules or units and the connectors. The circular design used in this project provides all kinds of modules, forms, and toolbox to build any function needed in any house, these tools can be used, reused, assembled and disassembled without any damage, they are small in size, light in weight and each part can be used to form more than one object.

The following table (3.4) will show the components made specifically for this circular project which makes it easier for customization and user-friendly.

Table 3.4: Shows the Components of Each Product Kit and Their Characteristics (Edited by Author).











	<p>Components have pre-fabricated holes insertion points</p>
	<p>Connectors are integrated into the product</p>
	<p>The product consists of 1 to 4 connectors only</p>
	<p>The product consists of 1 to 4 components or units</p>
	<p>The product comprises 1 to 2 types of connectors</p>
	<p>Assembly and disassembly can be completed easily without damage to the product.</p>
	<p>Double the size of the connectors is provided as tolerance</p>
	<p>Tools are not required: can be accomplished by hand / common tools are required.</p>

Table 3.4: Shows the Components of Each Product Kit and Their Characteristics (Edited by Author). “Tables Continued”.

	<p>Connection is freely accessible, and ample space for hands and or tools</p>
	<p>The product comprises 1 to 2 types of components</p>
	<p>Product has market standard dimensions and movable by hand less than 1000x600x100 mm</p>
	<p>Product has a market standard dry-connection system, during the disassembly the connectors will stay intact (integrated Connectors/ clips/ magnets/ Velcro/ screw/ bolts and nuts)</p>
	<p>The product is manageable with one hand (weight is less than 7.5 kg)</p>
	<p>Less than 4 motions are needed to assemble / disassemble</p>
	<p>Components can be interchangeable between each other and between other systems</p>
	<p>An assembly and disassembly video tutorial is available</p>

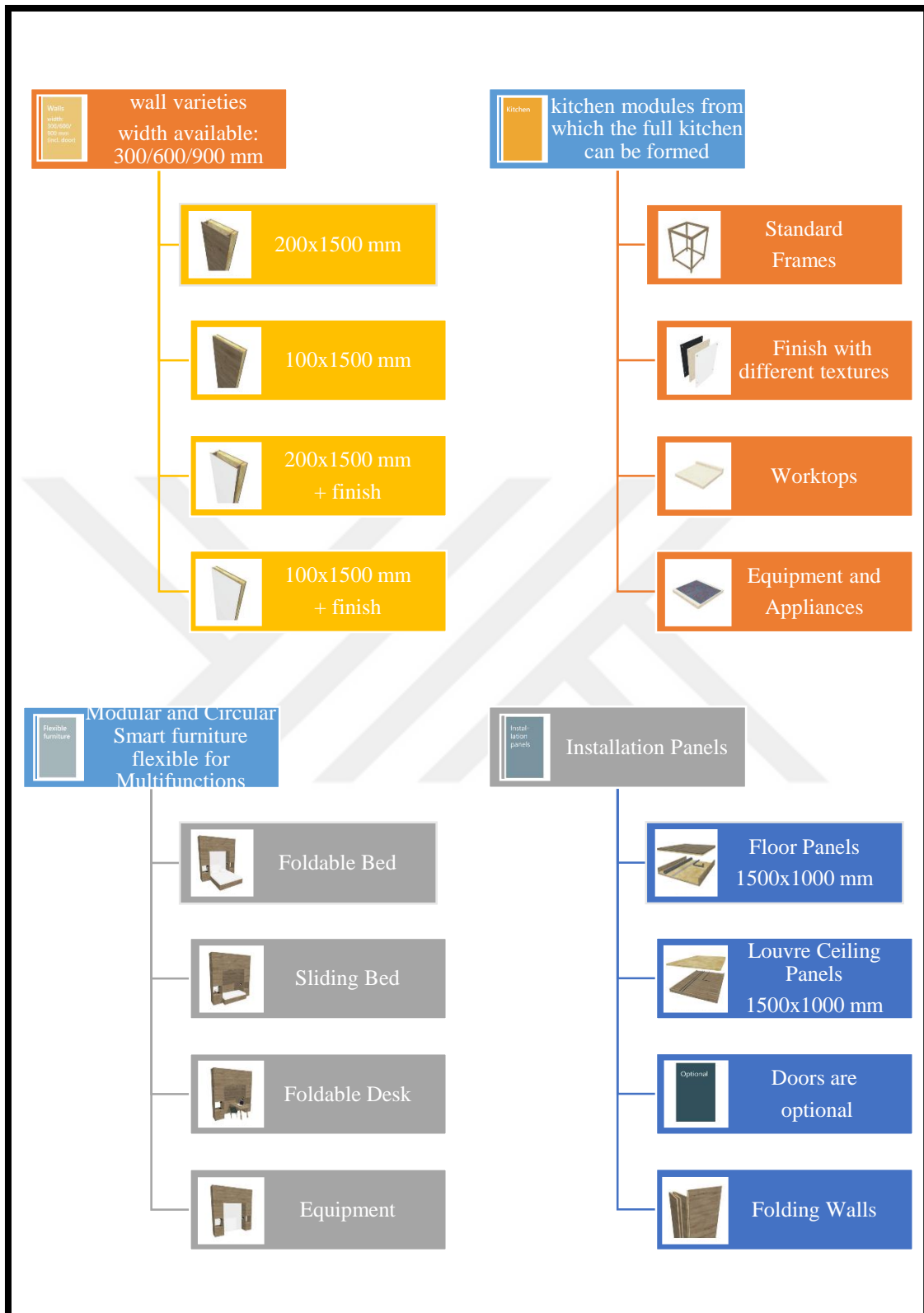


Figure 3.22: Shows the Toolbox, and Modules That Can Be Purchased to Form the Interior of the Units (Part 1).(Edited by Author).

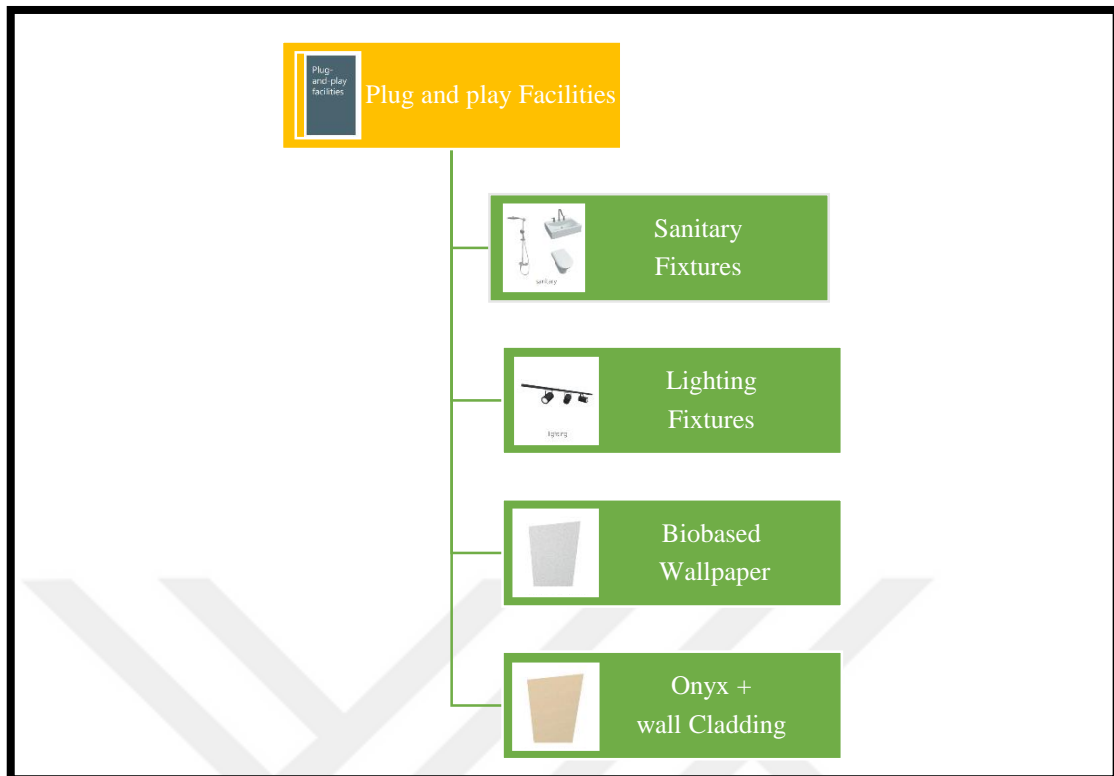


Figure 3.23: Shows the Toolbox, and Modules That Can Be Purchased to Form the Interior of the Units (Part 2).(Edited by Author).



Figure 3.24: Shows How a Modular Infill System Furniture Can Be Assembled , Disassemble and Reassemble Even by Residents Who Have No Experience in Building (*Berends, 2021*).

With the variety of modules and tools presented in the toolbox suggested by the designer of this project the possibility of changing, mix and matching, easy assembly and disassembling and the possibilities of forming so many compositions became easier, the user can make his own living space according to his needs and capabilities and can add and customize whenever the situation of his living and lifestyle changes. It even makes it possible for the user to move to any place with any distribution of the rooms and still be able to use his old modular furniture in order to suit the geometry of the space he occupies (Berends, 2021).

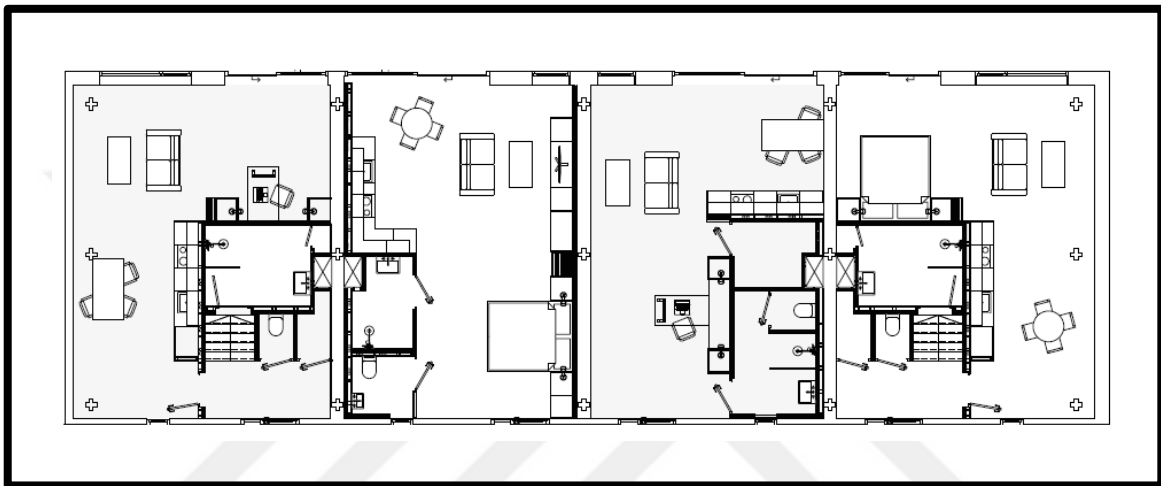


Figure 3.25: Shows the Variety of Compositions and Uses of Each Unit Within the Same Area (Bates, 2022).

In the previous picture 3.10, the designer shows an example of the variety of options and circulations that can be done with the same items in different scenarios. With the use of modular design, the designer also included the concept of smart furniture or in other words the small space foldable furniture; to meet the preferences of the new residents in accordance with their financial capacity instead of getting a huge apartment and having to furnish every part of it, the new modules help saving space by serving two or more functions at a time. For example, the space will adapt to the function you need when you need it as shown in the following pictures. During day time the bedroom area can turn into working area or small office while in night the same space is used as a bedroom where no one can see in the morning because the main concept behind this is getting a Space to use not a Space to own (Berends, 2021).



Figure 3.26: Shows the Appearance of the Space Within the Day-Time Where the Function Is for Activity and Study or Work (Berends, 2021).



Figure 3.27: Shows the Modification That Happened to the Same Space at Night-Time Where the Main Function Is to Rest and Sleep (Berends, 2021).

And to show the worth of this kind of idea the designer showed in figure 3.28 how much space they saved by using modules that can serve many functions at the same time and instead of buying a 68sqm house they used 68sqm inside a house of the area 52sqm only.

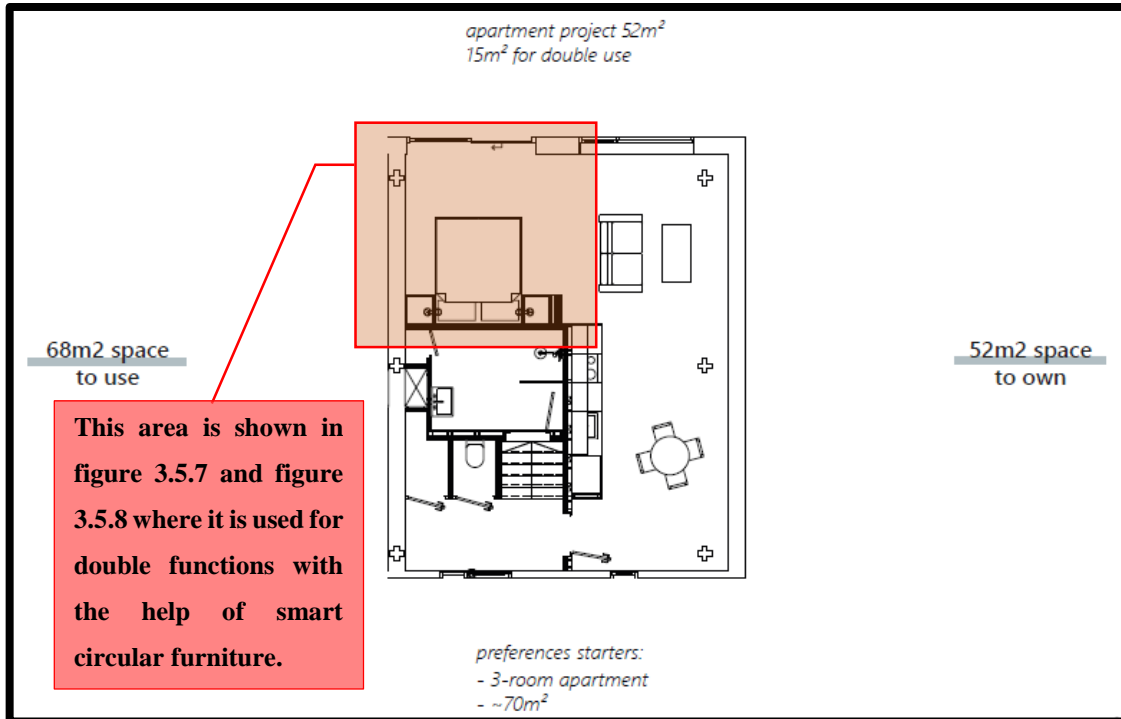


Figure 3.28: Shows the Usage of the Small Space in as Many Functions as Possible Instead of Owning a Big Area With One Function That Would Be Wasted for Nothing (Edited By Author).

And at the same time by having this circular modular design, the user is not losing any of the worth of his items since he can reuse them again no matter what the scenario was, the chart in figure 3.29 shows this theory. So each one of these parts will keep its value, while you are using it repeatedly in different functions and variable locations or materials.





	elements	€/element	€*elements	residual value
	14	5,00	70,00€	50,00€
	3	3,00	9,00€	6,00€
	5	2,50	12,50€	5,00€
	1	8,00	8,00€	6,00€
	23		99,50€	67,00€
Apartment 52m ²			500,00€	
Total rent:			599,50€	

Figure 3.29: Shows How the Design Elements and Modules Can Keep Its Value by Having a List of Components With a Clear Pricing List (Berends, 2021).

In conclusion, circular design concepts can greatly influence interior design by encouraging environmentally good and sustainable behaviors. Circular design can influence more sustainable interiors in a variety of ways, including adaptable spaces, modular furniture, sustainable materials, waste reduction, and Biophilic design. Interior designers can contribute to the development of a future that is more resource-effective and sustainable by using circular design principles.

Examples of the ways circular design enhances interior design:

- a. **Adaptable space:** Using circular design concepts in interior architecture entails making flexible rooms that can be quickly altered to accommodate changing requirements. This strategy lowers waste while reducing the requirement for new development (Ugreen, 2023).
- b. **Modular furniture:** Choosing modular furniture is also a way to apply circular design concepts to home decoration. The simplicity of disassembling and reassembling modular furniture makes it more convenient to repair and recycle (Ugreen, 2023).
- c. **Sustainable materials:** Utilizing sustainable materials that reduce their negative effects on the environment and encourage resource efficiency is also essential for circular design in interior decorating. Natural materials, recyclable materials, and recycled materials are examples of sustainable materials (Ugreen, 2023).
- d. **Waste reduction:** Waste reduction is a key component of the circular design concepts for interior architecture, along with resource optimization (Rob Atkinson, n.d.). By using circular materials in their designs, furniture makers may lessen their reliance on virgin resources, lower their environmental impact, and advance a more sustainable future (Kidd E, 2023).
- e. **Biophilic Design:** Biophilic interior design, which blends natural elements and materials into interior spaces, may also be done using circular design concepts (Wellbeing Design Consultants, 2022). By lowering stress, enhancing air quality, and boosting energy efficiency, Biophilic design may support well-being and sustainability.

3.5 CIRCULAR DESIGN EFFECTS ON FURNITURE VALUE

The circular design strategies can have an effect on the furniture value in different ways, especially when it helps extending the furniture's lifespan, when it helps increase the resale value, when it reduces the maintenance costs and the operating costs, and when it enhances the brand reputation and the customer loyalty. All these factors can be achieved by following the circular design strategies and by adopting a certain lifestyle which helps increase the sustainability and benefit the economy.

This chapter shows some examples of how by implementing the practices and strategies of the circular design some individuals as well as well-known companies were able to increase the value of their furniture by using DIY (do it yourself) skills, self-services and some effort of participation, as well as repurposing and after sales strategies.

3.5.1 DIY Projects

The acronym DIY stands for "do it yourself" and refers to the activity of making or repairing things in your home without the help of a professional. DIY projects can range from simple tasks such as putting up shelves to more complex projects such as renovating a room. DIY is often associated with saving money, as it allows people to complete tasks without having to pay for professional services (MORGAN, 2018). Circular economy and DIY projects are related in the sense that both promote sustainable practices and reducing waste by reusing and repurposing materials. In a circular economy, resources are kept in use for as long as possible and waste is minimized, and in DIY projects, individuals often use discarded or second-hand materials to create new items, which aligns with the principles of a circular economy. By embracing DIY, individuals can also reduce their reliance on new products, giving more value to the old items and making your own household supplies. Current DIY fads have emerged as not just affordable alternatives but also potential solutions to sustainability and climate change (Chong, 2020).

For instance, DIY remodeling initiatives have increased recently, according to surveys (Baker & Wedeen, 2020), and the global DIY renovation ware stores and home improvement retail market is expected to generate \$1278.0 billion in sales between 2022 and 2030 (CG : Home Products, 2022) in figure 3.5.3.

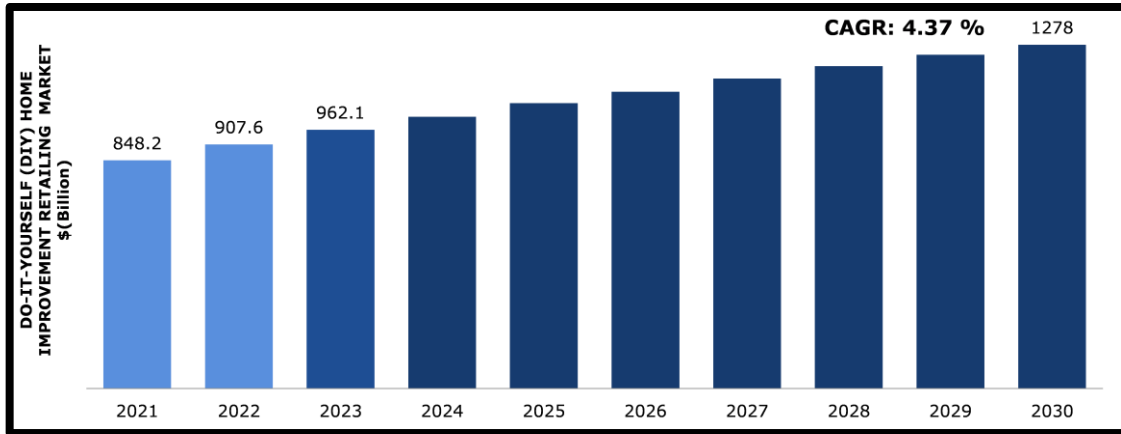


Figure 3.30: Shows the Effect of DIY Projects Popularity on the Sales Improvement of Retail Shops (CG : Home Products, 2022).

The DIY projects can be directly related to the circular economy and specifically circular design and furniture market since DIYers can take into consideration the principals of circular design, because it reduces waste and increases the old products value, while they follow the principles of reuse and refurbish, assemble and reassemble, as well as prolonging the EoL of the products especially their old furniture (Chong, 2020). A number of companies are developing alluring concepts to increase their customer base, with a goal of being a zero-waste business. For instance, Earthy Good is creating and providing eco-friendly DIY items. (CG : Home Products, 2022), And IKEA who committed to becoming a circular business by 2030 designing products with built in circular capabilities with modules that can be used for assembly and disassembly and repurposing while being completely use-friendly (IKEA, n.d.). Following the lead of such companies the users can boost the economy of their country by adopting sustainable lifestyle and by following the circular design strategies which increases the value of each product and component. Additionally, The "use-and-throw-away" mentality and excessive consumption are becoming less popular because people are learning how to recycle, reuse, repair, or otherwise repurpose items thanks to the skills they acquired from DIY projects and the awareness spread about the circular design concepts and the sustainability strategies enhanced by the practices of DIY practices (GATEA, 2022). DIY projects are becoming more popular giving used items bought at secondhand stores a new life therefore more value and less waste (CG : Home Products, 2022) therefore increasing the value of old furniture. Despite all the positive sides of the DIY in increasing the furniture value, there might be some negative aspects too, the following table will compare between both aspects accordingly.

Table 3.5: Shows How DIY Projects Can Have an Effect on Furniture Value in Positive and Negative Ways According to Each Situation (Created by Author).

Positive effect of DIY on furniture value	Negative effect of DIY on furniture value
<p>Personalization: DIY projects can make furniture unique and increase its value to the owner by adding personal touches or creative modifications. (Futurelearn, 2020)</p>	<p>Aesthetic appeal: If the person was not talented or made the DIY with poor skills this will make the piece less appealing and decrease its value. (Rose, 2023)</p>
<p>Functionality: Upcycling or repurposing furniture can increase its functionality, making it more valuable to the owner and potentially to others. (Futurelearn, 2020)</p>	<p>Materials: Using low-quality materials in a DIY project can affect the durability of the furniture and will make its virtual life shorter, which will reduce its value. (Rose, 2023)</p>
<p>Cost savings: The owner can save money compared to purchasing new furniture, this will make the item they made more valuable to them. (Futurelearn, 2020)</p>	<p>Craftsmanship: When a person who doesn't have the skills makes furniture he might not take care for details which will make the furniture look less professional which will lower its value. (Rose, 2023)</p>
<p>Environmental sustainability: By recycling the materials or repurposing furniture the users can help the environment, which can be seen as a positive factor in sustainability and increase the value of the piece. (Futurelearn, 2020)</p>	<p>Historical significance: Modifying antique or vintage furniture can remove original details and compromise its historical significance, reducing its value. (Rose, 2023)</p>
<p>Creativity: By making original pieces from old ones the person shows his creative side and can even earn more for selling a custom made version of a popular piece of furniture if it was well-executed and attractive (Futurelearn, 2020).</p>	<p>Market trends: Furniture value is also influenced by current market trends, and DIY projects may not align with current styles, affecting their value (Rose, 2023).</p>

3.5.2 The IKEA Effect

As mentioned before, IKEA adopted the principles of circular design by designing products with built in circular capabilities with modules that can be used for assembly and disassembly and repurposing while being completely use-friendly. The main goal is to involve the user in the process of building, repairing or customizing their own furniture which aligns with DIY aspects and the circular design strategies (IKEA, n.d.). In addition to that the IKEA team found out by incidence that getting their customers involved in the assembly process creates a bond between them and the product which increases the value of the product for them, and this phenomenon was called the IKEA effect (Sarstedt & Neubert, 2016). In 2011, Harvard Business School's Michael I. Norton, Yale University's Daniel Mochon, and Duke University's Dan Ariely published the first experimental data on the IKEA effect. Their research shows that self-assembly has an impact on how customers evaluate a product. The findings imply that when people make a product with their own work, even if it is poorly done, they value the result more than, if they did not put any effort into its construction (Norton, Mochon, & Ariely, 2012), which means that through the promotion of a sense of attachment, ownership, and perceived value for the product or furniture, circular design can capitalize on the psychological advantages of the IKEA effect (İşbilen, 2012).

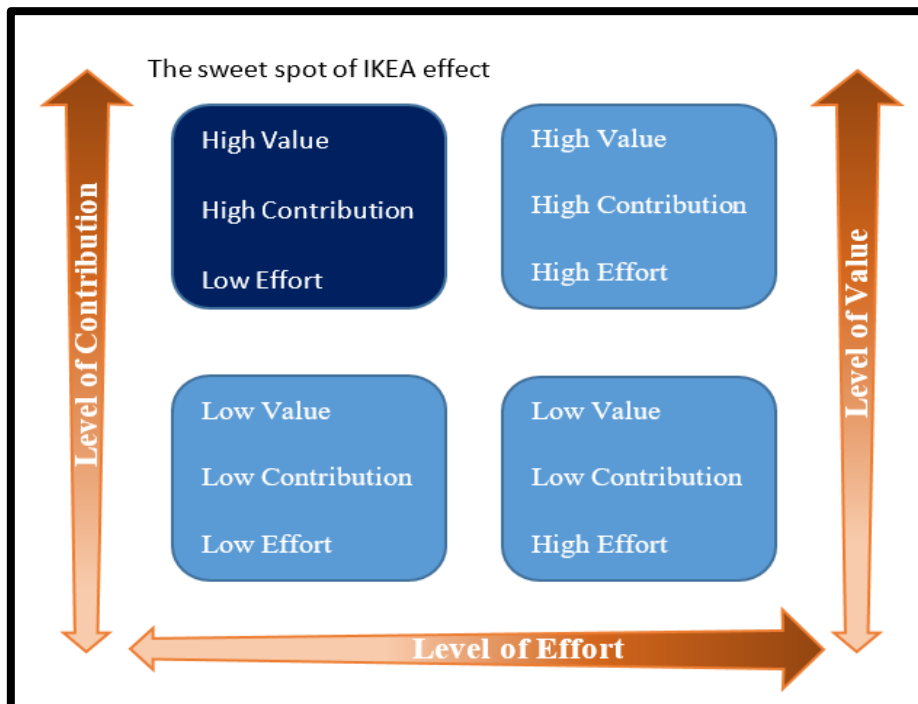


Figure 3.31:Shows How the Value, Effort and Contribution Level Effects on the Total Value of Furniture for the Customers (Edited by Author).

Some people say that the IKEA brand started the trend of circular design. Actually, it was only a reason that more spotlight was shining on it, And according to some researches about the IKEA effect, the researchers said that people are making more waste because they had no bond with the items they are using, and they don't value the materials or the items they have (Mariani, september 2016).

Just like IKEA adopted the strategies of circular design and affected the spread of it using psychological approaches, it also shares some philosophical aspects and principles with the European Bauhaus movement generated from the original Bauhaus which helped creating more sustainable furniture that boost the increase of their value on many levels (Iles, 2021). Both the circular design and the Bauhaus approach focus on efficiency, functionality as well as the integration of the form and function of the designed product (Iles, 2021). The Bauhaus method sought to produce designs that could be mass produced and used by a large audience. In addition to promoting accessibility and scalability, circular design works to develop systems and products that can be widely used to advance sustainability and circularity as well as focusing on user-friendly aspects which encourages users to be more aware of the value of their products and teaches them how to take advantage of every part wisely with creativity (Iles, 2021). It's important to note that even though the circular design and the Bauhaus movement are more interested in making comprehensive design philosophies that embrace a variety of ideas and methods, the IKEA effect is more concerned with the user's emotional attachment and perceived value. However, in terms of user involvement, value perception, and sustainable design principles, all three ideas might overlap.

3.5.3 Furniture as a Service (FaaS)

Just like IKEA, Earthy Good, and other well-known companies adopted the principles of circular design and sustainability, a new kind of service was introduced to the market within the last few years known as FaaS (furniture as a service) the concept behind this service is to reduce waste and extend the EoL of furniture to the maximum extent which can help in increasing the value of old and used furniture (Ellenmacarthurfoundation, 2021). By minimizing waste, maximizing resource use, and encouraging a change to more sustainable consumption patterns, FaaS can support the objectives of circular design and the new European Bauhaus. By providing furniture as a service, the model promotes reuse, lessens the demand for new furniture production, and makes it easier for the furniture business to

implement circular economy concepts (Carlson, 2020). FaaS suggests that instead of buying furniture the consumers can rent them from retail shops and manufacturer and have a close ended contract with a known duration in which the customer will pay an amount of money monthly to the supplier until the contract ends or until the user decides that they don't want to use this piece of furniture anymore, in that case they return the product to the supplier and they can either replace it with another product with the same service with the supplier or just get the furniture from a different place (Selibio, 2022), this service can enhance customer loyalty and at the same time the old furniture will have another chance to be used by another user without being disposed and in case of any damage the supplier or manufacturer will have his own resources and replacement parts and the expertise to fix it with more convenient price and in better conditions, then this will extend its life and make it reusable again (Buch & Trenk, 2021). FaaS is considered as a part of two relatively new trends which are Sharing Economy and Circular Economy, these two trends are considered as a lifestyle adopting high awareness towards sustainability, economy and environment (Northsearegion, 2014). The idea of FaaS evolved and became more popular when linked to circular economy because the goal became to know what happened to the furniture after using it, because even if the manufacturer made it according to the CE principles with recycled materials and low weigh components that can be disassembled and reused or repurposed, if the consumer throws it at the end of his use the whole effort will be wasted, so by using FaaS rules the manufacturers stays the owner and can ensure that materials, elements and the embedded resources from the furniture are conserved and reused (Ellenmacarthurfoundation, 2021).

FaaS was first proposed at the beginning of 2010, but it has lately gained popularity as a result of shifting consumer habits and an increased consciousness of environmental issues. Considering that more people are now working from home and are seeking adaptable and economical furniture options (Selibio, 2022). A variety of furniture alternatives, from single pieces of furniture to fully furnished rooms or apartments, are frequently provided by FaaS firms and suppliers. Numerous FaaS businesses also provide shipping, assembly, and maintenance services, and customers can select from a variety of styles and quality levels. According to the company and the quality and structure, the pricing structure for FaaS might change, but it is often based on a monthly charge or a pay-per-use basis (Verdon, 2022). In addition to the (FF&E) Furniture, Fixtures, and Equipment factors which can affect the

prices of furniture related to manufacturing (Bloomenthal, 2022) and components (figure 3.17).

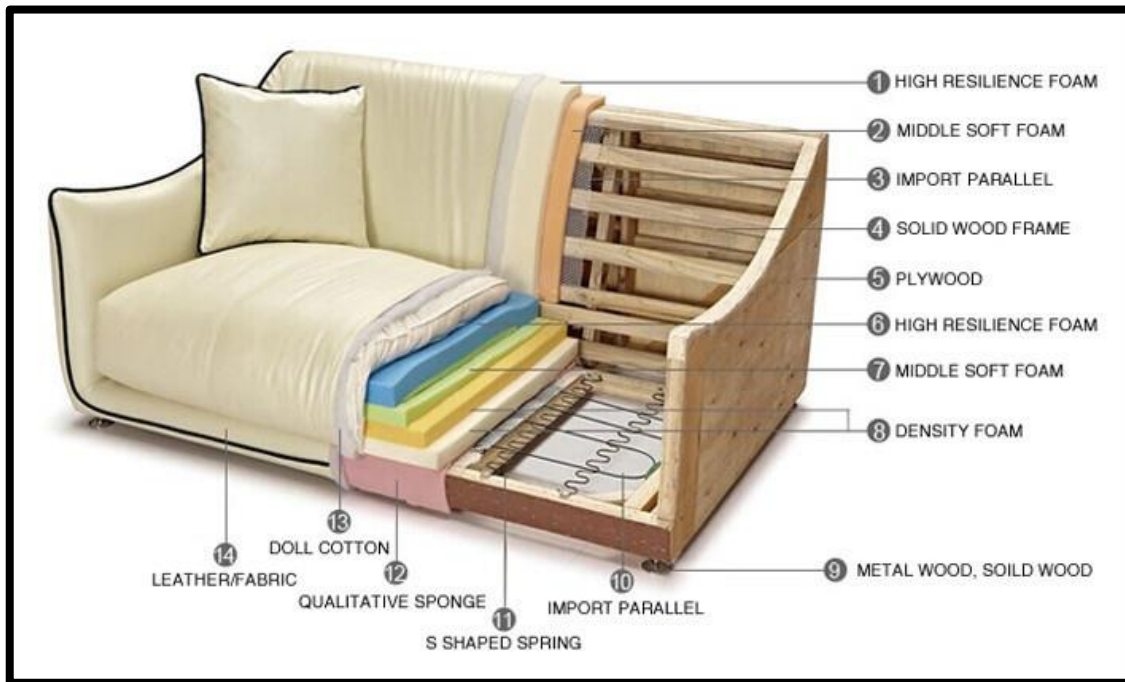


Figure 3.32: Shows the Material and Structure of the Furniture According to Which the Price Might Change (Hipcouch, 82017).

In addition to these services, manufacturers of the FaaS furniture line made it easier for users who want to be able to repair their purchased products by giving each component of the furniture modules a QR code, so in case of damage the consumer sends the code to the manufacturer to get a replacement. At the same time the manufacturer can track the history of all modules and asses which ones were the most fragile to enhance the quality and give better replacement by tracking the number of orders (Ellenmacarthurfoundation, 2021).

The flexibility of FaaS is one of its main benefits because customers don't need to buy and dispose of furniture, which would be relatively expensive especially for people who move occasionally, like students abroad or young professionals since they can avoid the need to relocate bulky furniture and the hustle of selling the furniture. Instead, they may effortlessly replace their furniture to suit their needs wherever they go and the company and suppliers can take care of the rest and most importantly all this would be with less payments and the used furniture will still keep its value since it will be rented out again by a new customer (Verdon, 2022). Another benefit of FaaS is sustainability, businesses may ensure that furniture is reused and not thrown out after a brief period of usage by leasing it, which

reduces waste and resource consumption. FaaS businesses also frequently employ more environmentally friendly materials and manufacturing techniques, significantly lowering their environmental effect which is directly related to the concept of circular economy (Ellenmacarthurfoundation, 2021) (Iberdrola, 2023) (Hipcouch, 82017).

As a conclusion, the FaaS can affect the value of furniture in many ways, but mainly it can affect the quality, depreciation and perception in addition to giving the users the option of renovation without creating a lot of waste.

One of the popular companies who is following the practices of FaaS and making sure that no furniture is getting wasted is KaiYO, who is taking old furniture from old owners, refurbishing it and reselling it or renting it with affordable prices while at the same time standing up for the national forest foundation and the practices of sustainability, circularity and saving the environment, their motto is “Rehome don’t throw out (Give furniture a second life in a second home)” (Kaiyo, 2022).

Table 3.6: The Effect of FaaS on Furniture Value (Selibio, 2022).

FaaS	Increase value	Decrease value
Quality	If the producer prioritizes the durability and quality to ensure that their furniture can withstand frequent use and transportation, the value will be high because it can be rented many times.	If the producer doesn’t prioritize the durability and quality, the product will be damaged and lost within the first or second use which will make it useless and the value will be wasted.
Depreciation	The furniture is rented for a short time, which will make it last for longer without losing the trend and with minimum damage and wear and tear. Value saved and be rented again.	The furniture is rented for a long time or bought, which will make it lose the trendy style because it is old, in addition to bigger chance of damage, wear and tear. Value saved and be rented again.
Perception	If FaaS gains popularity and acceptance, rented furniture will have more value.	If FaaS is perceived as less prestigious alternative to purchasing it will have a negative effect on furniture value.

4. SURVEY ON CIRCULAR DESIGN

4.1 DATA COLLECTION PROCESS

The main goals behind making the surveys are to measure the awareness of people about the concept of circular economy and circular design and to see how efficient and applicable are the solutions provided by the principles of this concept to solve the problems faced by people in the contemporary life whether they were designers, users, or manufacturers. Moreover, the questionnaires aim to find a link between the efficiency of these solutions and the role of the mentioned groups in spreading the concept of circular economy and its practices in addition to discovering what are the main factors preventing the circular economy to unleash its full potential to offering the ultimate benefit from its solutions. Therefore, before forming the questions it was necessary to specify the target participants to this questionnaire to get the best results (Grand.Canyon, 2021). The participants were people who live in Lebanon, and Turkey. To obtain the results desired in this thesis and to fulfill the aim of this questionnaire 3 versions of surveys were formed instead of making one questionnaire for all participants different but related questionnaires were formed according to the variety of participant's backgrounds and professions therefore the division was put into groups and the groups were divided according to their relation with the circular economy and its practices which eventually lead to the following categories: the designers and architects, the users and finally the market representatives such as manufacturers, showroom owners, workers, salesmen, and sales consultants. To get the best results, and in order to match each person's ability to understand the questions clearly and to collect a more authentic and specific data which can lead to precise numbers and statistics, the questions were sometimes duplicated with different words and terminology. The questions were inspired from the observations of the current situation of people all over the world and more closely in Turkey and Lebanon, and from the information collected in the previous chapters about the circular economy and the circular design. Some previous articles and thesis about this topic were viewed and some of the questions were inspired by their previous research and recommendations (Dokter, 2021). The first questionnaire was targeting the users to see and evaluate their relation with the circular economy and to measure their awareness toward this topic and asks them about suggestions to make it more appealing to them, this questionnaire includes 30 questions. The second questionnaire was targeting the designers and architects, the aim of this questionnaire

is to also measure the awareness of designers about this concept and to know how they are approaching it in their design process and in their services and most importantly the thesis aimed to measure the importance of their role in spreading the concept of circular design and if they are doing any effort to create a more sustainable life. This questionnaire was also containing 30 questions, and some of the questions empathized on the size of the company and the number of client to measure the impact of the company on the market and if it is relatable with the size of the company or not. The last questionnaire was targeting the market and supply chains including the manufacturers, furniture showrooms and chain stores, the questionnaire included 20 questions aiming to evaluate the awareness of the workers in this sector about the CE and to see if they are playing any role in manipulating the demand of the users of specific trends, in addition to measuring how important is their role in the spread of CD. The questionnaire includes some questions about the company policies and about the clients at the same time to compare and understand better the situation of the market. The questionnaires forms were made using the KoboToolsbox website used by humanitarian organizations to collect data with authenticity and safe use (Cassidy, 2017), in addition to being easy to share with participants and less complicated (vwo, 2021), Google-forms websites has some limitations because of the traditional interface that's why it was not used. The questionnaires were tested on a number of people before then the final version of each questionnaire is deployed and ready to collect responses. First of all, for reaching out to users the target was random people above the age of 18 with the restriction of designers, showroom owners and salesmen, the questionnaire was distributed to them via Link on WhatsApp. As for the designers and architects, the questionnaire was sent to them via Email and same goes for the showroom owners and employees, their Email address or contact number were reached thru their websites and they were contacted and requested to spread the survey among their employees and workers. All 3 questionnaires included the general personal questions that are standardized in almost all social surveys and questionnaires about age, gender and profession which is also known as demographic questions (Voxco, 2020) at the beginning of the questionnaire, then the other questions were made according to the information collection need and according to a disciplined story-like flow. After collecting the data from the answers of the participants the elimination part was necessary to get reliable information since some of the responses were not complete, others were from duplicate emails, and others were answered by the wrong category. For example, some of the user's

questionnaire were done by a designer or the opposite. The non-useful responses were eliminated and not considered in the collection of reliable data (Grand.Canyon, 2021). After filtering the usable responses, a sum of 90 responses, 30 from each group was left. Comparing between the data received from the 3 groups with the literature review and the observations will generate the main findings of this thesis which will be used to suggest some solutions and new horizon for future researches.

4.2 FINDINGS

First of all, after the demographic questions and in order to relate with the main problematic that inspired me to conduct this thesis research I started with the questionnaire targeting the users which are referred to as clients in some situations. While making the questionnaire for the users first I tried to make the questions as simple as possible with less technicality and more daily life related terminology. The aim of the thesis was to measure the severity of the situation mentioned in the thesis problematic according to the observations that shows that people of the current generation are struggling with the loads of economic and social burdens which makes them obliged to keep relocating and transferring from place to place with all that comes with this procedure from payments, struggles and waste. Therefore, and in order to show this statistically and put it into numbers to validate the choice of this topic and its importance, two important questions were asked. The first question is about the frequency of relocation of participants within the last 5 years and the other one was about the number of times they renovated their houses within the same period. The statistics show that the primary observation about the multiple times of relocation of the population is correct among the users, since only 20 percent of the participants said that they never changed their houses and mainly the ones who responded like this were participants above 50 years' old which means they were the last generation which struggled less with the housing problems and ownership instead of rental houses. Figure 4.1 shows that 33.33 percent of the participants relocated only once, 20 percent had to relocate twice within 5 years and 16.67 percent moved 3 times from house to house, and mainly the latter category was either the students or the young graduates who are still looking for good job opportunities and professional life which makes them relocate even more, while the last 10 percent had even to move more than 3 times from house to house within 5 years. This shows that the relocation is a real problematic for contemporary people when it comes to all the hustle and costs of moving.

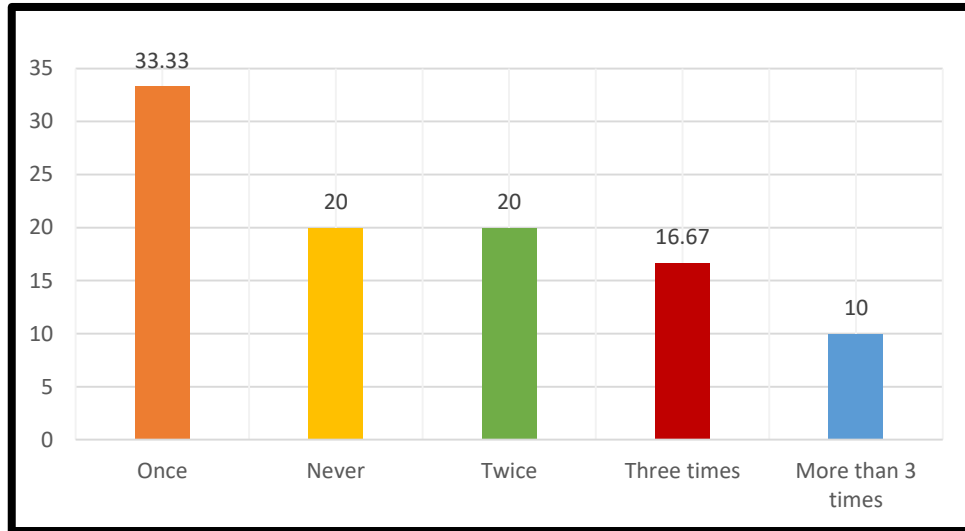


Figure 4.1: Shows that the Problematic Stated in the Thesis Was Validated by the Percentage of How Frequently People Are Moving From Their Houses Within The Last 5 Years (by Author).

On the other hand, 50 percent of the participants noted that within the last 5 years they have never renovated their houses while the other 50 were divided into 33.33 percent who did once, 10 percent who did twice and the rest did 3 or more times which is only understandable because with the frequency of moving from a house to another people are not even finding the time for renovation because they are already obliged to do it by moving to another place, and only the ones who are staying in the same house for more than 3 years are the ones who would think of renovation.

After evaluating the main situation of people in the contemporary life and understanding the relation of this situation with the problematic, understanding people's behavior and awareness related to this topic and to the thesis subject comes second as a priority of study. That is why the questions that came next were to see how people are adjusting with this situation and what are the dominant behaviors and practices of the population in the studied area, are they learning how to solve these problems from professionals, or are they just going with the flow and following their instincts. Participants were asked if they get any consultation before moving to other houses or if they ask experts to give them advice to help them reduce the damages and get the best results and the responses showed that more than third of the participants consider the advice of an expert as a must, while only 16 percent consider it not needed, and the rest go for it only when they feel like they need it. This shows that the role of designers to solve the issues of contemporary life is very important since the

majority of people come back to them for advice. On the other hand, if the designers were not to rely on there must be some logic among people to minimize the losses when possible, and to measure this logic within people and to see if it even relates with the logic of the circular economy so the following question was: what would you do with their furniture in case of house renovation. Frankly, 36.67 percent of the participants replied that it depends on the situation of the furniture without giving further explanations while 23.33 percent decided to keep the ones in good shape and replace the damaged ones with new furniture no matter what was the way of replacement such as throwing, selling or just giving it to someone. 13 percent decided to keep the ones in good shape and refurbish the damages ones and the same number of people preferred to sell all old furniture and buy new ones, this was shown in figure 4.2.

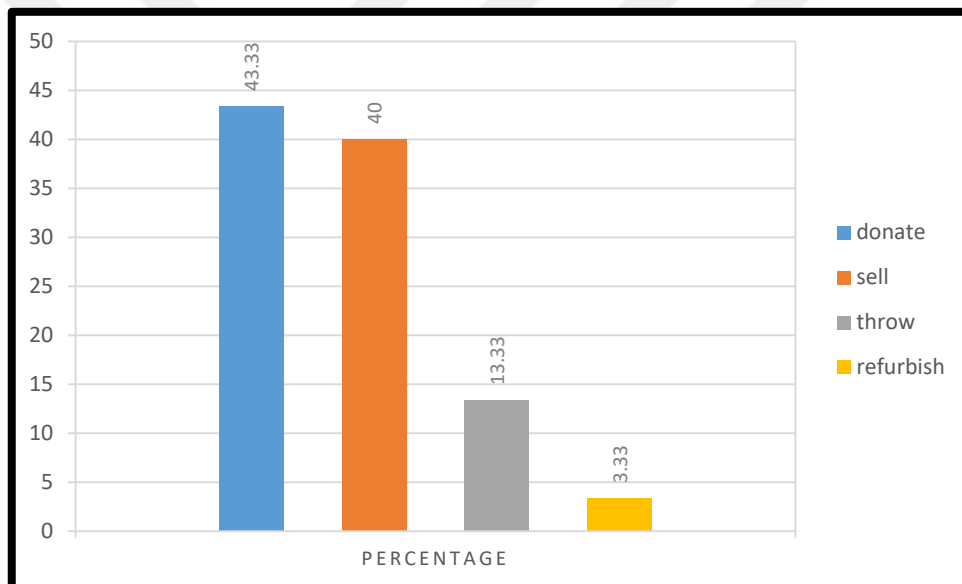


Figure 4.2: People Are Not Considering Throwing Any Product Unless It Was Badly Damaged, Which Means That There Is Some Environmental Responsibility (by Author).

Some answers would not be clear enough to evaluate the situation; an additional question was there to give different cases according to which we can understand the behavior of people. For instance, 90 percent of the population will keep the existing furniture and move it with them to a new house despite the expenses if the furniture was still trendy and in good shape while 6.67 percent would rather sell it because there is risk of damage and extra cost so they would just buy new ones with a guarantee from the seller to come in good shape and the rest would refurbish it anyway to get the new look feeling. In case of old fashioned furniture which is in good shape 56.67 percent of people prefer refurbishing it giving it a

trendier look and taking it with them to the new house, while 16.67 percent of them prefer getting rid of it by selling or donation and only 10 percent of the people would just keep it as it is as long as it is in a good condition. In case of slight damage, the majority consider the refurbishing option while others prefer to sell or give it to someone else, and in case of a bigger damage selling or giving away got a higher chance while refurbishing was an option for only 3.33 percent of the participants, and in this case scenario we can see that 13.33 percent of the participants considered throwing as an option while it wasn't present in the previous cases, lastly in case of complete damage the majority with 70 percent considered throwing as the best option while no one mentioned repurposing or recycling as an option. These results show that the participants are mainly trying their best not to throw the products they have unless they have to, and the majority are trying to find the most economically convenient solutions for themselves either by selling or refurbishing, but unfortunately no one was cautious enough to think about recycling or repurposing and the major problem is that 38% of them are not following up on the new design trends and solutions while the rest are either checking up the market or the social media (check figure 4.3), which makes it a big responsibility for the market to give awareness on its behalf.

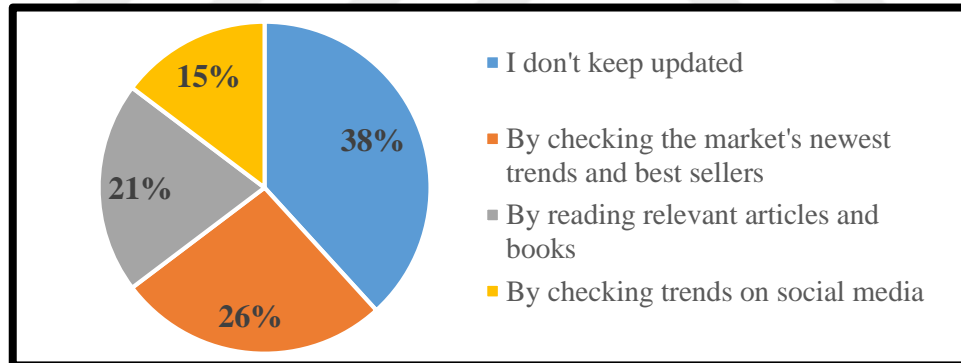


Figure 4.3: Shows the Methods That People Are Following to Stay Updated on the New Design Trends and Solutions (Author).

While making the sequence of the questions, checking the level of awareness of the users was one of the main goals and this was validated until now with the findings that presented itself in the previous responses. However, more questions were designed to give a more accurate relation between the principles of Circular economy and the daily life practices of the users in numbers. The first question to evaluate that was checking how often do users include recycled materials generally in their daily life. The majority was divided between sometimes and rarely while only few participants said often (figure 4.4).

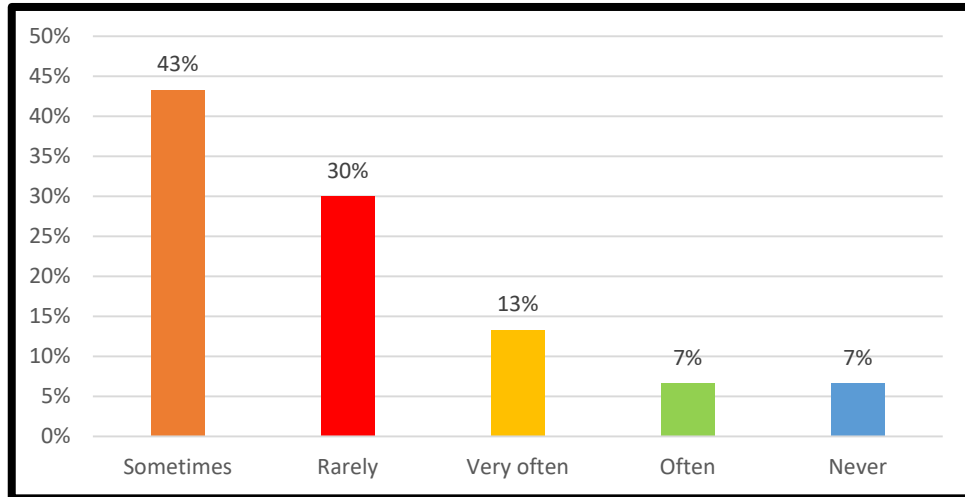


Figure 4.4: Shows the Frequency of Usage of Recycled Materials While Choosing Any Products by the Participants in the Questionnaire (Created by Author).

This fact was translated more clearly when the users were asked to prioritize their choice of materials while making any furniture purchase and the formation of their responses is explained in the Figure 4.5 as following:

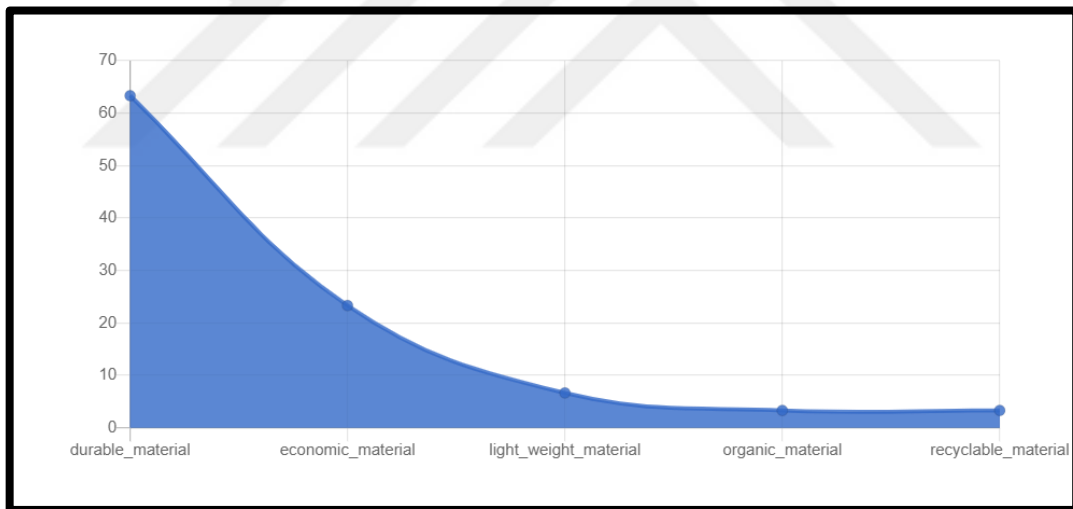


Figure 4.5: Shows the Users Preference of Materials While Choosing a Piece of Furniture (Created by Author).

At this point of the questionnaire where the questions will be more relatable to the circular economy foundations and practices, before giving all the information leading the participants to automatically understand the concept of the circular design. The participants were asked if they know already what is the circular design or if they even heard of it before, and non-surprisingly 60 percent of the participants did not know what CE is (figure 4.6).

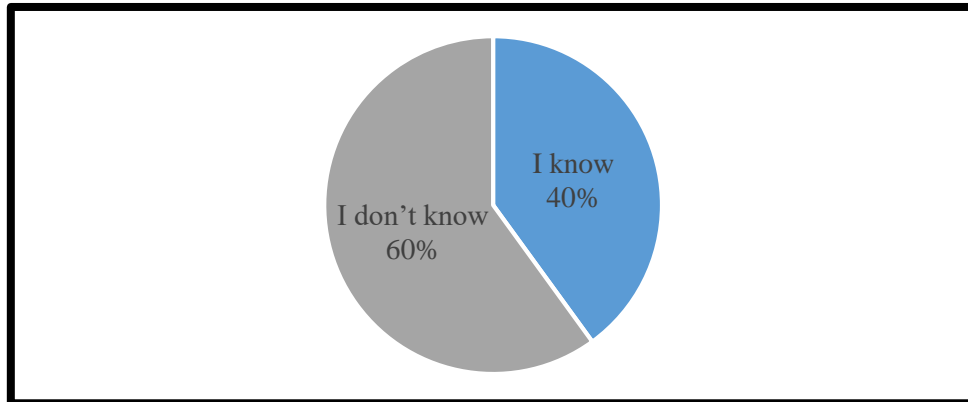


Figure 4.6: Shows the Percentage of People Who Know About Circular Economy (Created by Author).

After answering the last question, the choice of participants who didn't know the meaning of circular Economy opens a new paragraph section that explains and gives the definition of CE and circular Design to make it easier for them to relate to the upcoming questions. The first clue given by the questionnaire to the users was asking a general question about the main things they keep in mind before buying any furniture. The answers were very similar to what was expected because it is just common sense, like the dimensions to fit the space to be furnished, their budget, which is related to the economic status mentioned in previous answers, the color scheme, which is related to the aesthetic side, the preferred materials, which are related to quality, durability, and aesthetics, and lastly, the furniture features, which are related to functionality and convenience. These preferences were measured later with more details to relate to the degree of mindset that people have when it comes to purchases and how it will be manageable to influence them later to switch to the Circular Economy.

In addition to that, to relate to the experience of users while buying any piece of furniture and to see if the questions they ask show their interest in circular design products or any of their features, research about the most common questions asked by users to the furniture suppliers was conducted, and the result was interesting because most of the questions can be related with the concepts of circular design such as the materials used to make the furniture (can be recycled or sustainable for example), the warranty which is related to the repair, the customizing feature related to the repurposing in addition to assembly related questions, which means that if there is enough awareness among users all these questions could be used in advantage of the circularity concept. To see that the following questions in Table 4.1 are

the most common among all clients according to Headsprings Depot (Headsprings Depot & Design tips team, 2019), The percentages shown in the table are not accumulative since the question asked of the participants was a multiple-choice answer where the participant could choose more than one option.

Table 4.1: Shows the Percentage of Participants Who Ask Each Question Mentioned in the Research of Headsprings Depot Website (Generated by Author According to the Previously Mentioned Research).

Common Questions asked by clients according to research	Participants
What materials are used to make this furniture?	76.67%
Is this furniture on sale or is there a discount available?	63.33%
What is the warranty or guarantee on this furniture?	60%
How do I care for and maintain this furniture?	43.33%
What are the dimensions of this piece of furniture?	43.33%
Can I see samples of the different fabric or color options?	40%
What are the shipping or delivery options and associated costs?	36.67%
Is this furniture customizable?	16.67%
Can you recommend complementary pieces of furniture or décor items?	16.67%
How to assemble these pieces together?	13.33%
Other	6.67%

These questions show the concerns of users about the furniture they are buying and how much their choice would affect their future use and maintenance. However, and despite the importance of the questions asked by the clients and users about the furniture before buying them it is still obvious according to the other results of different questions that the participants are not aware of the furniture characteristics that can help them as a long term solution within the current social and economic situation. Even if they got responses for the questions that they have asked the supplier they are still not able to make the correct decision on which feature is the most important for them. The following question revealed this fact by asking the participants to arrange a list of priorities which should be available in a piece of furniture according to them. The answers showed that they are not aware of sustainable choices, economic replacements and long term multipurpose solutions and that they mostly

think about the present moment only. When participants were asked to arrange these furniture characteristics according to their importance to them the following sequence presented in figure 4.7 was the result:

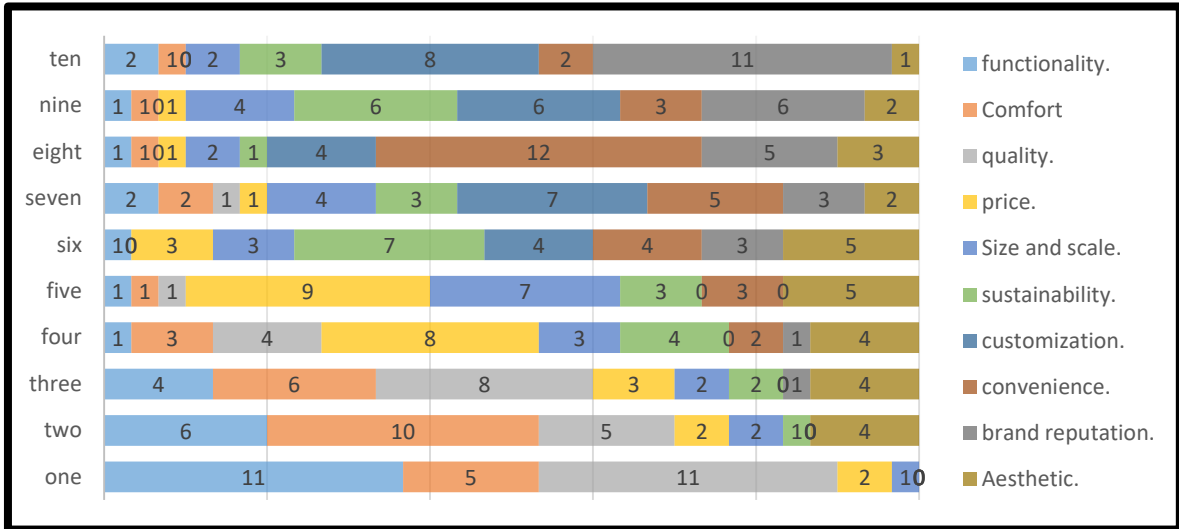


Figure 4.7: Shows the Importance of Each Characteristic of the Furniture From the Most Important to the Least Important According to the Participants One Is Most Important Ten Is Least (Created by Author).

Even though function and quality were in high ranking for top 1 and top 3 characteristics for furniture to be available in the product to be purchased, but sustainability, customization and convenience were late in the chart, which means that economically and environment wise in addition to user friendly aspects of the furniture were mostly neglected by users. Some can say that people are looking for the cheaper price which s maybe economically convenient, but on the other hand if users keep buying cheap products which they will need to replace every few months then the purpose of minimizing the costs is not achieved. That is why sustainability, customization and convenience are more important than price. Other than that, when considering the functionality users are not considering the long term because according to Circular design when you buy furniture with one purpose only it will eventually be not handy in case of changing your life style or your location, this was also shown in the responses (figure 4.8) where 50 percent of the participants never had any piece of furniture that can be disassembled and repurposed even though they had to relocate many times and they had to replace their old furniture many times according to the previous responses.

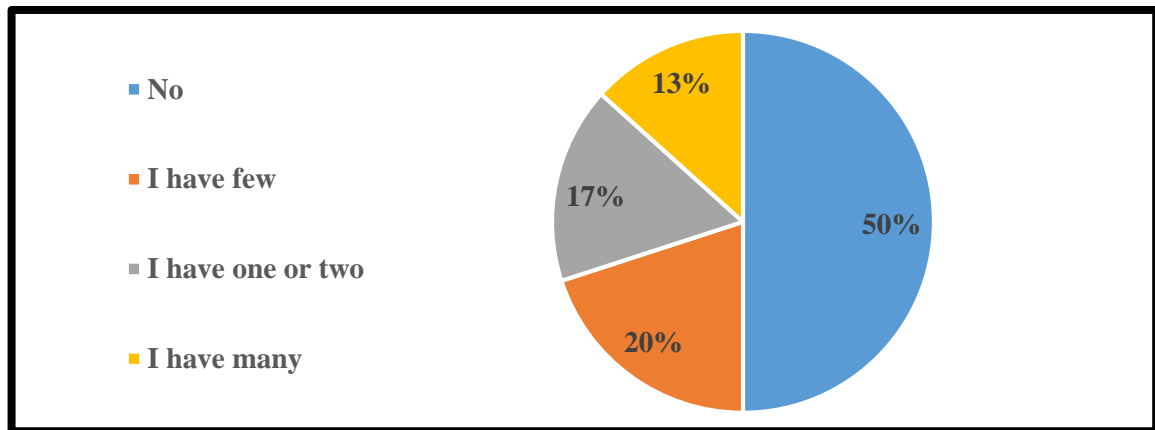


Figure 4.8: Shows the Percentage of Furniture That Can Be Disassembled and Repurposed Bought by the Users Among the Participants in This Questionnaire (Created by Author).

At the same time even less than 50 percent of people ever tried to buy disassembled furniture, and even among the rest who did buy disassembled furniture 53.8 percent of them hired someone to assemble it for them, even though the statistic says that 100% of the times the disassembled furniture comes with a catalogue for construction, and 28.5% of the times it comes also with tools. This shows that the majority of users are not willing to play any role in the lifecycle of their furniture or in the amelioration of the situation when it comes to making any effort. But fortunately, the minority who already tried can make a small change towards the solution because even though 28% of the participants tried to make the effort, the results they got were mostly satisfying even if the experience was somehow hard for them and most of them enjoyed it and felt a stronger bond with the pieces of furniture which they assembled or even created in a DIY project. This shows that the fact that furniture value can be affected by many factors other than the materials and the brand was true and that the IKEA effect and the DIY effort can change the value of the furniture, and unfortunately because of the lack of awareness of users about many topics such as CE and DIY and many others the new trends and services are not able to achieve the full potential of creating solutions for the problems faced by users. 37 percent of the participants did not even know what is the term DIY (figure 4.9) and 37 percent of them did not even know that they can rent furniture instead of only buying. Ironically, even the ones who know, either prefer buying new furniture or think that renting furniture or getting used ones will make their houses less classy. The only ones who would consider renting or getting used furniture are the ones who need it for cheaper prices or the ones who need to stay temporarily somewhere.

The responses showed that people who rented furniture, only ever rented them for temporary use like ceremonies, events or functions and the rent duration was not more than a week.

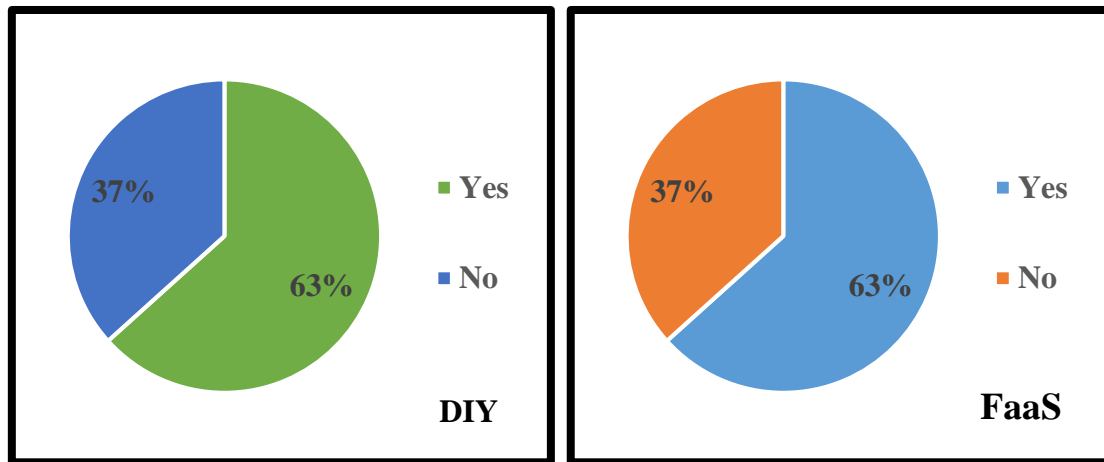


Figure 4.9: Shows the Percentage of People Who Know What Is DIY, on The Left, and People Who Never Rented Furniture Instead of Buying on the Right (Created by Author).

Finally, and after evaluating the participant’s awareness according to their responses and after giving them a clearer view about the opportunities they were missing out on, I decided to ask them to evaluate themselves according to the knowledge they got throughout the questionnaire and ask them for suggestions on how to spread more awareness and enhance the solutions given by the new trends of circular design and circular economy.

The participants considered their behaviors somehow adjustable in relation with the circular economy practices even though there are no exterior influence or support since 70% of them never heard of any organizations that spread awareness or help the individuals who want to adopt the circular economy as a lifestyle. In addition to that 80% of the participants think that the lack of awareness and education is the main reason why they never knew about the concept of circular economy and 60% of them thought that because there is lack of CE products in the market people are not even paying any attention to it or finding it hard to adjust when it is hard to reach the supplies, and even when it is available the prices of these products are considerably expensive. Some of the suggestions which they considered valid to fix these problems where to promote the concept of CE through social media, advertisements, education about its benefits and solutions, and by collaborating with stakeholders, manufacturers, designers and suppliers to promote the principles of CE in their practices, where they considered that the role of

designers is important in this matter. And despite all these difficulties and lack of awareness 76.67% of the participants anticipate that the concept of CE and CD will increase even if slightly in importance within 5 to 10 years, which is really important because according to them the situation of lack of resources and bad economy is getting severe day by day.

As for the second questionnaire the target was architects and designers, since it was suggested in the discussion and further research part of a previous research about “Circular design in practice: Towards a co-created circular economy through design” by the author Dokter (Dokter, 2021). The research suggests to make deeper investigations within the sectors of interior Design and Interior Architecture and the disciplines that designers are adopting to move towards a better CE. That is why the thesis includes the following questionnaire to whom 30 designers participated. The participants are from various sectors of design and construction.

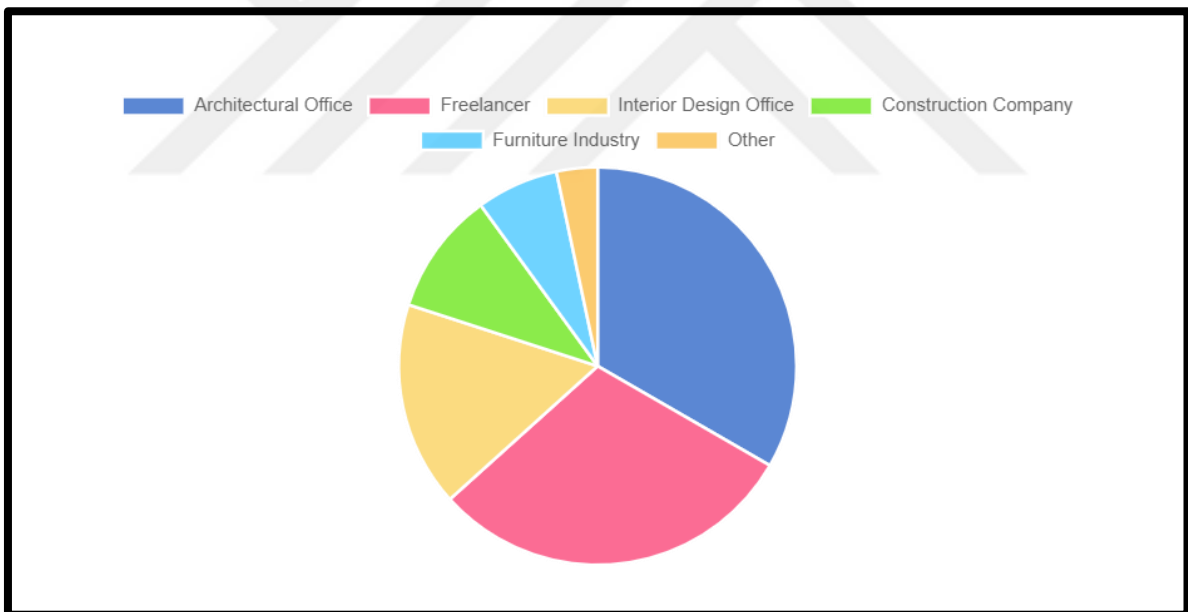


Figure 4.10: Shows the Sectors And Work Fields Attended by the Participants to Show the Diversity of Their Perspectives Related With Design (Created by Author).

The participants came from different backgrounds but the majority were young designers freshly graduated around 25 and 34 years’ old architects, interior architects, interior designers and furniture designers from both genders male and female equally and a great amount of them were in high positions in the company they work at. The rank of the companies mattered to my survey because I wanted to see if bigger companies can have a

bigger impact on the market and users or is it not relatable. The rank was decided upon the number of employees because according to the American institute of Architects and according to Turkish economic law a small firm contains between 2 to 49 employees; a medium firm has 50 to 99 employees while a big firm has more than 100, and these firms can have international branches and a wide range of links while the small and medium ones are only local and mediocre (AIA, 2016). In addition to that a question about the number of clients the participants have per year was asked to see how wide is the range of impact they can do in one year if each one of their clients was convinced with the concepts and ideas they are spreading, which showed that at least 26% of the firms can influence more than 40 users per year which can be a huge impact if each designer in the country contributed in sharing the awareness, and according to LinkedIn statistics in the year 2017 there is a ratio of 1 designer to each developer in each company which is a really big number if you compare it to the full population (Field, 2017).

Before commencing directly with the questions related to the main topic which is the circular economy and circular design, a general idea about the scope of work of the participants was needed to have a better understanding of the relation between the designers' practices and work environment with the situation of CE and CD in their life and job policies, in addition to exploring some clues which can help to catch the main key for creating suggestions in the discussions to the CE success. The scope of work of the participants is presented in the table 4.2. And it is necessary to mention that the percentages are not accumulated to sum up 100% because the answer of this question allows the participant to choose more than one option, since the design and construction companies provide various services that complement each other to reach the desired result as a designer. The percentages showing in the table 4.2 are not accumulative which means their sum will not be 100 percent since participant can choose more than one option for the provided services and the scope of work, because in the field of design and architecture the services are various and they complete each other, that is why the survey was made according to a previous research about the services that can be provided by such kind of companies and offices, and the services are included in the following table.

Table 4.2: Shows the Various Services Offered by Designers and the Percentage of the Participants Who Provide These Services. (Table Created by Author for Percentages).

Scope of work	Percentage
Designing the layout, functionality, and appearance of interior spaces, including the selection of finishes, fixtures, and furniture	63.33%
Sketching and Modeling to visualize the design and communicate the concept to clients, manufacturers, and other stakeholders.	60%
Material selection: Selecting materials and finishes that are appropriate for the intended use, style, and budget.	56.67%
Developing conceptual designs and preparing architectural drawings.	53.33%
Developing space plans and preparing detailed drawings and specifications.	53.33%
Preparing detailed technical drawings and specifications for manufacturers, including information on materials, dimensions, and construction methods.	43.33%
Overseeing construction and installation of interior elements, including lighting, flooring, and wall coverings.	40%
Collaborating with clients, engineers, manufacturers, and other professionals to ensure the design meets functional, aesthetic, and technical performance requirements and safety standards.	40%
Conducting research on current furniture design trends, materials, and manufacturing methods to develop new ideas and concepts.	40%
Managing the construction process, including the selection of contractors, monitoring progress, and ensuring the design is executed according to specifications.	30%
Ensuring the interior design meets building codes, accessibility requirements, and environmental standards.	30%
Marketing and sales: Promoting the design to potential clients and participating in trade shows and other events to showcase the work.	23.33%

The questions included in the table are taken from a survey on the most popular question asked in the market (Foyr, 2018).

The statistics from the questionnaire shows that designers and architects who participated in the questionnaire are not giving much attention to sustainability in their work policies and

only half of them have a preferred list of materials and suppliers that promotes sustainability to abide by while making any purchase or design in addition to that only 26% of the offices were considered environment friendly according to their employees. While selecting the materials to work with in their designs mostly designers are not paying that much attention to the environmental impact of these materials in the future, and even when they do they are not putting any effort in it since they mostly prefer to choose the material with eco-friendly certificates without checking or employing it in a closed loop system, which leads to a non-desired result which makes even eco-friendly material end up in landfills because very few designers are considering the strategies to minimize the waste during the construction and installation in addition to neglecting the closed loops. And when they were asked about their preferences while choosing the materials for their projects among the following criteria: Importance of trend, making sure the material is recyclable before using it, choosing lightweight materials, water-proof materials, economic materials, durable material, investigating if the materials chosen is recycled or raw and at the end if the material is organic and safe.

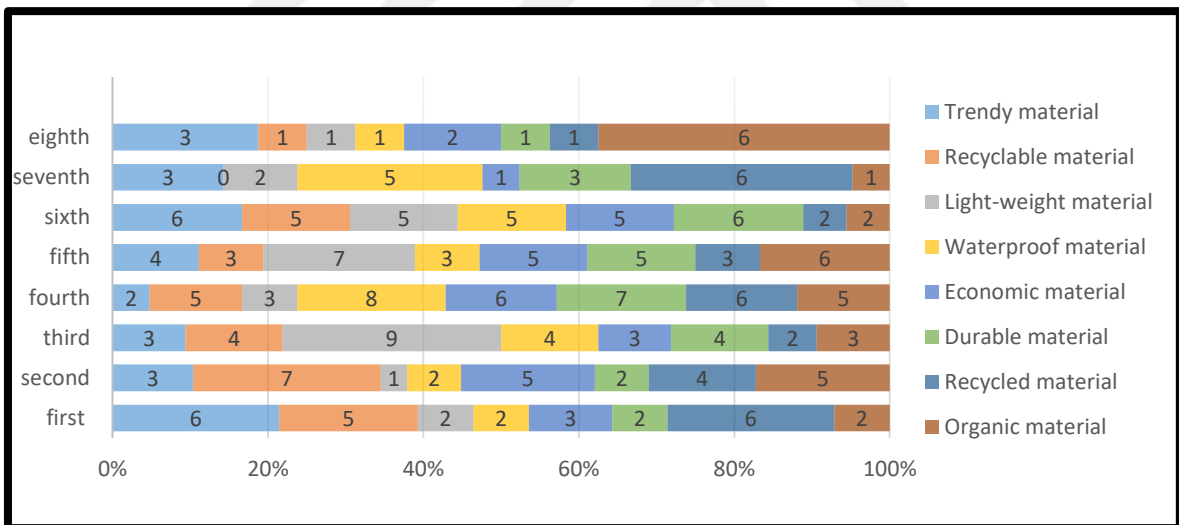


Figure 4.11: Shows Material Criteria Preferences According to Designers While Choosing for Their Project Selection (Created by Author).

This sequence shows that most of the designers' care about following the esthetic trends while on the other hand do not give much attention to the idea behind it or the concept which led to it which eliminates the majority of its purpose and benefits, which is most probably the case in the circular design concept. The responses show that 36.67% of the designers never used recycled materials in their designs and 26.67% of them would only consider it if

the client ask for it, which means that the influence is coming from the user instead of the designer which is a fact that must be reversed. However, which makes it only make sense is that surprisingly 46.67 percent of the participants who are designers and architects do not even know what is the concept of Circular Economy. This can only make sense when 40% of them never designed or incorporated any design elements that can be disassembled and repurposed in their designs.

While creating the designers' questionnaire the hypothesis of the thesis anticipated that some of the designers might not know about the circular design and that was in my mind related with the age and generation, that is why after asking the question about knowing the meaning of this term a definition with examples was given in the survey, but it only appears to the ones who choose the answer no. however, the negative answer occurred much more than anticipated. This shows the lack of awareness even among the society of designers and architects, and this opens new problematics to discuss later.

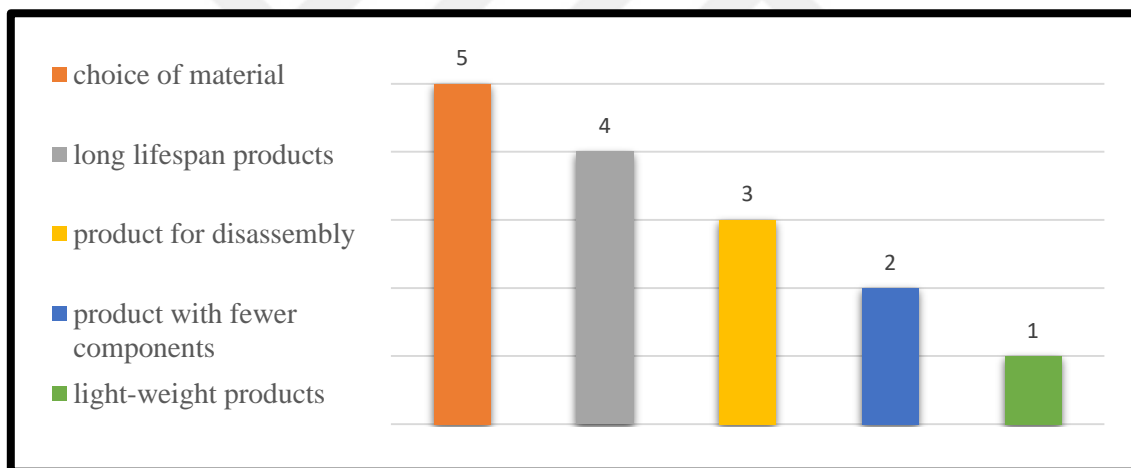


Figure 4.12: Shows How the Choice of the 'Products' Characteristics Shifted In Importance According to the Participants After Learning About the Concept of Circular Economy and Circular Design. The Size of the Bar Shows How Important the Characteristic Is, So Five Is the Most Important and One Is the Least (Created by Author).

In order to get the opinion of designers on the concept of circular design and its principles after making sure that all the participants know what exactly they are asked about, and in order to come up with better solutions and suggestions for future researches and practices inspired from the minds of designers, I requested the participants to arrange the principles of the CD according to their importance in their point of view. The results show that the choice of materials must be the most important at the beginning stage then comes the choice

of long lifespan which is related to durability, then designing for disassembly, designing with less components and at last the light weight of the product. This shows that after understanding and knowing more about the concept of circular design the sequence of choice was greatly changed, and the participants confessed that only few of these principles were previously considered in their design process (check figure 4.12).

The lack of awareness concerning the concept of circular economy among designers and users according to these questionnaires were not the only reasons of its failure, even the organizations and public resources are not available when it comes to the incorporation of such policies, figure 4.13 shows that 50% of the participants declared that they have never heard of any organizations or supply chains which promote and adopt the concept and principles of CD, while on the other hand only 17% have encountered such thing and established partnerships and collaborations with them, and according to the statistics and the checking the responses one by one, the participants who ever had this type of collaborations are only the ones within big companies and outside resources. These participants were also the ones who ever had the chance to work on a project that promotes the principles of CD while the others were completely in blackout from this exposure.

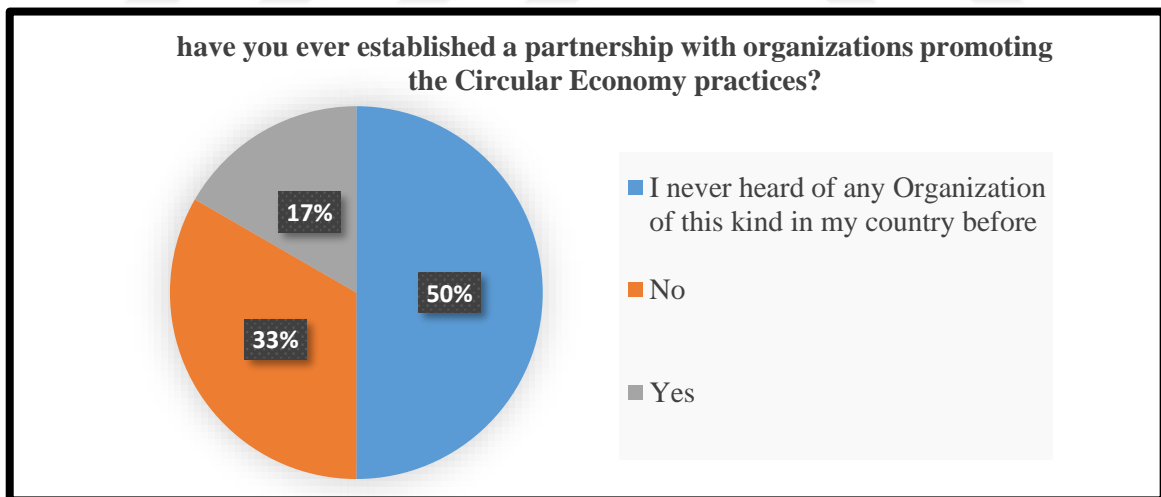


Figure 4.13: Shows How Lack of Exposure and Participation Can Affect the Spread of Any Concept (Created By Author).

In addition to the importance of the role of organizations and public resources the designers admitted the importance of their role in spreading the awareness among users and the market, but that cannot be achievable if they don't keep themselves updated about the latest

developments and the latest trends specially from trusted sources and reliable references, however when the participants were asked about their source of updates 60% of the participants said that they rely on the market by checking the latest trends and best sellers, which again shows that instead of influencing the market and users they are getting influenced by them. On the other hand, and thankfully some of the participants declared that they keep attending seminars and workshops to learn about the new technologies and trends which is the most reliable source for designers in addition to the books, articles and sometimes by gaining knowledge from other experts in the field. With that fact put on the table of reality of the current situation, it is a must to check the other side of the story where we can study the relationship between the users and the designers, because it could be the reason why designers are more lenient and dependent on taking the orders from their clients instead of taking charge. When the participants were asked how they try to influence the decision of their clients, 56 percent said only by verbal explanation, 36 said that they include demonstration and 13 percent use the written material, while the rest don't even bother to try. This can be a major problem in the case of new trends because some people don't like to read, and others can't imagine without seeing demonstration and that is why some clients resist the idea of accepting a new concept or product just because they don't know anything about it and about its benefits while others would accept the change and become fans of the new concept because they had the right demonstration and the correct approach. This fact was clearly demonstrated in figure 4.14 by the variety of answers noted when the designers were asked if their clients resist when they propose a new idea to them.

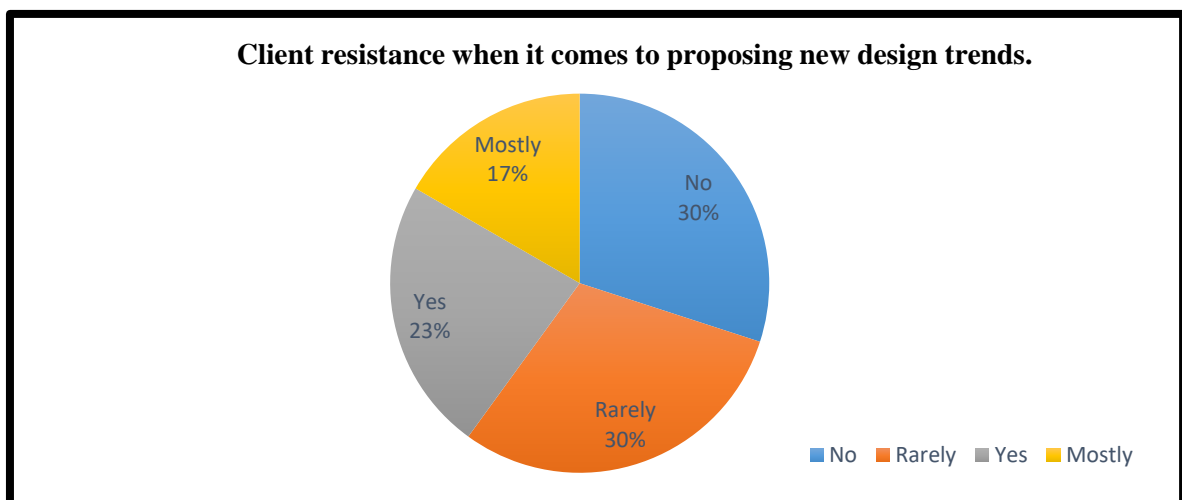


Figure 4.14: Shows the Variety of Users Responses According to the Approach of the Designer In Proposing New Idea In the Design (Created by Author).

And since clients resistance was mentioned, it was necessary to also learn about the other challenges that might discourage the designer from promoting or implementing the circular design in his practices and design, and when the participants were asked the majority designers considered that the lack of awareness is the first obstacle and after that comes the limited access to sustainable materials to work with, while the clients resistance only comes in third position before the difficulty of measuring the impact of the new trend in real life. And when they were asked to come up with ways to overcome these challenges 60 percent thought that educating the users about the benefits of CE on their future, 50% thought that encouraging users slowly to adopt this concept by starting with the maintenance choice and explaining how this choice is going to affect them financially by decreasing the costs and waste, while the third most chosen solution was making collaborations with stakeholders, contractors, suppliers, and service providers to promote the principles of Circular Economy and sustainability. Finally, when the designers where asked how do they see the circular economy evolving in the design industry in the next 5 to 10 years 70% of the participants thought that the value and awareness about CE will increase slightly because still they think that people are not quite aware of the environmental crisis and the lack of resources.

As for the third questionnaire, another suggestion from a previous research named Circular Design in Practice was suggesting that to understand more about the relation between circular design and the contemporary and future life, it is needed to involve stakeholders Users and chain actors such as suppliers and furniture showrooms, which was exactly why this questionnaire was made. However, after getting the results from the previous two questionnaires for designers and for users it was also shown that the market can be a huge influence and an active factor in the spread of circular economy concept. When users were asked how they how they keep updated on the new trends they said that they look for the new trends in the market and what are the best sellers the exact same answer we got from designers even though the rate was different, it is still a common point between both groups.

Just like the two previous questionnaires, the participants were asked to fill in their demographic information, and the results showed an interesting fact, even though 23% of the workers in this field are designers according to the responses of the participants, and despite that 40% of the responses show that these institutions are offering interior design services and execution, yet the percentage of firms that are hiring a specific person for the

job of a customer service and design consultant is only 46.67%. (check figure 4.2.15). These results show that this sector is not giving enough attention to the users input or any effort to educate the users or orienting them to choose better options.

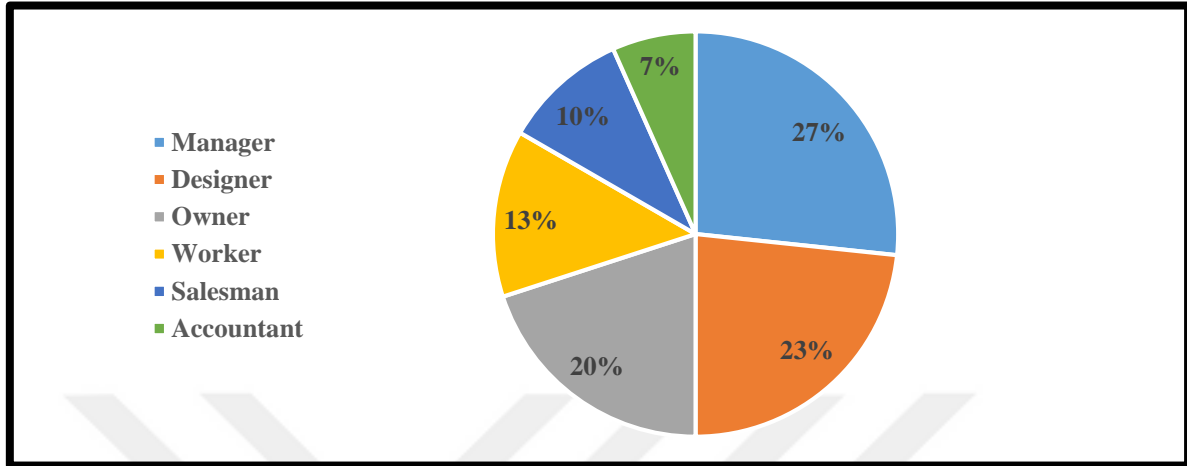


Figure 4.15: Shows the Variety of Professions of the Participants Working In Furniture Showrooms and Manufacturing Industry (Created by Author).

In addition to that only 10% offer second hand furniture, which shows how they are not aware of the value of reusing or not even care about the amount of waste which their products are going to produce, because if they don't offer repair and they do not have a policy or returning or refurbishing then eventually the user is going to be either obliged to look for outsource and pay extra or maybe will not even be able to fix the product because it was custom made and will not find replacing parts for the damaged furniture which will lead him eventually to either sell the furniture to someone else with cheap price since it is damaged in case the user is aware of the environmental and economic impact of disposing it or in the other case he will just throw it in landfills to become a total waste.

Table 4.3: Shows the Low Percentage of Repair Work Which Shows How Manufacturers and Sellers Are Not Paying Attention To The Sustainability Of Their Product. (The Percentages Are Not Accumulative to 100% The Participants Chose More Than 1 Answer). (Created by Author).

Services	Percentage of participants providing this service
Selling standard furniture	56.67%
Selling custom made furniture	43.33%
Interior design and execution	40%
Furniture repair	6.67%

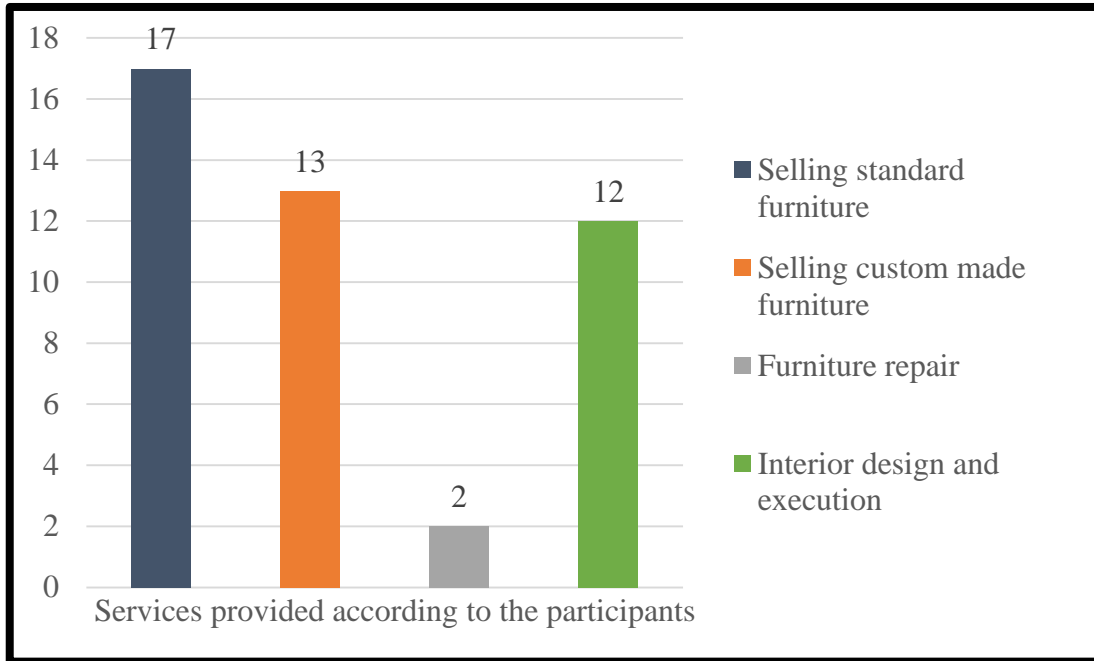


Figure 4.16: Shows the Distribution of Services Provided by Furniture Showrooms and Manufacturers Among 30 Participants (Created by Author).

Furniture showrooms, manufacturers and suppliers are not trying to play any role in spreading awareness among users since the results of the questionnaire show that they are mainly trying to sell what works best for them without any effort while at the same time getting them the highest profits possible. 90% of the firms that participated in the questionnaire do not give any value to used furniture even if it was their own product, they only sell first hand furniture, either custom made, standard or copies. In addition to that, even when buying the product if it was ready made or while buying the materials to work with as manufacturers 40% don't even bother to check if the material is eco-friendly or sustainable, while the other 46% check but still buy what is more convenient to their sales and processes and only 14% decide to choose the sustainable and recycled materials. Moreover, when asked about their clients' preferences the result was the same, because the majority of users are not paying attention to these matters while some clients rarely ask, others don't even think about it.

On the other hand, supposing that eco-friendly and sustainable choices were not available for the manufacturers of the suppliers, another type of questions was prepared to at least see if the trends of modular, smart and circular design are available in the market, and how users are approaching these products.

According to the statistics 50% of the firms who participated don't have any smart furniture and 6% don't even know what is smart furniture, while 50% of their clients never asked about it and only 20% request it. As for the modular furniture the situation was much better, since only 26% of the suppliers don't have it and 16% don't know what it is and the clients are requesting modular design furniture with the ratio of 43% among all the participants. On the other hand, when it comes to the circular design furniture 50% of the participants never heard of it and 33% said they have it but when it comes to asking them other questions about the circular design it appears that they thought the question is about the furniture shaped like a circle, which makes their response for the next question about users' demand not reliable.

And at last to show the direction of the market and to come up with suggestions on how will be possible to spread more awareness and demand on the circular design furniture, the participants were asked about the furniture style that sells best for them, and the results were represented in table 4.2.4, while the major reason for this question is to highlight the place of circular design products among all other products for clients.

Table 4.4: Shows the Best Sellers In the Market According to the Participants and How Neglected Is the Circular Design Furniture and How Users Like Traditional and Trendy Products. (The Percentages Are Not Accumulative to 100% Since Participants Can Choose More Than 1 Option). (Created by Author).

Types of furniture according to their style	Density of request on each type
Modern / Minimalistic / Contemporary	60% of participants' best seller
Classic / Neo-classic / Casual lux	50% of participants' best seller
Antique / Rustic / Victorian / Vintage	13% of participants' selling well
Boho / Retro / Urban-collective	13% of participants' selling well
Traditional / Art-deco / Scandinavian	10% of participants' selling
Modular Furniture	10% of participants' selling
Smart Furniture	6% of participants' selling
Circular Design Furniture	0% of participants' not selling well

As the table shows that the modular, smart and circular design furniture are the least popular among clients and users, specifically the CE products with a ratio of zero occurrences.

To see the reason behind these results and if there was any relation between clients' choices and the policy of the market, and to see if the suppliers are playing any role in the deviation of the users' choices I asked the following question: when a new client comes for a piece of

furniture, what are your suggestions or advice to him? And 76.67% of the participants replied that they ask few questions about his preferences and then suggest accordingly. This shows that the major role player here in the user himself and that the market is following his preferences, and unfortunately not playing any role in spreading any awareness or change in the economy or the world of design. In spite all that the manufacturers and suppliers in the market still think that they can play a big role in affecting the choices of users and designers according to the participants. The only way they were able to affect the market was by providing only what the market needs, and facilitating the access to it which makes the users think that they are not in any need of change since even the assembly and transportation is done by the supplier for free most of the time.

As a conclusion of this chapter, the main finding was that each one of the 3 groups is depending on the other to make the change while none of them is making any effort towards this change. There are many solutions, and there are many ways to create change, but it all starts with the spread of awareness and by creating collaborations between the 3 groups each one in his own scope. CE collaborated many different ideas and incorporated older concepts and designs with a hint of sustainability and a hint of effort, but without the will of change and the power of education solutions are not efficient if no one knows about them.

4.3 RESEARCH LIMITATIONS

This thesis is written from a point of view of an interior architect and aims to shine the light on the practices of circular design and their effect on interior architecture, in addition to measuring the awareness of people about this topic.

I am a student of Masters in Architecture in Turkey and this study is not concentrating on the cultural aspects of this country or any other country. The fact that the participants in the survey are mainly living in Turkey and in Lebanon does not generalize the findings on the whole area since the number of participants is not large and scattered between different nationalities. This fact explains that I have conducted the research with some limitations and I don't aim to generalize the information on the countries mentioned, the results reflect only the perspective of the participants in the survey including the 3 questionnaires.

I have conducted this research with some assumptions such as, the circular design is a very effective concept and it should be popular among designers, and it might not be very popular

among the market people and the users that is why it is not reaching its full potential in solving the modern life problems. The assumptions were not validated because it appeared that the circular design is still an emerging concept which is still not that popular specially among the participants, and even though the designers are aware of the term sustainability and eco-friendly design, they are still not familiar with the term Circular Design.

During the research few limitations were faced. The first idea for the questionnaire was to evaluate the effectiveness of the circular design solutions in relation with the economic and environmental crisis by asking the users about their experience with circle design furniture, and a questionnaire was made of 4 sections: relocation and transport, assembly and disassembly, functionality and repurposing, and sustainability and affordability, but unfortunately when the first questionnaire was distributed the majority of participants did not know what is the circular design, and never had an experience with any of its products, and even if they had furniture with the features of circular design they never took advantage of these features and they asked for professional help. This is why the survey took another path and 3 different questionnaires were made.

The second obstacle was the fact that most of the studies where the information about circular economy and circular design were taken are made and established in the first class world countries where the concept of circular economy is more prominent, while the participants mainly live in Turkey and Lebanon, and some of them are from different nationalities too. These participants haven't yet been exposed to these strategies and services, which made a gap between the practice and the theory, and on the other hand led to negative results about the topic itself.

Even within the second survey option the main limitation was the small amount of respondents. This made it a bit problematic to evaluate the results which were somehow similar, and the ratio of variation much narrower, this made it harder to decide if the results were completely reliable or not because of the small gap between the numbers in the diagrams. The second limitation was the small number of participants from large companies which were considered as a changing factor to see if the impact they can do is higher than smaller ones, and if they have better resources and better understanding and awareness about the circular economy because of their links. The third one was that some of the responses were a bit contradicted in a way that during the analysis of each answer on its own, the

researcher can sense that the participant did not quite understand the question which affected the reliability of the results. Another factor that affected the study was that the circular economy concept was new for most of our participants, which made it impossible to conduct any case study about the topic.

4.4 ETHICAL CONSIDERATION

This research study collected primary data from the participants through a survey or questionnaire. The survey has been sent to all the participants through either their personal phone numbers or their personal email and their consent was taken to share the responses before they started the questionnaire. The personal data and footage of the participants have been ensured to be protected and not shared with anyone or used to any other purpose than the thesis information. The confidential consent was taken from each participant and the data is collected in a confidential space. Considering all these facts, no ethical issue is associated with this research study.

This thesis is not inclusive, which means that the opinions and the answers of the participants are not taken as a standard to generalize the findings as a fact that describes the whole community.

The experiences of the participants and their nationalities are not shared with anyone and therefore the background of the person does not affect the findings, on the other hand the experiences are taken into consideration to understand the shortcomings and come up with future suggestions when the problem is common.

5. DISCUSSION

On the light of what was discussed earlier in the literature review and in the findings part it seems that there is a huge gap between the strategies of circular design and circular economy and between the designers, users and the market among the participants where the participants of questionnaire came from.

Even though the main problematic of this thesis was to solve the housing relocation and its effects on the economic state of users and their resources, another problematic arises from the findings which is more severe.

The concept of circular economy tries to spread knowledge and practical solutions for the environmental and economic crises which is getting worse by time through a closed loop between resources, materials, designers, manufacturers, products, service providers, and users to reduce waste and to create a stronger economy. But unfortunately, the concept is still a sprout that did not bloom in the second and third world countries because of the lack of awareness and the minimal effort made by any of the participants who represent a wide group of the society. People in these societies are living one day at a time not thinking about sustainability or long life solutions, the main concern is the accessible services. In addition to the economic deterioration, the difference between the degree of awareness among users, designers and the market is significant. By comparing the answers retrieved from the common questions in the three questionnaires, the questions related to the circular practices show that the users have tendency to follow the CE while the market is completely indifferent and the designers are not making any effort to change the situation. On the other hand, the questions related to the resources and accessibility to the materials and circular services, both users and designers in the studied area suffer from the lack or high expenses of the circular products which makes it almost impossible to adopt this movement and benefit from its solutions. Moreover, all categories responses showed that there is a lack of interference of organizations and governmental interest in circular economy which makes it even harder to promote it in their areas.

On the other hand, the situation in Europe is completely different. European designers and activists started the movement of the NEB (new European Bauhaus) to involve the users and the manufacturers in the process of design and consumption in addition to spreading the

habits that support sustainability and circularity, this is why while conducting the research, all case studies, projects made according to the CE and the organizations and firms which are adopting this concept were either in the USA, some European countries, Japan, Singapore, Korea, and the some of the first world countries, which shows that the efficiency and solutions of the circular design are only applicable where the biggest stakeholders of the modern life exist, and where resources are available and international companies with access to technology and social services exist. On the other hand, in the area where the participants come from, it is significantly hard to find an example of circular furniture or services that support sustainability and circularity. In addition to the fact that materials and tools for user-friendly and eco-friendly products are inaccessible in these regions, even a system for recycling and upcycling to reduce the waste and landfills is missing. This can only change if a new educational system was included in these areas to spread the awareness and involve everyone in the process.

a. Education

An educational system for children, undergraduates, and graduates involving the circularity to enlighten people from all categories about the importance of sustainability and Self-sufficiency to improve the economy. Children should be encouraged to be creative and independent so that when they get older they use their skills to avoid the need for others.

Education for designers is a must since they are the ones who should put the greatest efforts to stay updated and involved in the social and economic matters. Designers must understand that it is their responsibility to find solutions and convince people to follow their lead.

The context of a CE needs designers to take into account many usage cycles by multiple users and the full product lifetime, so design briefs in the CE will appear completely different from those in the current linear economy. Designers will need to change their perspective from being product creators to solutions providers in order to address these issues at the design stage. They will also need to build cross-disciplinary knowledge and abilities. For a CE, systems thinking is essential and required in design practice and education. In business and design literature, the topic of systems thinking should receive extensive study.

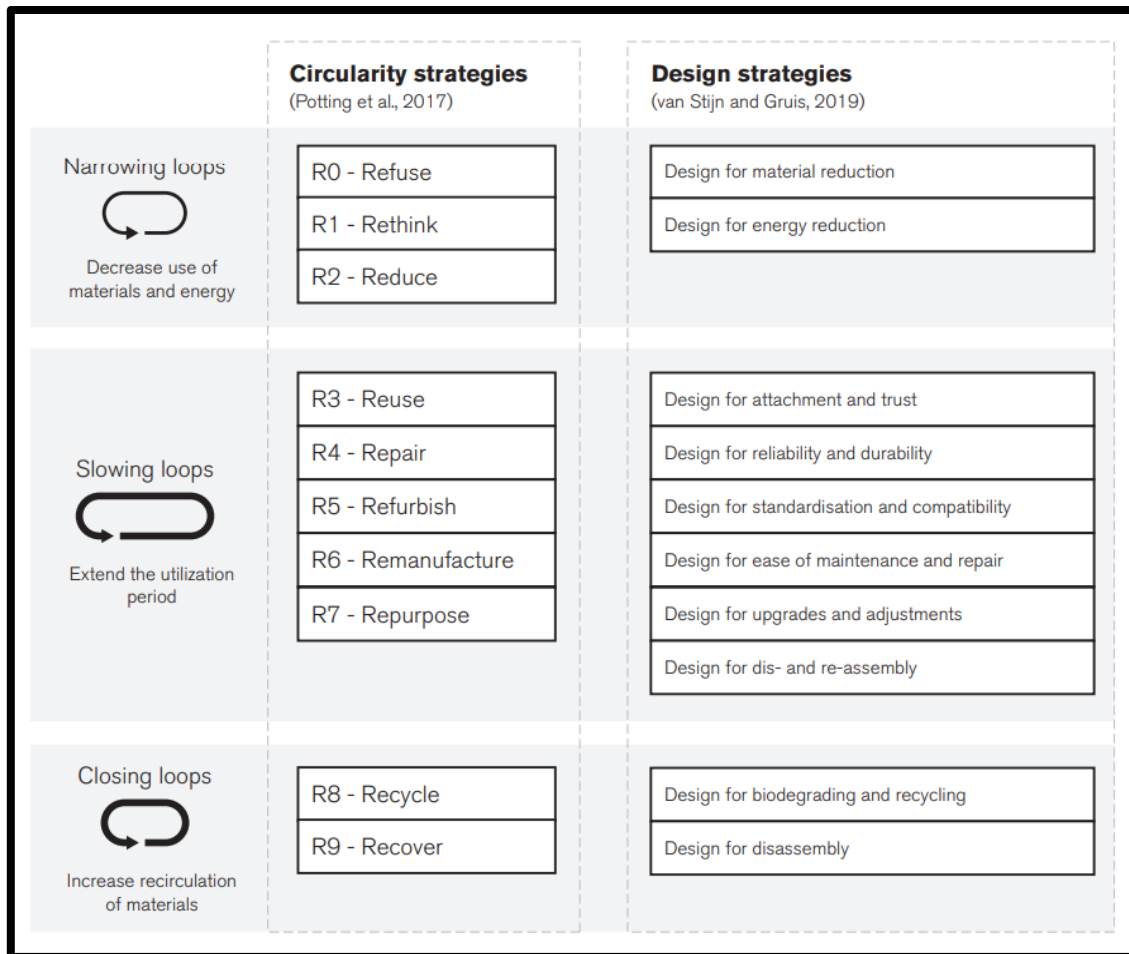


Figure 5.1: Shows the Functionality of Circular Design and the Relation Between Circular Strategies and the Role of Designers to Move From Linear to Circular Economy (Dokter, 2021).

In addition to the educational system for the designers, the market should be obliged to have a design ambassador or representative to create a link between the new products and the end user, the job of this designer is to educate the market about new products and their efficiency, also about the alternatives to old fashioned products, because when the people in the market understand the value of the product and how it can help users, they can play a bigger role in selling it by spreading the awareness to their clients.

Moreover, the questions related with the furniture topic among all groups show that the market choices and malpractice against circularity is creating an obstacle for the users who are willing to make sustainable choices since they don't provide repair services, reselling old furniture or offering circular solution which is affecting the future of furniture by creating more waste and causing economic loss, so by spreading awareness among the market the CE can save a lot of waste and prolong the life cycle of the products.

b. Collaboration

Furthermore, creating more collaborations between the stakeholders and chain suppliers to give access and facilitation to the designers and manufacturers who adopt the new concepts to make them and promote them with advertisements and campaigns by Securing financial support to those adopting it, which makes the products affordable and appealing for users. This way economy also will flourish. However, designers haven't gotten much advice on how to use these methods effectively within a practical and incredibly complex design process that is why CE needs a built environment that spans six dimensions (government, economic, environmental, behavioral, societal, and technological). In order to help designers, make better design decisions, assessment methods that pinpoint pertinent criteria and indicators for circularity are essential. These methods can also help "quantify" the degree to which design concepts support circularity.

Also, it is necessary to have a technology that supports the interactions between the value chain, circular business models, and physical design, and here comes the role of engineers and government to facilitate these chains and relations.

Additionally, the findings showed that it's not only the region that makes the change in results or mentality. By analyzing the statistics in the responses of users, the age factor was playing a role in the differentiation of knowledge and the social and economy state of the participants. The younger generation seems to have more struggle with the economic state and affording their living while the elder generation was more settled and at ease, this is a factor that made the elder generation unaware of the problems which makes them ignore the new solutions, while the younger participants showed the struggle of relocation, extra expenses and lack of resources, at the same time it shows the increase in awareness about new topics, trends and social and economic movements. This shows that maybe with time the CE and CD might get spread and have move efficiency in solving the middle east crises too.

Finally, the findings showed that users have a tendency to adopt most of the circular design strategies and practices, thus this can be a starting point to come up with system that prompts the designers to create and suggest more products that answer the users demands and their economic state.

6. CONCLUSION

In this thesis I studied and evaluated the applications of circular design in interior architecture in relation with the current situation of economy and lack of resources for affordable way of living for people in the modern world. Additionally, I suggested some potential ways for people to follow in order to improve the efficiency of new solutions in their surroundings with the help of circular design principles and practices.

In the literature review I tried to provide a broader view about the circular economy and its history while explaining how this concept helps with creating a more sustainable way of living by being more aware to the environment, the materials used, the value of each and every component and the potential of each part even after the EoL of the product. While in the third chapter I showed how the concept of circular design emerged from the circular economy practices and started changing the designers way of thinking and strategies, starting from the 7 R's principles of sustainability to the rules of circular design which suggest understanding the circular flow at the beginning and search for inspiration from nature without spoiling its resources then defining the problems and needs of users to be able to make the design according to those needs while choosing smart materials and following the rules of less components, lighter weight, longer lifespan and design for disassembly to reach later the launching stage where they make good advertisement and make sure to have closed loop where they can provide after sales services to make sure that the products life is as long as possible to also gain the trust of the clients. Through this thesis I tried to show how by adopting the circular economy concepts for design, the inconveniences and huge costs and waste generated by the linear economy will be greatly reduced while at the same time creating new job opportunities for people which also affects the economy and the purchasing power of the citizens therefore make more profits. In addition to that, I explained the relation between the circular design with different other concepts which makes it have greater potential to be accepted by users who already like the modular and smart design. Also, the DIY lovers must be fans of the circular design because it supports all the potential in the DIY in addition to being sustainable and easier to achieve.

On the other hand, I discovered through the findings that even with all the benefits that the circular design might offer, there is a huge gap between the participants in the survey made and the whole idea of the circular economy concept and specifically the circular design. The

findings show that the participants lack the awareness about this concept even though it seems to be a potential solution for their economic problems. On the first hand, users follow the trends blindly without thinking about the potential of the furniture and products they are buying and they consider that if the price is low then the product is economic, and as long as the supplier provides the transportation, assembly and warranty then they have got a good deal, but on the other hand they don't think about the sustainability, the long life span, the convenience and the customization which is much needed if they have to move from a place to another without leaving a lot of waste behind. Second of all, I noticed that designers who participated in the survey shown a lack of responsibility towards the society, environment, or the economic situation of their clients. They follow the trends without educating their customers about it or how will it benefit them, and they also struggle from lack of exposure and lack of resources which makes it harder to them to adopt any new concept even if they believed in its efficiency because the lack of resources will make the product end up to be very expensive which will make the users avoid it, and as a result of that, this fact also affects the market which pushes the showrooms to avoid getting these products because they already know they will not sell well for them, and even if they decide to get the product they don't know how to sell it because they don't have enough information about it.

Finally, I suggest that spreading awareness among all categories of citizens, common people, designers, suppliers, stakeholder, organizations and even government can play a big role in correcting the economic situation and in the spread of new concepts such as the circular design. In addition to empathizing on the role of the designers in this matter because the designers should consider themselves as problem solvers nit just artists. And even though the lack of awareness was prominent in my findings but I think that this is only because of the exposure of the name of circular design, since this concept is new as a name, but its practices like sustainability and environmental awareness are well knowns terms among all participants, which means that the circular design is just a new emerging term that will be spread among people soon with the educational and academic system. And to conclude this chapter, it is necessary to know that the lack of awareness and low sense of responsibility are the main reasons of most of human problems, this is why I would suggest to conduct more studies deeply about this topic in different areas and multiple countries to have a better understanding of the situation, problems and solutions.

REFERENCES

- AIA. (2016). Firm survey report. Retrieved from The American institute of Architects :
https://www.4specs.com/s2a/news/Research_2016-AIA-Firm-Survey-Report-Overview.pdf.
- Allen, M. (2017). Quantitative and Qualitative Research. Retrieved from UTA Libraries:
https://libguides.uta.edu/quantitative_and_qualitative_research/quant.
- Andrews , D. (2015). The circular economy, design thinking and education for sustainability. SAGE journals - Local Economy: The Journal of the Local Economy Policy Unit, Volume 30, Issue 3.
- Ann. (2018, 7 15). The 7 R's of sustainability. Retrieved from Aeromatico:
<https://www.aeromatico.com/the-7-rs-of-sustainability/>.
- Association, M. H. (2007). Is Modular Housing the Solution to the Housing Crisis? Retrieved from <https://www.modularhome.org/>:
<https://www.modularhome.org/2022/08/22/is-modular-housing-the-solution-to-the-housing-crisis/>.
- Auclair, M. (2021, 3 25). Lead a circular lifestyle by practicing the 7 R's of sustainability. Retrieved from unpacked living: <https://www.unpackedliving.com/blogs/news/lead-a-circular-lifestyle-by-practicing-the-7-r-s-of-sustainability>.
- Babbie, E. R. (2010). The Practice of Social Research. In E. R. Babbie, The Practice of Social Research (12 ed., p. 624). Belmont, CA: Wadsworth Cengage.
- Baker, K., & Wedeen, S. (2020 , 10 13). RECENT UPTURN IN DIY REMODELING PROJECTS UNLIKELY TO CONTINUE LONG-TERM. Retrieved from Joint center for housing studies of Harvard University:
<https://www.jchs.harvard.edu/blog/recent-upturn-diy-remodeling-projects-unlikely-continue-long-term>.

- Barker, N. (2022, August 12). Little Finlandia in Helsinki is a modular conference venue held up by pine trees. Retrieved from De Zeen: <https://www.dezeen.com/2022/08/12/little-finlandia-helsinki-pine-trees-jaakkotorvinen/>.
- Bates, A. (2022, 1 20). Who benefits, and how, from a circular approach to buildings? Retrieved from ramboll.com: <https://ramboll.com/ingenuity/who-benefits-and-how-from-a-circular-approach-to-buildings>.
- Berends, M. (2021, 06 23). Delft University of Technology. repository.tudelft.nl, 6(1), 60. Retrieved 05 10, 2022, from repository.tudelft.nl: <http://resolver.tudelft.nl/uuid:7ac01108-8281-4634-a895-2f365c693784>.
- Bloomenthal, A. (2022, 4 4). Furniture, Fixtures, and Equipment (FF&E). Retrieved from Investopedia.com: <https://www.investopedia.com/terms/f/ffe.asp>.
- BluentCad. (2022, 11 19). Why Furniture Manufacturers and Designers Should Consider Modular Systems. Retrieved from bluent.com: <https://www.bluentcad.com/blog/modular-furniture-benefits/>.
- Braungart, M., McDonough, W., & Bollinger, A. (2007). Cradle-to-cradle design: creating healthy emissions – a strategy for eco-effective product and system design. *Journal of Cleaner Production*, 1337-1348.
- Buch, J., & Trenk, J. (2021). Furniture rental – the new way to consume furniture? Attitudes and intentions to choose furniture rental as an alternative consumption model. *JÖNKÖPING UNIVERSITY*, 1 - 115.
- Cambell, A. (2018). Mass timber in the circular economy: Paradigm in practice? *Proceedings of the Institution of Civil Engineers: Engineering Sustainability* (Vol. 173(3)).
- Carlson, C. (2020, September 21). EC president announces "new European Bauhaus" to help Europe move to a circular economy. Retrieved from [dezeen.com: https://www.dezeen.com/2020/09/21/eu-new-european-bauhaus-ursula-von-der-leyen/](https://www.dezeen.com/2020/09/21/eu-new-european-bauhaus-ursula-von-der-leyen/).

- Cassidy, P. (2017, 11 21). Survey Finds Consumers Crave Authenticity - and User-Generated Content Delivers. Retrieved from socialmediatoday: <https://www.socialmediatoday.com/news/survey-finds-consumers-crave-authenticity-and-user-generated-content-deli/511360/>.
- CG : Home Products. (2022, 5). Global Do-it-yourself (DIY) Home Improvement Retailing Market Analysis. Florida: CG : Home Products. Retrieved from Researchdive: <https://www.researchdive.com/157/do-it-yourself-diy-home-improvement-retailing-market>.
- Cherry, K. (2020, 4 7). When to Use Surveys in Psychological Research. Retrieved from VeryWellMind: <https://www.verywellmind.com/what-is-a-survey-2795787>.
- Chong, L. (2020, 10). The Strange Evolution of DIY. Retrieved from Arcadiaquill: <https://arcadiaquill.com/12160/performing-arts/the-strange-evolution-of-diy/>.
- Circular Taiwan Network. (2021). The History of Circular Economy. Retrieved from Circular Taiwan Network: <https://circular-taiwan.org/en/know/history/>.
- circular-design.eu. (n.d.). Circular Design and why does it matter. Retrieved from Circular Design Europe: <http://www.circular-design.eu/automatisch/>.
- Coghlan, B.-M. (2014). Quantitative and Qualitative Research. Retrieved from UTA Libraries: https://libguides.uta.edu/quantitative_and_qualitative_research/quant.
- Danmark, P.-s. i. (2016, 09 16). HOW TO BRIDGE THE GAP BETWEEN THE PACKAGING SECTOR AND CIRCULAR ECONOMY. Retrieved from https://www.carlsbergfondet.dk/da/Forskningsaktiviteter/Forskningsprojekter/Postdoc_stipendier-i-Danmark/Monia-Niero_How-to-Bridge-the-Gap-Between-the-Packaging-Sector-and-Circular-Economy.
- Debacker, W., Manshoven, S., Peters, M., & De Weerd, Y. (2017). Circular economy and design for change within the built environment: preparing the transition. International HISER Conference on Advances in Recycling and Management of Construction and Demolition Waste, (pp. 114–117). Netherlands.

- DeFranzo, S. (2019). 4 Main Benefits of Survey Research. Retrieved from SnapSurvey: <https://www.snapsurveys.com/blog/4-main-benefits-survey-research/>.
- Deltek. (2021, 9 31). Three winning strategies for smart building design. Retrieved from AIA: <https://www.aia.org/articles/6438118-three-winning-strategies-for-smart-building>.
- Dix, M. (2021, 5 10). The Circular Economy: DCI End Of Life Furniture Program. Retrieved from dcifurn.com: <https://dcifurn.com/circular-economy/>.
- Dokter, G. (2021). Circular design in practice: Towards a co-created circular economy through design. Department of Architecture and Civil Engineering Chalmers University of Technology, 11.
- EconomicsOnline. (2020, 1 13). What is economics. Retrieved from EconomicsOnline: https://www.economicsonline.co.uk/competitive_markets/what_is_economics.html/#:~:text=Economics%20is%20the%20scientific%20study,of%20individuals%2C%20groups%20and%20organisations.
- EllenMacArthur, F. (2017). The butterfly diagram: visualising the circular economy. Retrieved from ellenmacarthurfoundation: <https://ellenmacarthurfoundation.org/circular-economy-diagram>.
- Ellenmacarthurfoundation. (2021). Circular Example- Bringing office furniture full circle: Ahrend. Retrieved from Ellenmacarthurfoundation: <https://ellenmacarthurfoundation.org/circular-examples/bringing-office-furniture-full-circle>.
- EllenMacarthurFoundation. (2022). Circular Design. Retrieved from ellenmacarthurfoundation: <https://archive.ellenmacarthurfoundation.org/explore/circular-design>.
- EPA. (2022, 9 29). What is a Circular Economy? Retrieved from united states Environmental Protection Agency: <https://www.epa.gov/recyclingstrategy/what-circular-economy>.

- Europarl team. (2015, 12 02). News European Parliament. Retrieved 04 26, 2022, from <https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits#:~:text=The%20circular%20economy%20is%20a,cycle%20of%20products%20is%20extended.>
- European Commission, 2014c. (2020, 11 27). Ecodesign your future: How ecodesign can help the environment by making products smarter. Retrieved from OP.Europa.EU: <https://op.europa.eu/en/publication-detail/-/publication/4d42d597-4f92-4498-8e1d-857cc157e6db>.
- F. Ceschin, Gaziulusoy. (2016). Design Studies. In F. C. Gaziulusoy, Evolution of design for sustainability: From product design (pp. 47, 118–163).
- Ferris, R. (2022, 7 11). Unpacking the meaning of circular design, and exploring what every business can do to adopt a more circular business model. Retrieved from Flokk.com: <https://focus.flokk.com/what-does-circular-design-actually-mean>.
- Field, D. (2017, 5 31). 6 major tech companies have doubled their design hiring goals in last half decade. Retrieved from Techcrunch.com: <https://techcrunch.com/2017/05/31/here-are-some-reasons-behind-techs-design-shortage/>.
- Foyr. (2018). Interior Design Scope of Work for Any Design Projects. Retrieved from foyr.com: <https://foyr.com/learn/interior-design-scope-of-work/>.
- Futurelearn. (2020). The Benefits of Upcycling. Retrieved from Future learn: <https://www.futurelearn.com/info/courses/upcycling-for-change-from-green-ideas-to-startup-businesses/0/steps/67684>.
- G. Benachio, M. Freitas, S. Tavares. (2020). Circular economy in the construction industry: A systematic literature review (Vol. 260). (P. J. Klemeš, Ed.) Curitiba, Brazil: Journal of Cleaner Production. Retrieved 2 5, 2023, from <https://www.sciencedirect.com/science/article/abs/pii/S0959652620310933?via%3Dihub>.

- GATEA, M. (2022, 7 25). Home Improvement In The US Relying Heavily On DIY, With People Splurging On Outdoor Spaces. Retrieved from Storagecafe: <https://www.storagecafe.com/blog/home-improvement-in-the-us-relying-heavily-on-diy/>.
- Grand.Canyon. (2021, 12 23). The Most Effective Quantitative Data Collection Methods. Retrieved from Grand Canyon University blog: <https://www.gcu.edu/blog/doctoral-journey/most-effective-quantitative-data-collection-methods#quantitative-data-collection-methods>.
- Graz Unesco city of design. (2020, 10 20). The Montreal design declaration. Retrieved from Cities of Design Network: <https://www.designcities.net/showroom/the-montreal-design-declaration/#:~:text=The%20Montreal%20Design%20Declaration%20is%20a%20milestone%20marking,people%20deserve%20to%20live%20in%20a%20well-designed%20world.%E2%80%9C>.
- GXN. (2015). Exploring circular sustainability. Retrieved from Green solution house: <https://gxn.3xn.com/project/green-solution-house>.
- HAYES, A. (2022, 6 29). Economics defined with types, indicators and systems. Retrieved from Investopedia: <https://www.investopedia.com/terms/e/economics.asp>.
- Headsprings Depot, & Design tips team. (2019). 14 Questions to Ask When Buying Furniture. Retrieved from Headspringsdepot.com: <https://www.headspringsdepot.com/blogs/news/14-questions-to-ask-when-buying-furniture>.
- Hipcouch. (2017, 8 14). What Factors Influence the Cost of Your Furniture the Most & How Can You SAVE on It? Retrieved from Hipcouch.com: <https://www.hipcouch.com/magazine/what-influences-cost-of-your-furniture-how-to-save>.
- Humanity, H. f. (2022). 2022 State of the Nation's Housing report. Retrieved from Habitat.org: <https://www.habitat.org/costofhome/2022-state-nations-housing-report-lack-affordable-housing>.

- Iberdrola. (2023). Circular design: how to rethink the creative process and commit to sustainability. Retrieved from Iberdrola: <https://www.iberdrola.com/social-commitment/circular-design>.
- Ibrahim Iman Abdelshahid. (2020). Sustainable housing development: role and significance of satisfaction aspect. city territory and architecture, 14.
- IKEA. (n.d.). Transforming into a circular business. Retrieved from about.ikea.com: <https://about.ikea.com/en/sustainability/a-world-without-waste>.
- Iles, J. (2021, July 15). The New European Bauhaus and the circular economy. Retrieved from ellenmacarthurfoundation.org: <https://ellenmacarthurfoundation.org/articles/the-new-european-bauhaus-and-the-circular-economy>.
- İşbilen, E. (2012). From Bauhaus to IKEA: integration of mass production, standardization modularization and claim of universality with capitalist mode of production. MIDDLE EAST TECHNICAL UNIVERSITY, 139.
- k.Winans. (2017). Renewable and Sustainable Energy Reviews. In k. Winans, Renewable and Sustainable Energy Reviews (Vol. 68, pp. 825-833). California: sciencedirect.
- Kaiyo. (2022). Retrieved from kaiyo.com: <https://kaiyo.com/>.
- Khan, M. (2022). Designing For Deconstruction. Retrieved from [re-thinkingthefuture.com](https://www.re-thinkingthefuture.com): <https://www.re-thinkingthefuture.com/rtf-fresh-perspectives/a973-designing-for-deconstruction/>.
- Kidd E. (2023). How can furniture designers incorporate circular economy concepts into their products and services? Retrieved from [commercial Interior Design](https://www.linkedin.com/advice/0/how-can-furniture-designers-incorporate-circular): <https://www.linkedin.com/advice/0/how-can-furniture-designers-incorporate-circular>.
- Kubus , R., Bustillo, R., & Bustillo, R. (2021). A New European Bauhaus for a Culture of Transversality and Sustainability. Sustainability, 22.

- KUNZIG, R. (2020, FEBRUARY 18). Is a world without trash possible? . Retrieved from nationalgeographic.com:
<https://www.nationalgeographic.com/magazine/article/how-a-circular-economy-could-save-the-world-feature>.
- Lendager. (2023). Resouce Rows. Retrieved from lendager.com:
<https://lendager.com/project/resource-rows/>.
- Mariani, G. (september 2016). Influence of consumer behaviour on the circular. *ieee*, 1(1), 97.
- MBN. (n.d.). What are unlimited wants? Definition and examples. Retrieved from marketbusinessnews: <https://marketbusinessnews.com/financial-glossary/unlimited-wants/>.
- Meilani. (2019, 11 8). The Circular Potential of Modular Design. Retrieved from materialtrader: <https://community.materialtrader.com/the-circular-potential-of-modular-design/>.
- Mike Press, Rachel Cooper. (2016). *The Design Experience*. London.
- Minunno, R., O'Grady, T., Morrison, G. M., & Gruner, R. L. (2020). Exploring environmental benefits of reuse and recycle practices: A circular economy case study of a modular building. Retrieved from *Resources, Conservation and Recycling*: <https://doi.org/10.1016/j.resconrec.2020.104855>.
- Mitchell M. Tseng & Chenjie Wang. (2019). *CIRP Encyclopedia of Production Engineering*. Berlin: Springer, Berlin, Heidelberg.
- MORGAN, B. (2018, 7 27). So, What Does DIY Actually Even Mean? Retrieved from housebeautiful: <https://www.housebeautiful.com/lifestyle/a22567439/what-is-diy-meaning/>.
- Natalia Hartono, A. C. (july 2019). MODULAR FURNITURE MADE FROM CORRUGATED BOX WASTE USING design for environment guidelines. *research gate*, 14.

- Northsearegion. (2014). Action plan to promote sharing economy and circular economy in Helsingborg. Retrieved from Northsearegion.eu: <https://northsearegion.eu/media/17975/action-plan-to-promote-sharing-and-circular-economy-in-helsingborg.pdf>.
- Norton, M., Mochon, D., & Ariely, D. (2012, 7 22). The IKEA effect: When labor leads to love. *Journal of Consumer Psychology*, 30. Retrieved from Dash.harvard.edu: <https://dash.harvard.edu/bitstream/handle/1/12136084/nortonmochonarielythirdround%5b1%5d.pdf?sequence=3>.
- Papanek, V. J. (1972). *Design for the Real World* by Victor Papanek. Chicago: Academy Chicago Publishers.
- Paradise, C., & Schwartz, P. (2022). Closing the loop: How systems enable the circular economy. Retrieved from smartdesignworldwide: <https://smartdesignworldwide.com/ideas/looprecap/>.
- Paul Ekins, Teresa Domenech, Paul Drummond, Raimund Bleischwitz,. (2019). *The Circular Economy: What, Why,How and Where. Managing environmental and energy transitions for regions and cities* (p. 82). Paris: OECD. Retrieved from <https://www.oecd.org/cfe/regionaldevelopment/Ekins-2019-Circular-Economy-What-Why-How-Where.pdf>.
- Peter Joore, Han Brezet. (2015). *Journal of Cleaner Production*. In P. J. Brezet, *A Multilevel Design Model: the mutual relationship between product-service system development and societal change processes* (Vol. 97, pp. 92-105). Leeuwarden: NHL University of Applied Sciences, Leeuwarden, Netherlands. Retrieved from <https://doi.org/10.1016/j.jclepro.2014.06.043>.
- Radius, F. (2019, 9 27). Applying smart design principles to amplify benefits of additive manufacturing. Retrieved from fastradius: <https://www.fastradius.com/resources/applying-smart-design-principles-to-amplify-benefits-of-am/>.

- Rob Atkinson. (n.d.). The Circular Economy: Part One. Retrieved from interiorarchitects.com: <https://interiorarchitects.com/the-circular-economy-part-one/>.
- Robinson, O. (2022, October 10). How is the cost of living crisis shaping customer behaviour? Retrieved from vocovo.com: <https://www.vocovo.com/us/blog/post/how-is-the-cost-of-living-crisis-shaping-customer-behaviour/>.
- Rose, A. (2023, Feb 6). 20 Home Renovations That Will Hurt Your Home's Value. Retrieved from gobankingrates: <https://www.gobankingrates.com/investing/real-estate/home-renovations-hurt-homes-value/>.
- Roser, M., & Rodés-Guirao, L. (2019). Future Population Growth. Retrieved from ourworldindata: <https://ourworldindata.org/future-population-growth>.
- Sanders, E.-N. (1999). Postdesign and participatory culture. In Useful & Critical: The Position of Research in Design.
- Sarstedt, M., & Neubert, D. (2016, 11). The IKEA Effect. A Conceptual Replication. Retrieved from Researchgate.net: https://www.researchgate.net/publication/310491448_The_IKEA_Effect_A_Conceptual_Replication.
- Schoeman, C. R. (2020, 11 19). 10 things that could go wrong when moving house. Retrieved from Master Movers : <https://www.mastermovers.co.za/10-things-that-could-go-wrong-when-moving-house>.
- Selibio, L. (2022, 11 21). Furniture-as-a-Service: Everything You Need to Know. Retrieved from circuly: <https://www.circuly.io/blog/furniture-as-a-service>.
- Suman, S. (2020). Economics as a Social Science. Retrieved from Economicsdiscussion.net: <https://www.economicsdiscussion.net/economics-2/social-science/economics-as-a-social-science-with-diagram/12264>.

- Sumter, D., De Koning, J., & Bakker, C. (2020). Circular Economy Competencies for Design. Faculty of Industrial Design Engineering, Delft University of Technology, 16.
- Terrapass. (2022, August 19). The Problems We Face With the Overconsumption of Natural Resources. Retrieved from Terrapass: <https://terrapass.com/blog/overconsumption-of-natural-resources/>.
- The geographer online team. (2019). Resource stewardship. Retrieved from thegeographeronline: <https://www.thegeographeronline.net/3-resource-stewardship.html>.
- The Manutan Family. (2023, 5 25). What is the impact of transitioning from linear economy vs circular economy for companies? Retrieved from manutan.com: <https://www.manutan.com/blog/en/circular-economy/what-is-the-impact-of-transitioning-from-linear-economy-vs-circular-economy-for-companies>.
- TheGuarantors. (2021, 12 16). Choosing a Furnished Apartment: Pros and Cons. Retrieved from TheGuarantors.com: <https://www.thegarantors.com/blog/renters/choosing-a-furnished-apartment-pros-and-cons>.
- Thomas, J. (2021, 5 19). What is Circular Design? And why does it matter? Retrieved from UX Planet: <https://uxplanet.org/what-is-circular-design-72b0a148e33f>.
- Thorpe, A. (2010). Design Issues. In A. Thorpe, Design's role in sustainable consumption. (pp. 26(2) , 3-16). https://doi.org/10.1162/DESI_a_00001.
- Trochim, W. M. (2006). Organizing Academic Research Papers: Theoretical Framework. Retrieved from library.sacredheart.edu: <https://library.sacredheart.edu/>.
- Twilio. (2022, September 7). Cost of living crisis is changing the way consumers interact with companies. Retrieved from Twilio.com: <https://www.twilio.com/en-us/press/releases/cost-of-living-crisis-is-changing-the-way-consumers-interact-with-companies>.

- Ugreen. (2023, APRIL 3). How to Incorporate Circular Design Principles: A Guide For Architects, Designers, and Builders. Retrieved from ugreen.io: <https://ugreen.io/how-to-incorporate-circular-design-principles-a-guide-for-architects-designers-and-builders/>.
- United Nations. (n.d.). Department of Economic and Social Affairs, sustainable development. Retrieved from sdgs.un.org: <https://sdgs.un.org/goals>.
- Verdon, J. (2022, 4 19). Furnish Brings Its Furniture-As-A-Service Model To New York And DC. Retrieved from Forbes.com: <https://www.forbes.com/sites/joanverdon/2022/04/19/furnish-brings-its-furniture-as-a-service-model-to-new-york-and-dc/?sh=6b3151997dab>.
- vermes, k. (2015, 7 29). A Circular Economy: Working Toward a Sustainable Lifestyle. Retrieved from recycle nation: <https://recyclenation.com/2015/07/circular-economy-working-toward-sustainable-lifestyle/>.
- viakgroup. (2021, 6 17). 8 Reasons Modular Furniture is the solution to more efficiency in a Workplace. Retrieved from viak group furnishing world: <https://www.viakgroup.com/reasons-modular-furniture-is-the-solution-to-more-efficiency-in-a-workplace/>.
- Voxco. (2020). Basic Survey Questions. Retrieved from Voxco.com: <https://www.voxco.com/blog/basic-survey-questions/>.
- voxco. (n.d.). voxco.com. Retrieved from <https://www.voxco.com/blog/quantitative-research-questions-examples/>.
- vwo. (2021). Website Surveys. Retrieved from vwo: <https://vwo.com/website-surveys/>.
- Wautelet, T. (2018). The Concept of Circular Economy: its Origins and its Evolution. Research Gate.
- weburbanist. (2020). Modular Minimalism: 5-Part Kit to Create Infinite Furniture. Retrieved from weburbanist.com: <https://weburbanist.com/2014/11/01/modular-minimalism-5-part-kit-to-create-infinite-furniture/>.

weforum. (2022, 6 16). What has caused the global housing crisis - and how can we fix it?
Retrieved from World Economic Forum:
<https://www.weforum.org/agenda/2022/06/how-to-fix-global-housing-crisis>.

Wellbeing Design Consultants. (2022). circular design with soma studio milano. Retrieved
from biofilico.com: <https://biofilico.com/news/circular-design-wellbeing-biophilic-interior>.

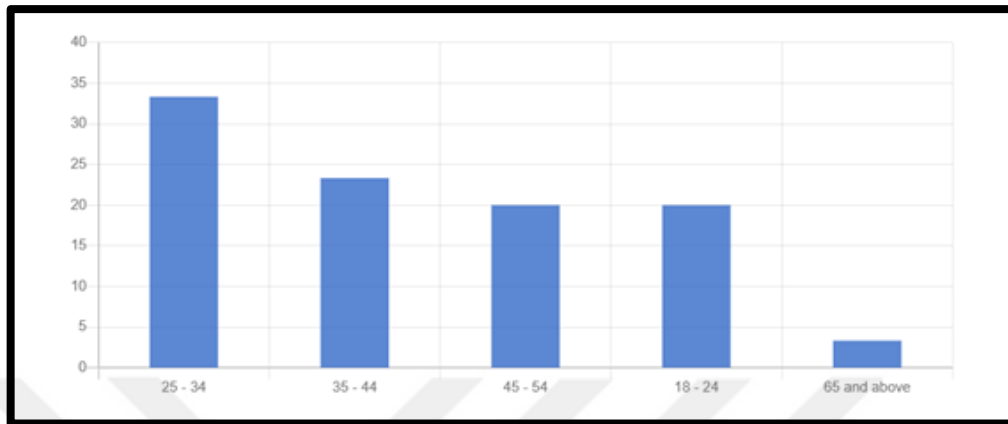
wikipedia. (2021). Circular economy. Retrieved from wikipedia:
https://en.wikipedia.org/wiki/Circular_economy.



APPENDIX A

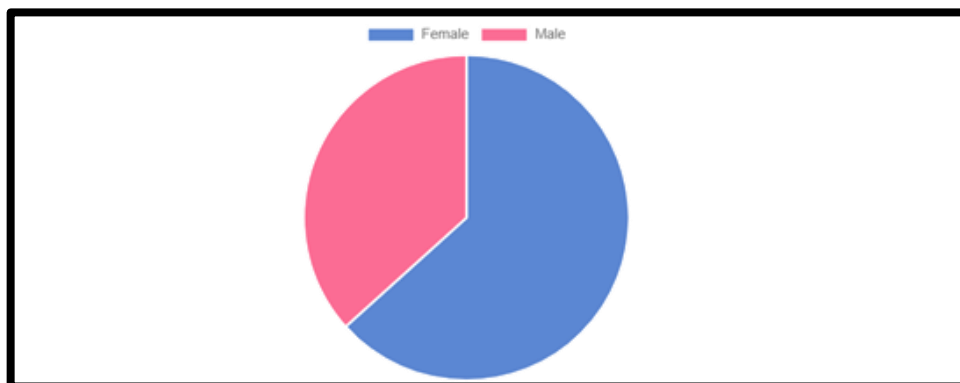
USERS SURVEY

1. How old are you?



Value	Frequency	Percentage
25 - 34	10	33.33
35 - 44	7	23.33
45 - 54	6	20
18 - 24	6	20
65 and above	1	3.33

2. What is your Gender?



Value	Frequency	Percentage
Female	19	63.33
Male	11	36.67

3. Specify your field of work

Value	Frequency	Percentage
nurse	2	6.67
teacher	2	6.67
administration	1	3.33
education	1	3.33
Student	1	3.33
Electrical engineer	1	3.33
Fashion designer	1	3.33
IT	1	3.33
student	1	3.33
unemployed	1	3.33
Teaching English / forex trading	1	3.33
Supply Chain Manager	1	3.33
student	1	3.33
humanitarian	1	3.33
education	1	3.33
services	1	3.33
study	1	3.33
Political science	1	3.33
banker	1	3.33
education	1	3.33
University instructor/ professor	1	3.33
University professor	1	3.33
Décor stylist	1	3.33
Study	1	3.33
teaching	1	3.33
School director	1	3.33
Teaching and education	1	3.33
engineer	1	3.33

4. On a scale of zero to 6 how much attention do you give to the environmental impact of your daily life actions and purchases?

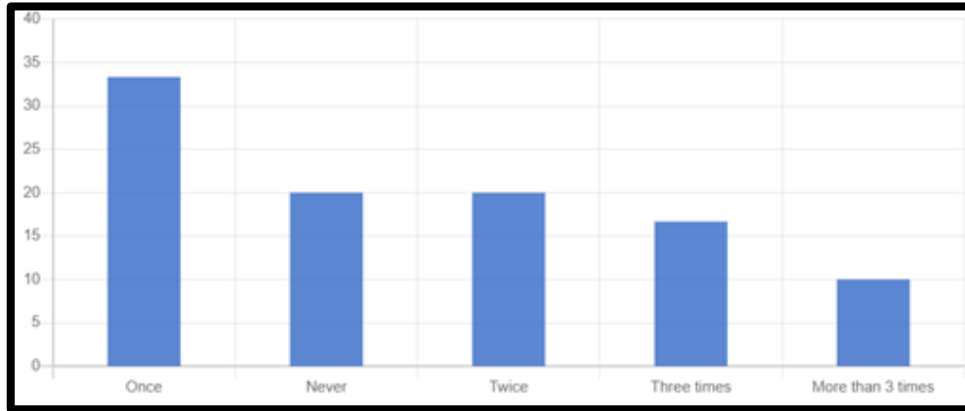
Mean 3.53

Median 3.00

Mode 3.00

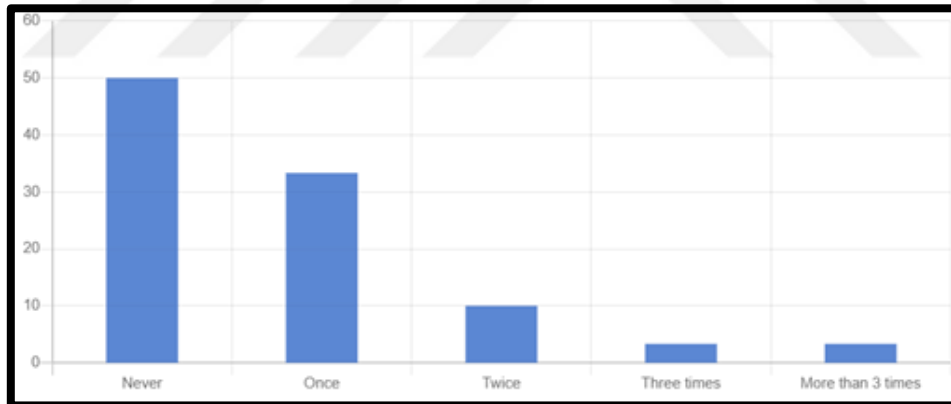
Standard deviation 1.50

5. Within the last 5 years how many times did you move from one house to another?



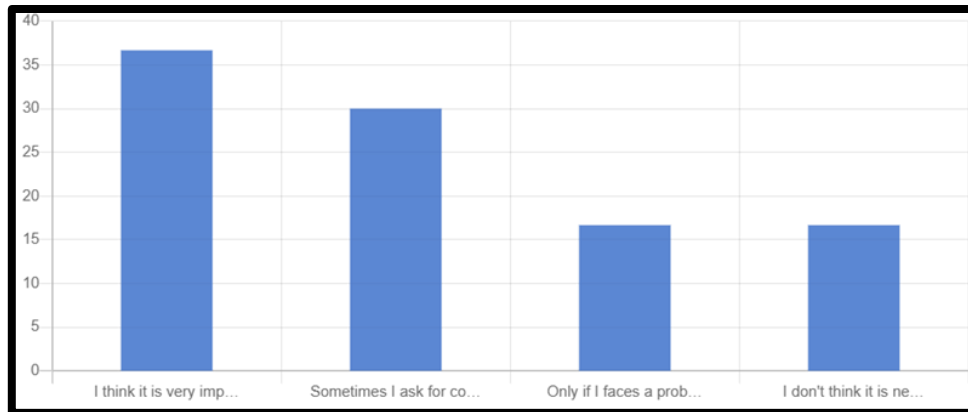
	Frequency	Percentage
Once	10	33.33
Never	6	20
Twice	6	20
Three times	5	16.67
More than 3 times	3	10

6. Within the last 5 years how many times did you renovate your house?



	Frequency	Percentage
Never	15	50
Once	10	33.33
Twice	3	10
Three times	1	3.33
More than 3 times	1	3.33

7. When you Decide to move to another house or to renovate your house, do you prefer to ask for an advice from architects, interior designer and furniture showrooms?



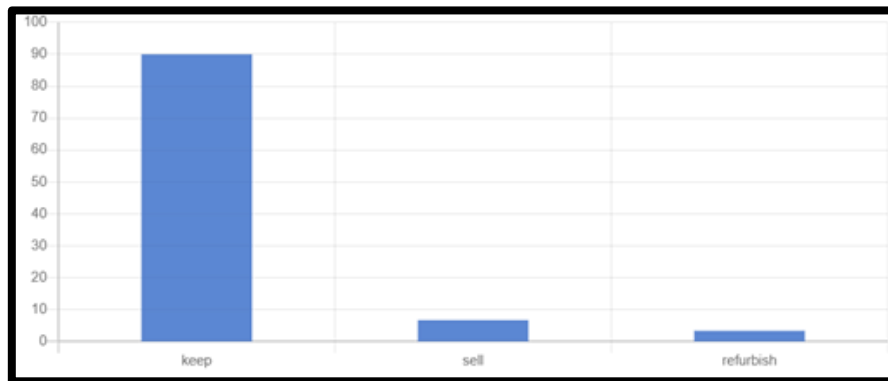
	Frequency	Percentage
I think it is very important to ask an expert	11	36.67
Sometimes I ask for consultation	9	30
Only if I faces a problem I cannot solve on my own	5	16.67
I don't think it is needed	5	16.67

8. If you want to renovate your house what would you do with your existing furniture?

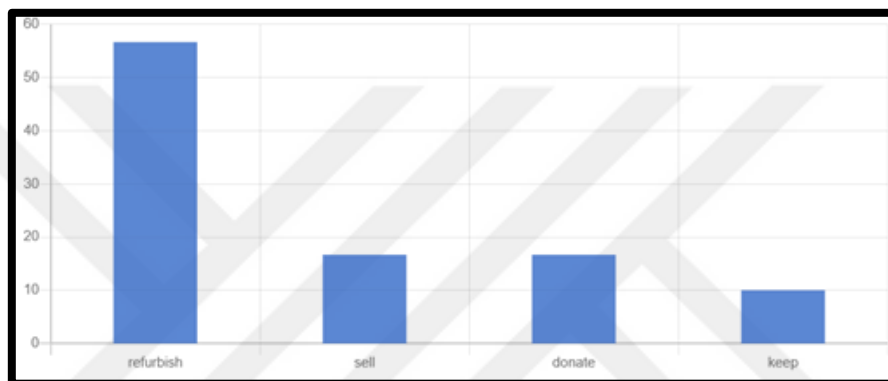
	Frequency	Percentage
It depends on the condition of the furniture I have	11	36.67
Keep the furniture which are still in shape and replace the damaged ones with new furniture	7	23.33
Keep the furniture which are still in shape and refurbish the damaged ones	4	13.33
Sell the old ones and buy new furniture	4	13.33
Donate or repurpose the old ones and buy new furniture	3	10
Refurbish all furniture to match the new trends	1	3.33

9. What would you do with your furniture when you want to move to another house according to each situation:

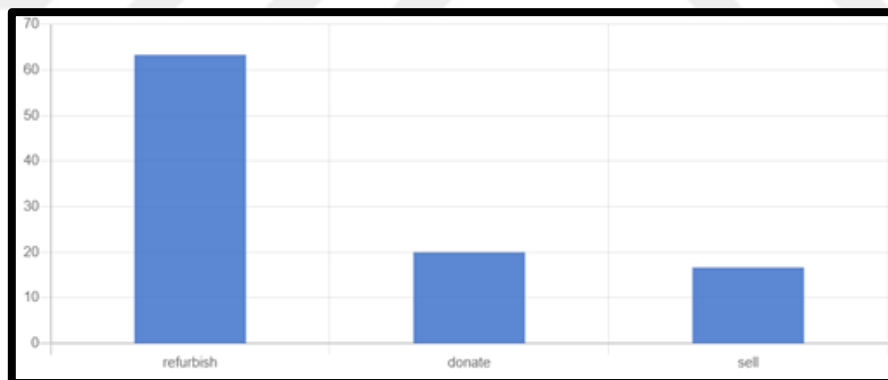
a. if the furniture was in good shape and trendy



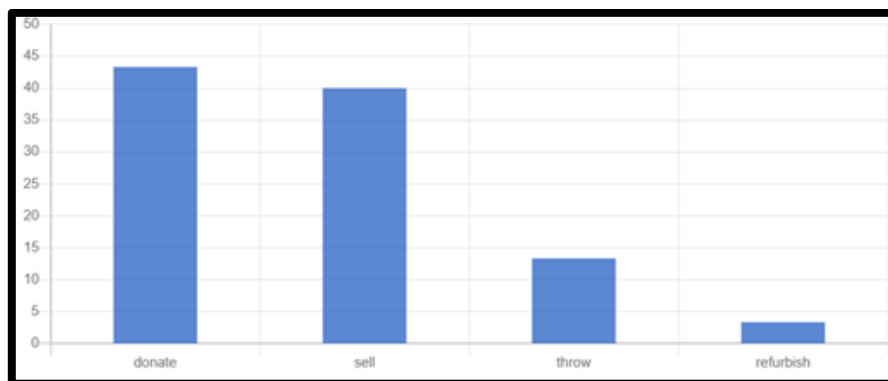
b. if furniture was in good shape but old fashioned



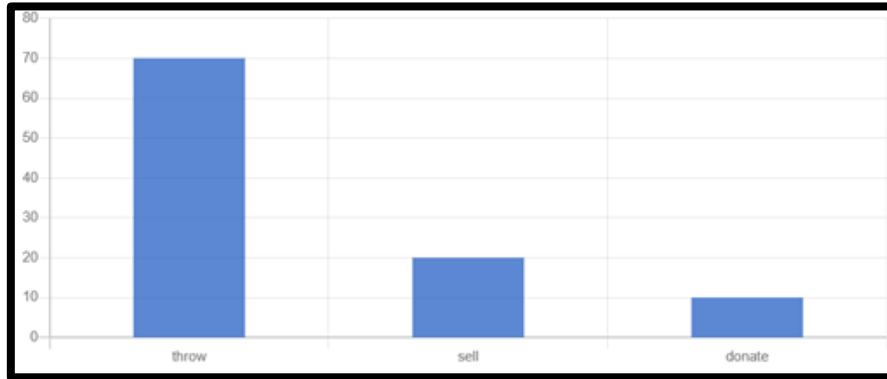
c. if the furniture was damaged slightly



d. if the furniture was damaged badly



e. if the furniture was completely damaged



10. How do you keep yourself updated on the latest design trends?

	Frequency	Percentage
I don't keep updated	13	43.33
By checking the market's newest trends and best sellers	9	30
By reading relevant articles and books	7	23.33
By checking trends on social media	5	16.67

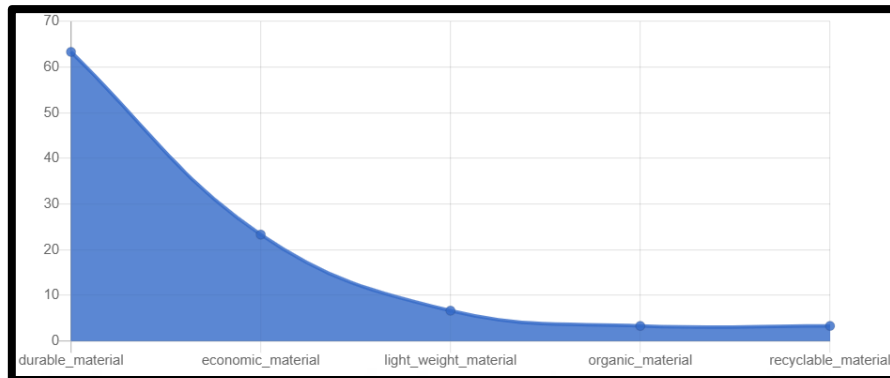
11. How often do you use recycled or upcycled materials in your daily life?

Value	Frequency	Percentage
Sometimes	13	43.33
Rarely	9	30
Very often	4	13.33
Often	2	6.67
Never	2	6.67



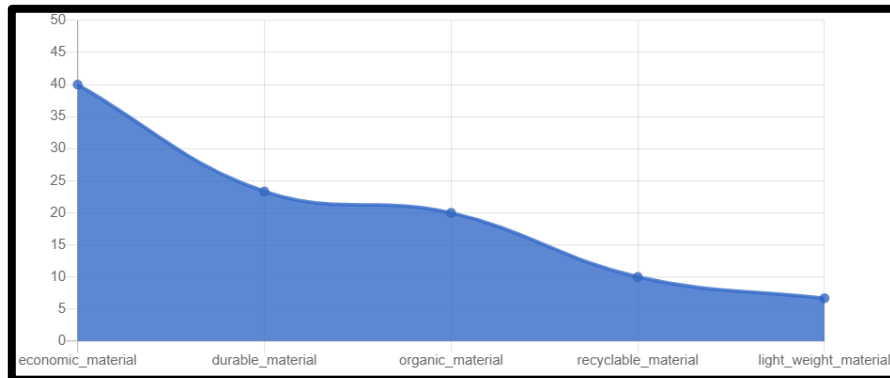
12. When buying a piece of furniture which one of these characteristics is the most important to you? Arrange 1 is highest 6 is lowest.

First choice:



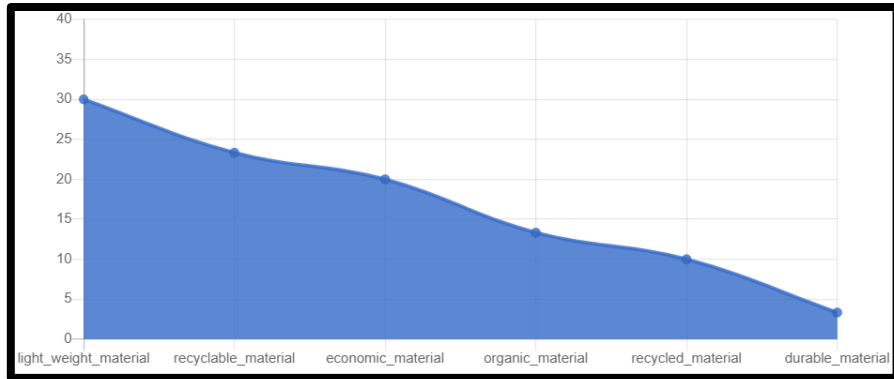
Value	Frequency	Percentage
Durable material	19	63.33
Economic material	7	23.33
Light-weight material	2	6.67
Organic material	1	3.33
Recyclable material	1	3.33

Second choice:



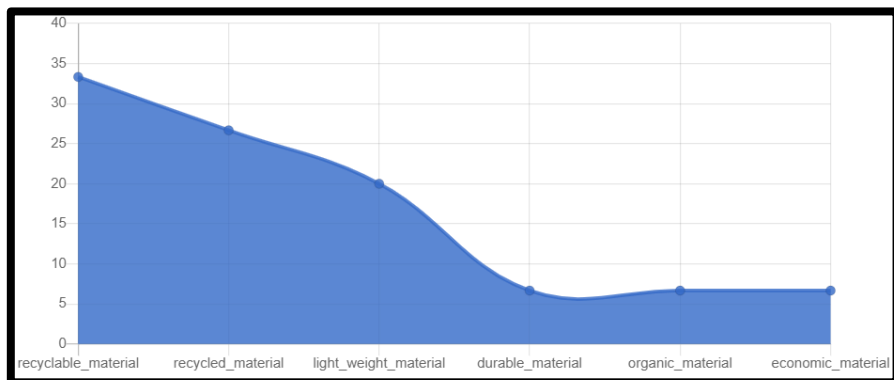
Value	Frequency	Percentage
Economic material	12	40
Durable material	7	23.33
Organic material	6	20
Recyclable material	3	10
Light-weight material	2	6.67

Third choice:



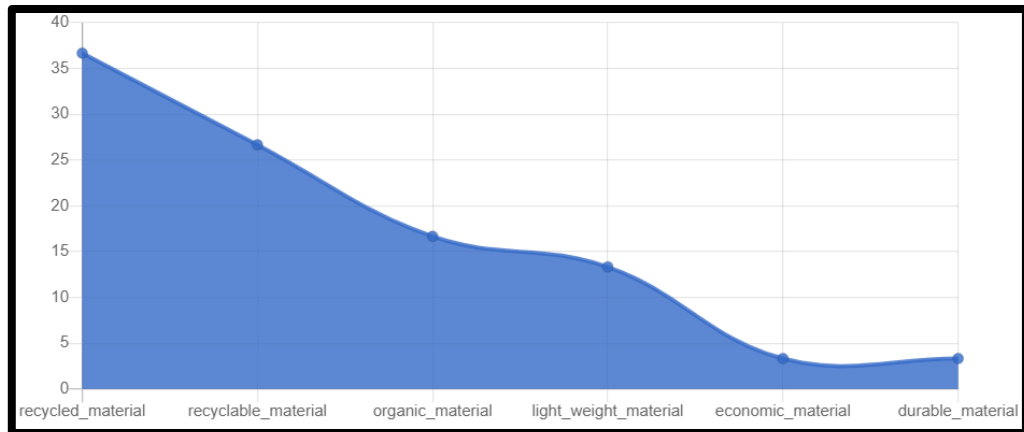
Light-weight material	9	30
Recyclable material	7	23.33
Economic material	6	20
Organic material	4	13.33
Recycled material	3	10
Durable material	1	3.33

Fourth choice:



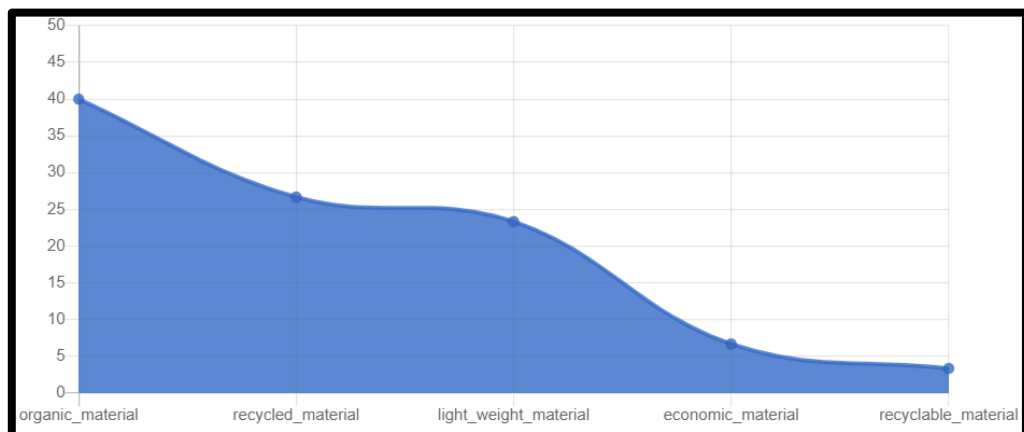
Recyclable material	10	33.33
Recycled material	8	26.67
Light-weight material	6	20
Durable material	2	6.67
Organic material	2	6.67
Economic material	2	6.67

Fifth choice:



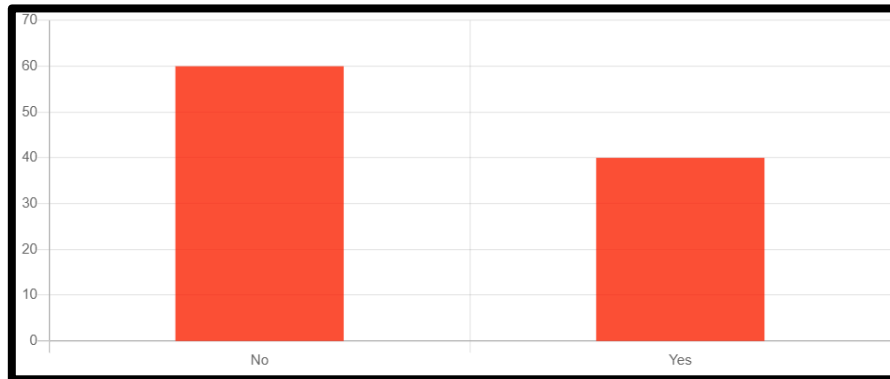
Recycled material	11	36.67
Recyclable material	8	26.67
Organic material	5	16.67
Light-weight material	4	13.33
Economic material	1	3.33
Durable material	1	3.33

Sixth choice:



Organic material	12	40
Recycled material	8	26.67
Light-weight material	7	23.33
Economic material	2	6.67
Recyclable material	1	3.33

13. Do you know what is the concept of circular economy?



14. Among the following options, choose the ones you consider important to put in mind before going to a furniture showroom:

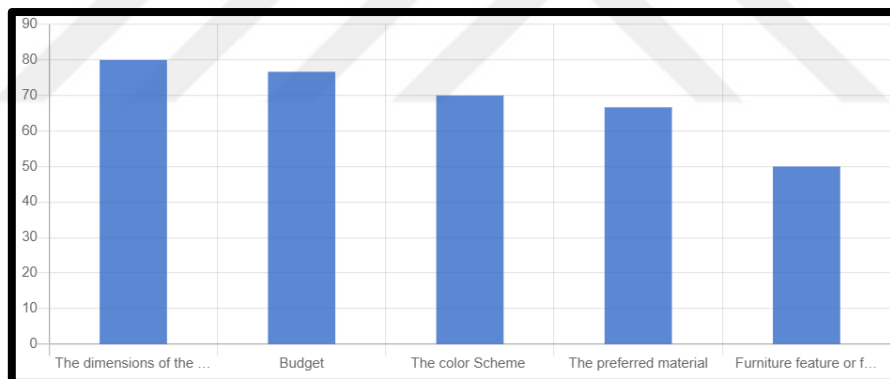
The dimensions of the space to be furnished

Budget

The color Scheme

The preferred material

Furniture feature or function (like bed with storage or sofa bed)



15. Before buying any furniture, which of the following questions do you ask the seller

What materials are used to make this furniture?

Is this furniture on sale or is there a discount available?

What is the warranty or guarantee on this furniture?

How do I care for and maintain this furniture?

What are the dimensions of this piece of furniture?

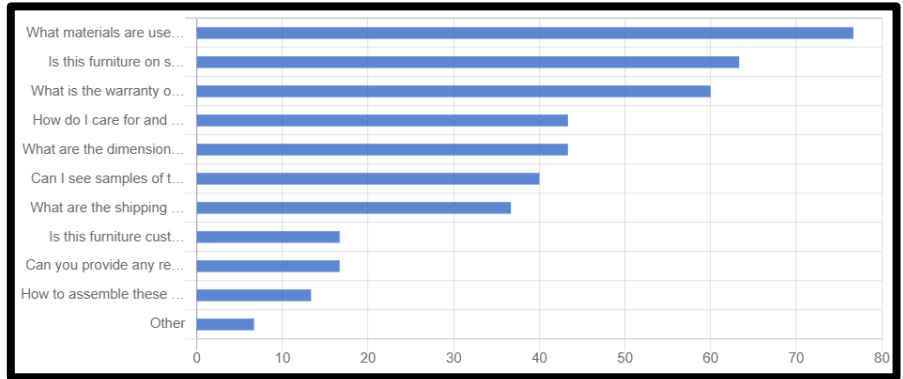
Can I see samples of the different fabric or color options for this furniture?

What are the shipping or delivery options and associated costs?

Is this furniture customizable?

Can you provide any recommendations for complementary pieces of furniture or décor items?

How to assemble these pieces together?



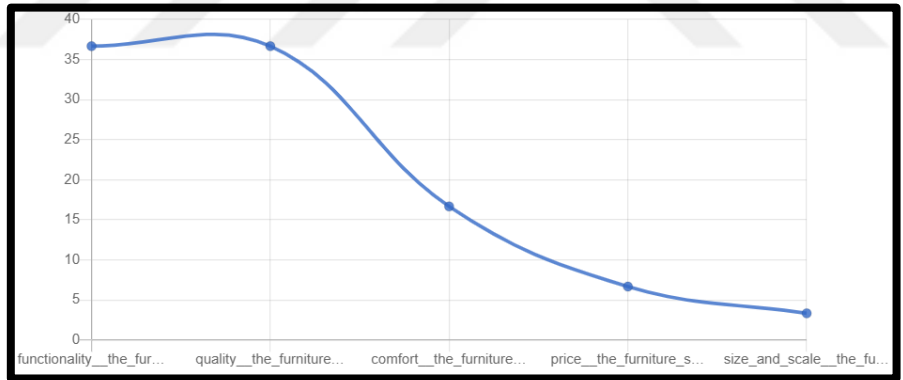
If you have other questions, specify:

Can I return the furniture whenever I want if there was a problem?

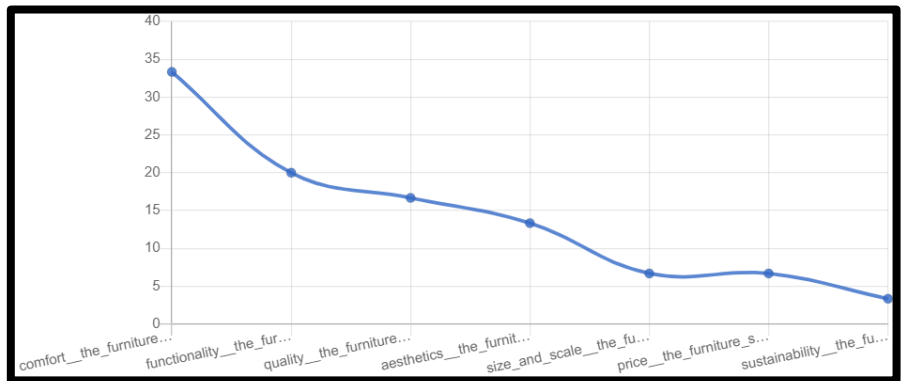
Can you make me furniture with my own design?

16. which one of these furniture characteristics are the most important, arrange them from 1 to 10 according to your preference. 1 is most important, 10 is least important.

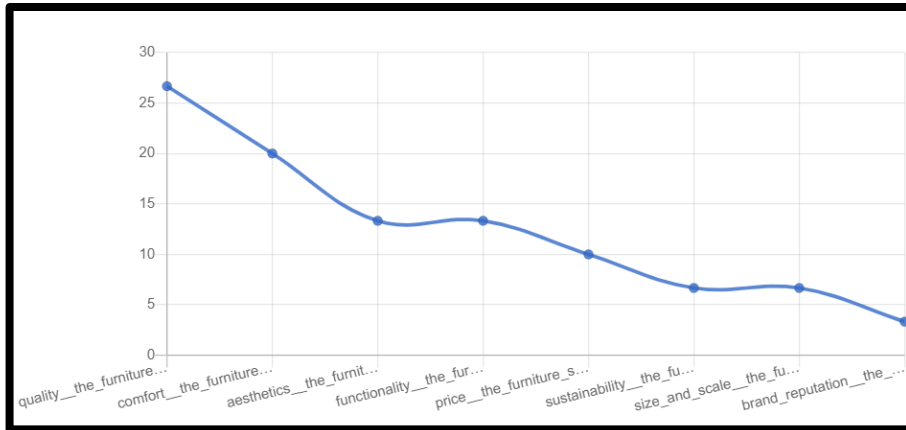
1- functionality



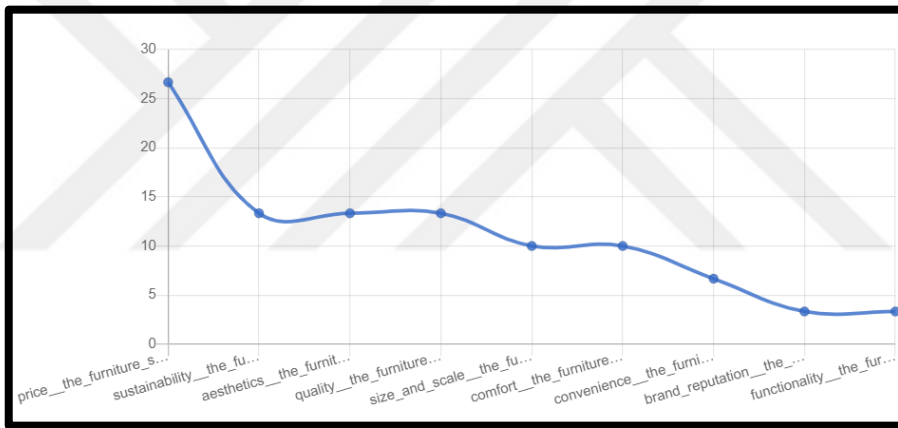
2- comfort



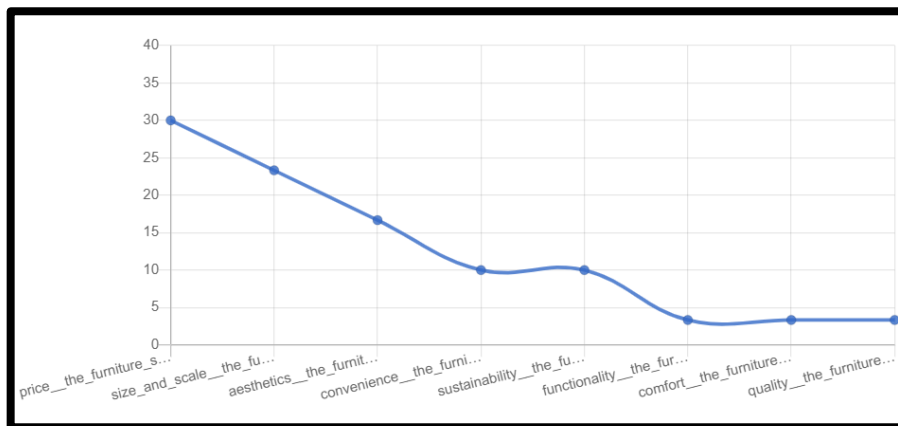
3- Quality



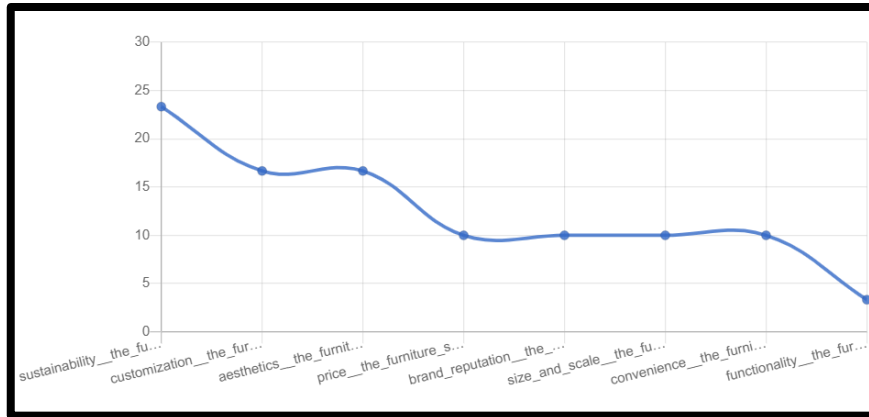
4- Price



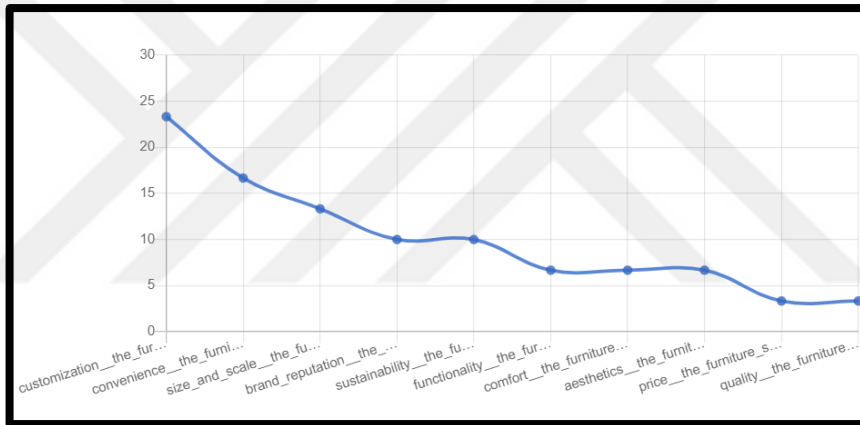
5- Size



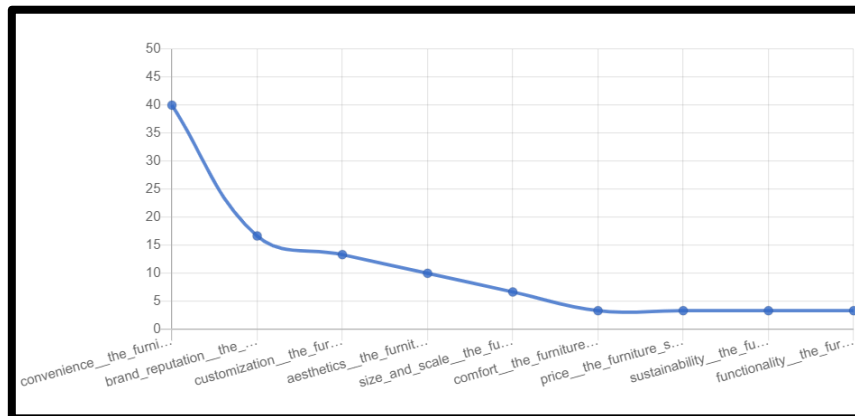
6- Sustainability



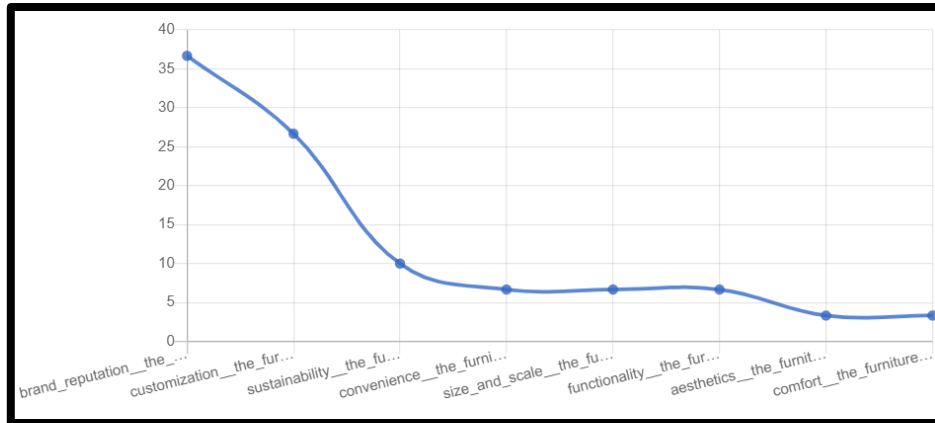
7- Customization



8- Convenience

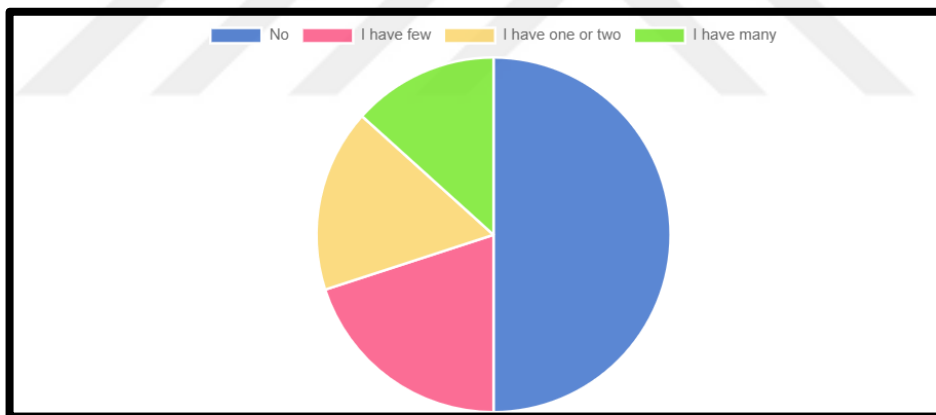


10- Brand



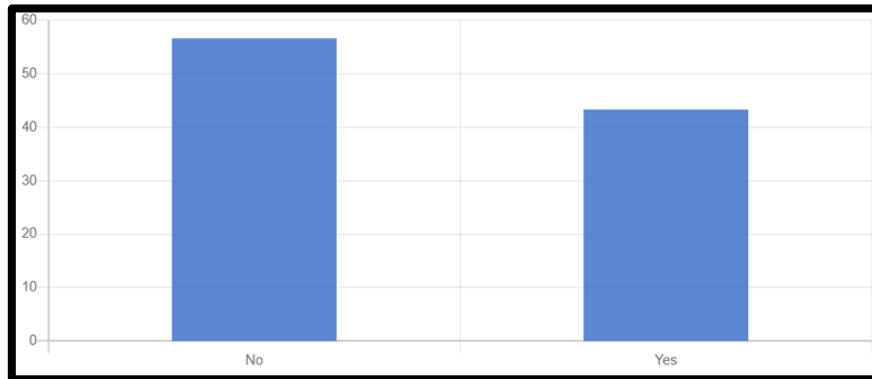
One of the characteristics was debatable which is the aesthetic, it was mostly in the first 3 choices but the numbers were very close with the other choice one or two participants difference.

17. Do you have any product that can be disassembled and repurposed at the end of its life?



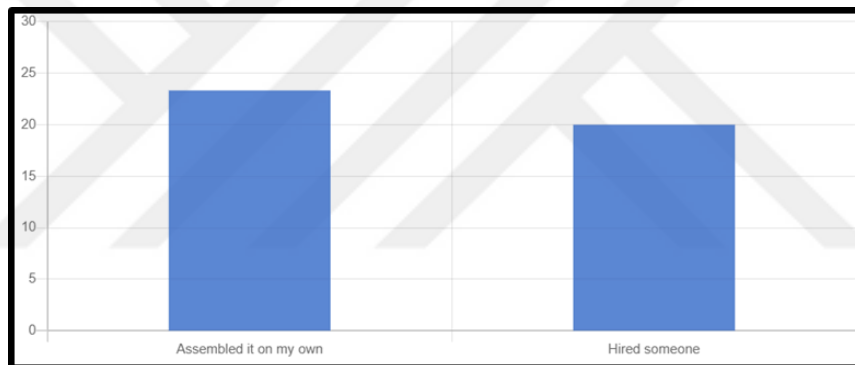
	Frequency	Percentage
No	15	50
I have few	6	20
I have one or two	5	16.67
I have many	4	13.33

18. Have you ever bought disassembled furniture?



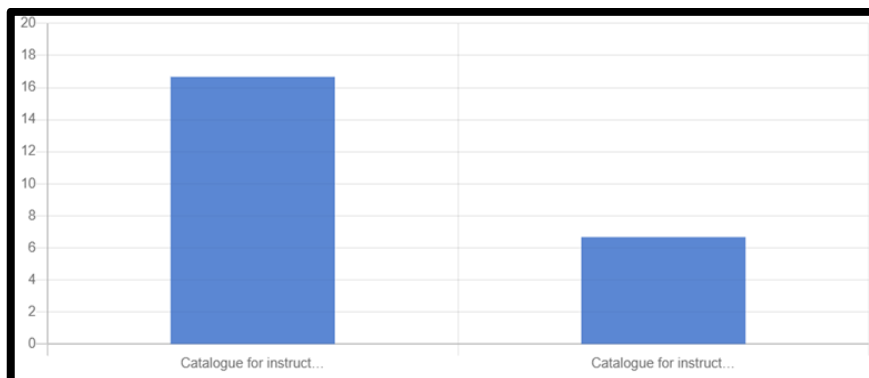
	Frequency	Percentage
No	17	56.67
Yes	13	43.33

19. Did you assemble it yourself or hired someone?



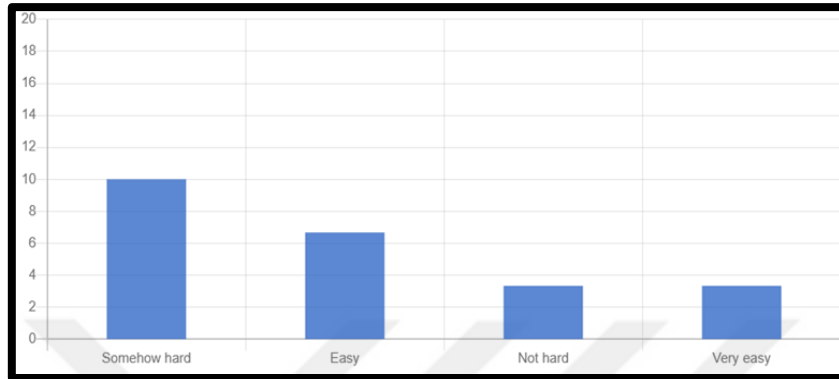
	Frequency	Percentage
Assembled it on my own	7	23.33
Hired someone	6	20

20. Did the furniture come with a catalogue and special tools for assembly?



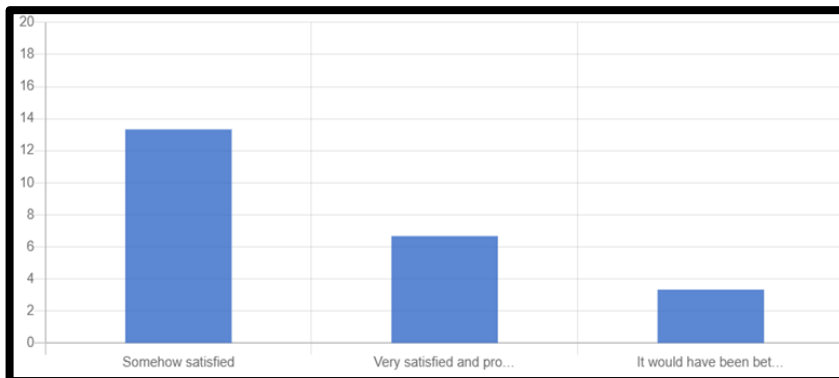
	Frequency	Percentage
Catalogue for instructions	5	16.67
Catalogue for instructions and special tools	2	6.67

21. Was it hard to assemble with the instructions?



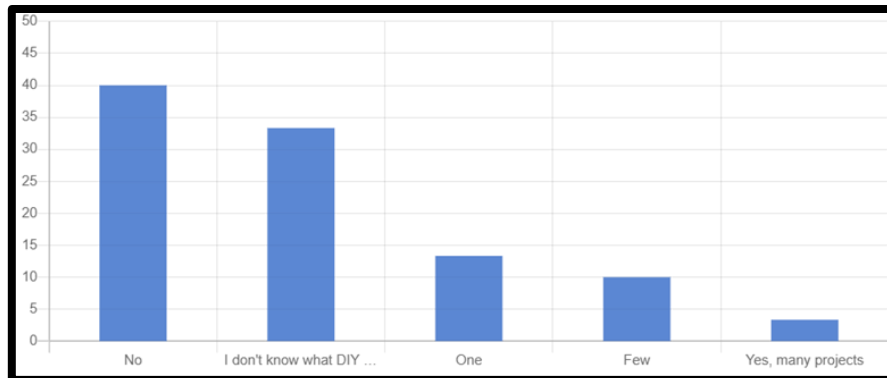
	Frequency	Percentage
Somehow hard	3	10
Easy	2	6.67
Not hard	1	3.33
Very easy	1	3.33

22. where you satisfied with the result?



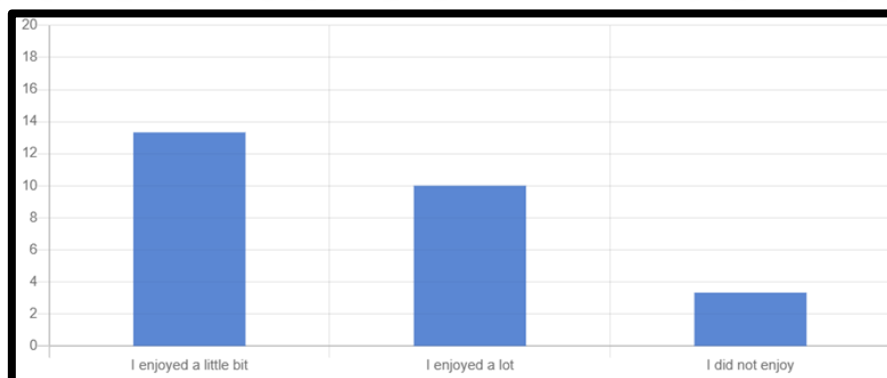
	Frequency	Percentage
Somehow satisfied	4	13.33
Very satisfied and proud of myself	2	6.67
It would have been better if I hired a professional	1	3.33

23. have you ever done a DIY project?



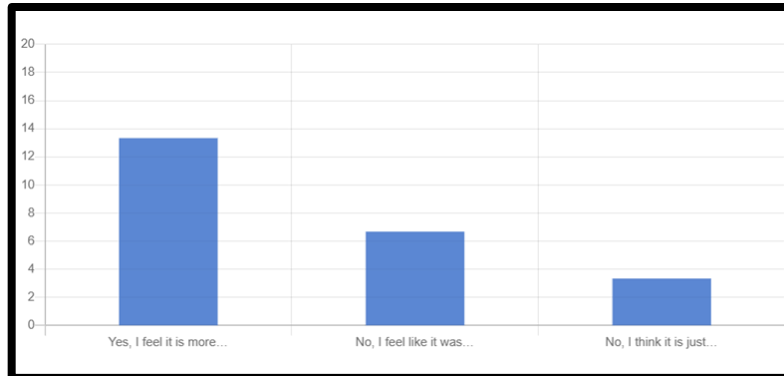
	Frequency	Percentage
No	12	40
I don't know what DIY means	10	33.33
One	4	13.33
Few	3	10
Yes, many projects	1	3.33

24. did you enjoy it?



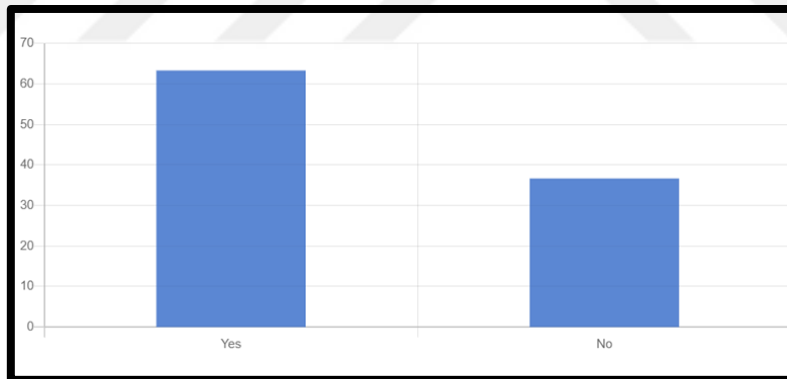
	Frequency	Percentage
I enjoyed a little bit	4	13.33
I enjoyed a lot	3	10
I did not enjoy	1	3.33

25. Do you feel that you have a different bond with the piece of furniture you put effort on more than standard furniture? do you feel it is more valuable to you?



	Frequency	Percentage
Yes, I feel it is more valuable	4	13.33
No, I feel like it was just a time pass and a recycling project	2	6.67
No, I think it is just a way of saving money	1	3.33

26. have you ever rented furniture instead of buying it?



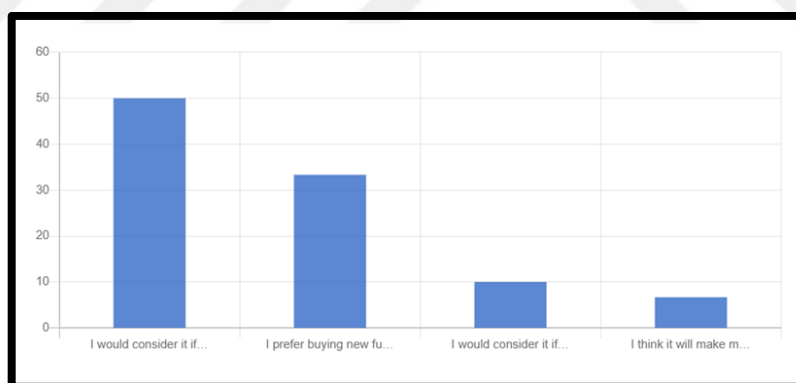
	Frequency	Percentage
Yes	19	63.33
No	11	36.67

27. for how long a what purpose did you rent the furniture?

Value	Frequency	Percentage
for 1 day for wedding ceremony	1	3.33
for one week for funeral	1	3.33
1day, function	1	3.33

funeral, 1day	1	3.33
4 days, events	1	3.33
2days, ceremony	1	3.33
3days,events	1	3.33
4 hours, funeral	1	3.33
3 hours, event	1	3.33
12 hours, events	1	3.33
2 days, ceremony	1	3.33
2 days, events	1	3.33
1 or 2 days, for events	1	3.33
1 day maximum for funeral	1	3.33
4 days for family functions	1	3.33
For events at home, 2 days	1	3.33
1 week , For family functions	1	3.33
2 days for different events	1	3.33
3 hours maximum for home events	1	3.33

28. what do you think about buying or renting used furniture?



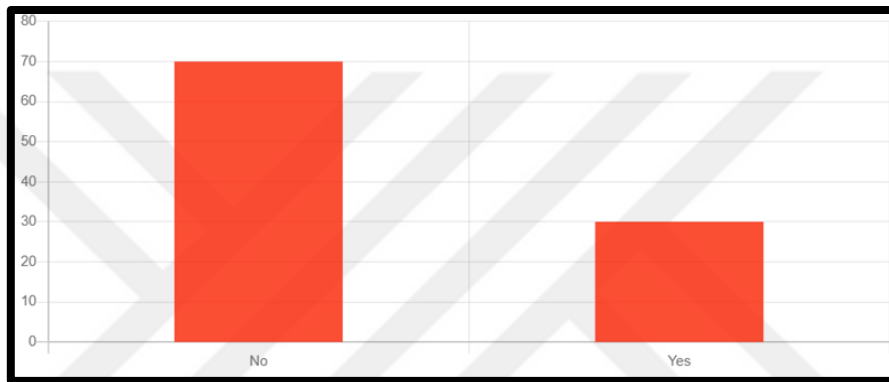
	Frequency	Percentage
I would consider it if I was living temporarily in a place	15	50
I prefer buying new furniture	10	33.33
I would consider it if it was a cheaper option	3	10
I think it will make my house looks cheaper and less classy	2	6.67

29. After answering these Question and knowing the definition of Circular economy how much can you rate your daily practices in accordance to circular economy principles?

Mean 4.40 Median 4.00 Mode 3.00 Standard deviation: 2.22

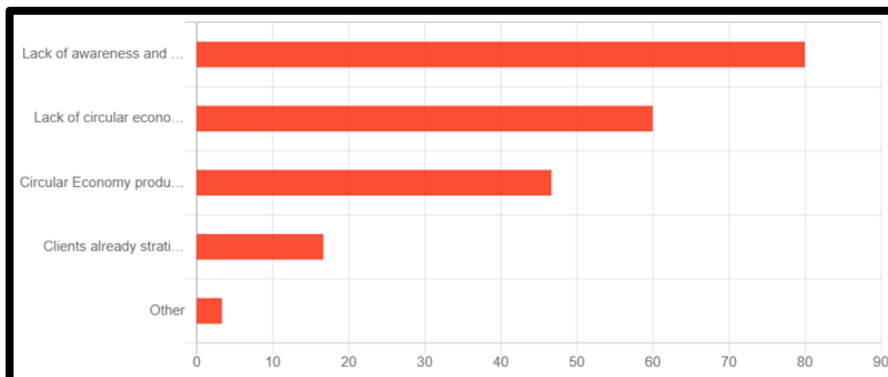
30. have you ever heard of organizations promoting circular economy practices in your country?

	Frequency	Percentage
No	21	70
Yes	9	30

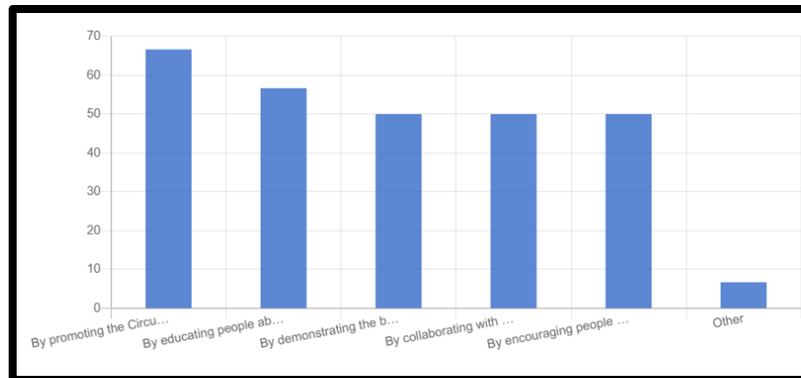


31. in your opinion, what are the reasons why circular economy and circular design are not popular?

	Frequency	Percentage
Lack of awareness and understanding	24	80
Lack of circular economy products in the market	18	60
Circular Economy products are expensive	14	46.67
Clients already stratified with current products	5	16.67



32. How do you think it's possible to promote a new concept like the circular economy among people?



	Frequency	Percentage
By promoting the Circular Economy idea through advertisements and social media	20	66.67
By educating people about the benefits and impact of circular economy on their future and daily life.	17	56.67
By demonstrating the benefits in a clear way with examples of circular economy products to show their efficiency.	15	50
By collaborating with stakeholders, such as contractors, suppliers and service providers to promote the principles of circular economy and sustainability.	15	50
By encouraging people to take maintenance choices that help decrease waste and financial costs.	15	50
Other	2	6.67

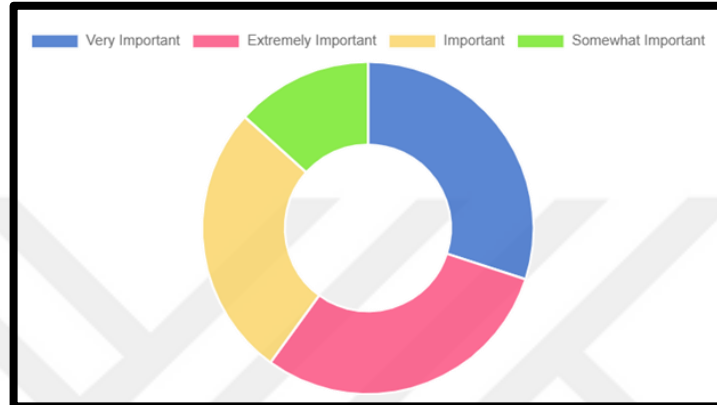
If other, specify:

Other: 1. There must be rules made by the government to oblige people.

2. Recyclable material with different shapes and forms must be available for users.

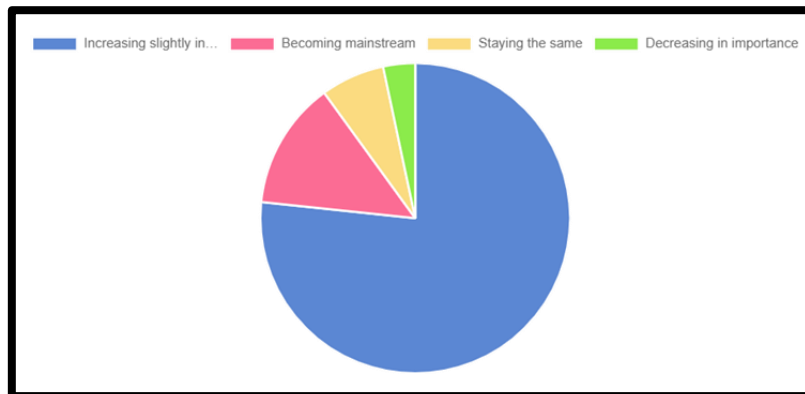
33. How important do you think it is for designers to promote a circular economy, sustainable design, or any other concept to the general people?

	Frequency	Percentage
Very Important	9	30
Extremely Important	9	30
Important	8	26.67
Somewhat Important	4	13.33



34. How do you see the circular economy and circular design evolving in the next 5 to 10 years?

	Frequency	Percentage
Increasing slightly in importance	23	76.67
Becoming mainstream	4	13.33
Staying the same	2	6.67
Decreasing in importance	1	3.33



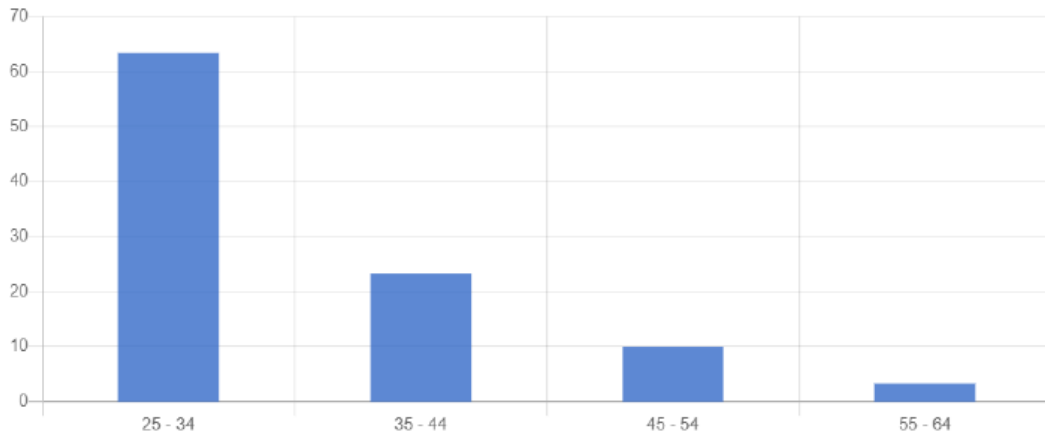
35. On a scale of 1 to 5, how bad and critical do you think the environmental crisis and the lack of resources are?

Mean 3.90 / Median 3

APPENDIX B

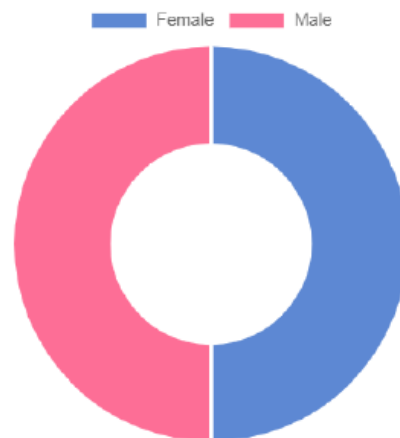
DESIGNERS SURVEY

1- How old are you?

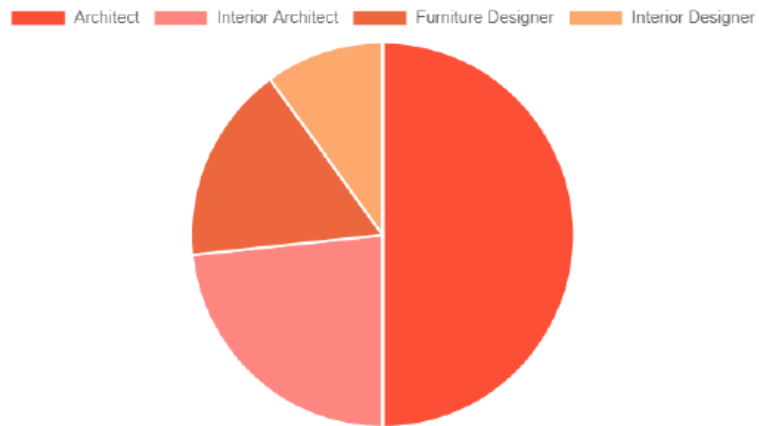


	Frequency	Percentage
25 - 34	19	63.33
35 - 44	7	23.33
45 - 54	3	10
55 - 64	1	3.33

2- What is your Gender?



3- What is your major of study?



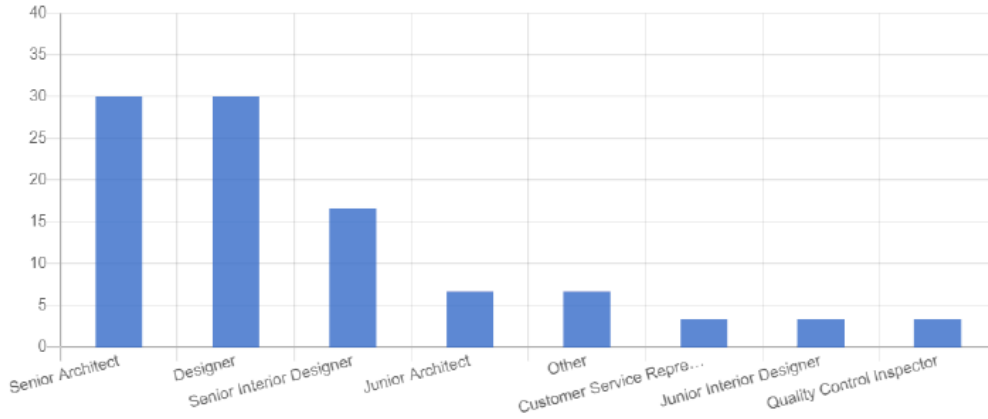
	Frequency	Percentage
Architect	15	50
Interior Architect	7	23.33
Furniture Designer	5	16.67
Interior Designer	3	10

4- In which Field do you work?

Value	Frequency	Percentage
Architectural Office	10	33.33
Freelancer	9	30
Interior Design Office	5	16.67
Construction Company	3	10
Furniture Industry	2	6.67
Other	1	3.33

Specify if other: 1) Design office

5- What is your Job Title?



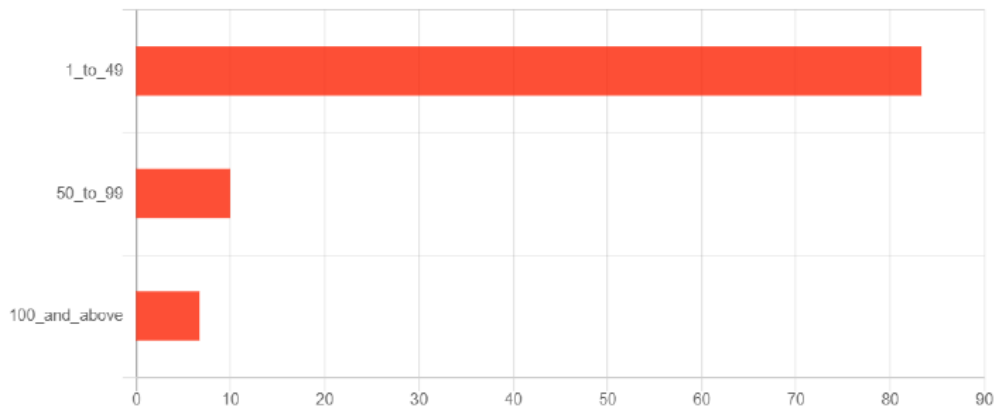
Value	Frequency	Percentage
Senior Architect	9	30
Designer	9	30
Senior Interior Designer	5	16.67
Junior Architect	2	6.67
Other	2	6.67
Customer Service Representative	1	3.33
Junior Interior Designer	1	3.33
Quality Control Inspector	1	3.33

Specify if other”

1 – Civil engineer

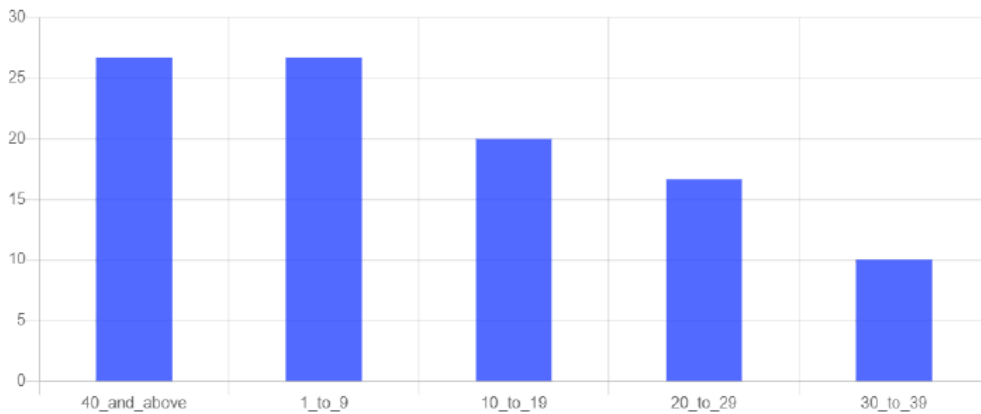
1 – Concept Designer

6- What is the number of employees in your company?



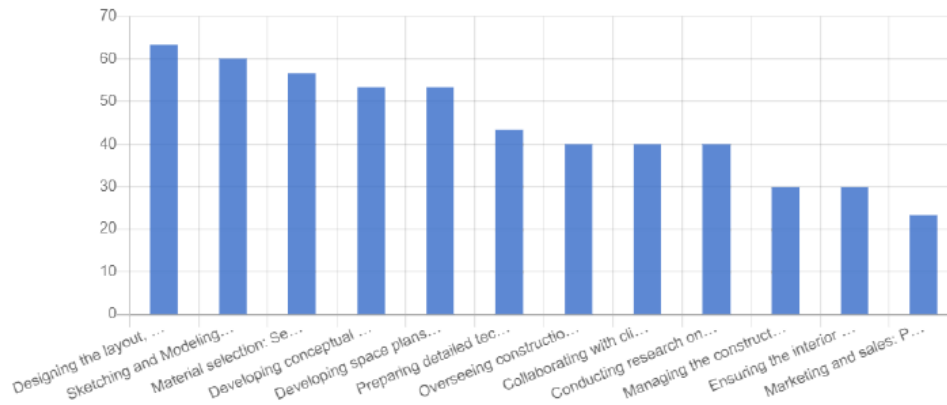
Value	Frequency	Percentage
1_to_49	25	83.33
50_to_99	3	10
100_and_above	2	6.67

7- What is the average of Clients your company has per year?



Value	Frequency	Percentage
40_and_above	8	26.67
1_to_9	8	26.67
10_to_19	6	20
20_to_29	5	16.67
30_to_39	3	10

8- What are the services you Provide?

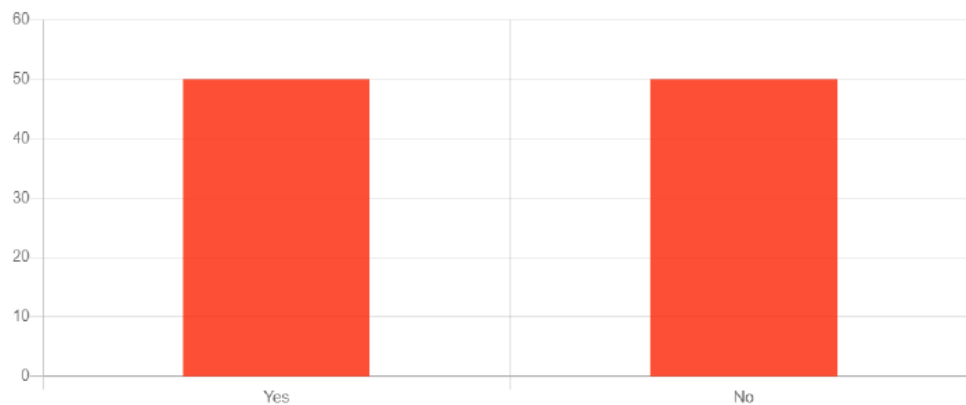


	Frequency	Percentage
Designing the layout, functionality, and appearance of interior spaces, including the selection of finishes, fixtures, and furniture	19	63.33
Sketching and Modeling to visualize the design and communicate the concept to clients, manufacturers, and other stakeholders.	18	60
Material selection: Selecting materials and finishes that are appropriate for the intended use, style, and budget.	17	56.67
Developing conceptual designs and preparing architectural drawings	16	53.33
Developing space plans and preparing detailed drawings and specifications	16	53.33
Preparing detailed technical drawings and specifications for manufacturers, including information on materials, dimensions, and construction methods.	13	43.33
Overseeing construction and installation of interior elements, including lighting, flooring, and wall coverings	12	40
Collaborating with clients, engineers, manufacturers, and other professionals to ensure the design meets functional, aesthetic, and technical performance requirements and safety standards	12	40
Conducting research on current furniture design trends, materials, and manufacturing methods to develop new ideas and concepts.	12	40
Managing the construction process, including the selection of contractors, monitoring progress, and ensuring the design is executed according to specifications	9	30
Ensuring the interior design meets building codes, accessibility requirements, and environmental standards	9	30
Marketing and sales: Promoting the design to potential clients and participating in trade shows and other events to showcase the work.	7	23.33

9- On a scale of zero to 6 how strong do you consider your office sustainability policy?

Mean	Median	Mode	Standard deviation
3.37	3.00	5.00	1.50

10- Does your office have a preferred list of materials and suppliers that prioritize sustainability?



11- If your company or client asked you to design something sustainable, how do you ensure the materials used in your designs are sustainable?

Value	Frequency	Percentage
By using materials with eco-friendly certifications	21	70
By using materials that can be easily recycled or repurposed	18	60
By using the latest technologies and smart designs	15	50
By using the strategies to minimize waste during the construction and installation	14	46.67
By researching the environmental impact of materials before using them	9	30
By making a project based on closed-loop systems	6	20
None of the above	2	6.67

12- Among the options below which one or ones describe your office policy and workspace environment best?

+



	Frequency	Percentage
Open workspace with shared facilities	20	66.67
Health-aware workspace for employees	8	26.67
Environment-friendly workspace	8	26.67
None of these	5	16.67
Closed office spaces with private cabins	3	10

13- On a scale of zero to 6 how much attention do you give to the environmental impact of materials when selecting them for a project?

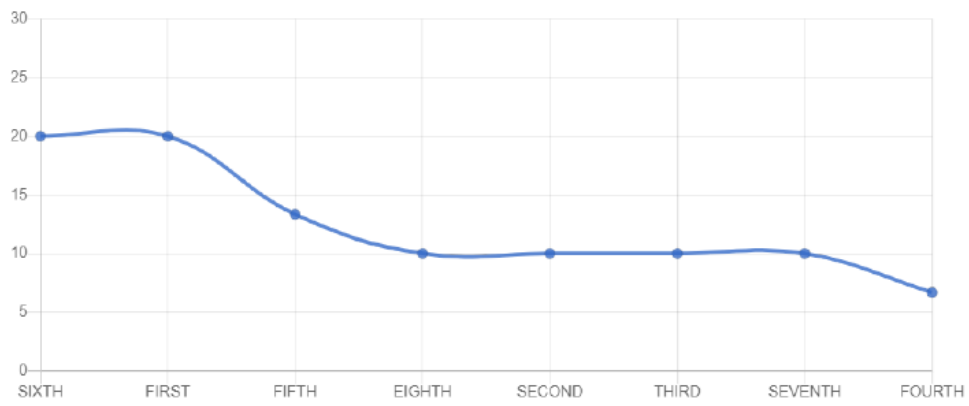
Mean	Median	Mode	Standard deviation
3.17	3.00	*	1.58

14- According to which criteria do you choose the material you use in your projects? 1 is most important and 8 is least important criteria.

Trendy Material (Aesthetic)



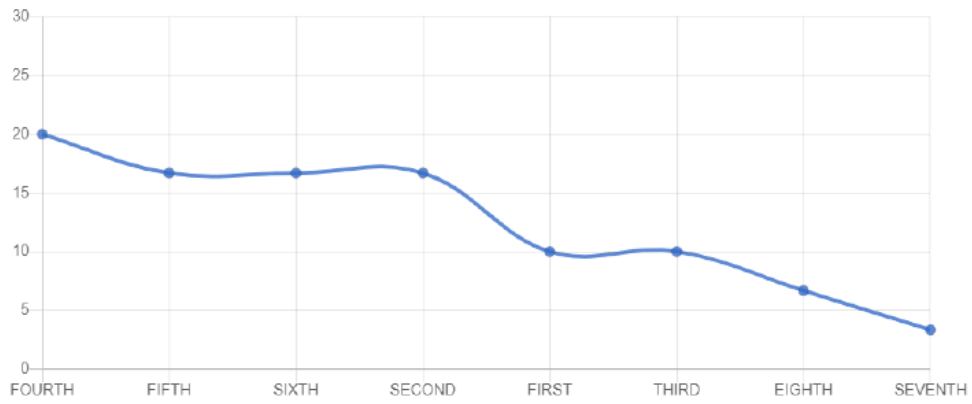
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
SIXTH	6	20
FIRST	6	20
FIFTH	4	13.33
EIGHTH	3	10
SECOND	3	10
THIRD	3	10
SEVENTH	3	10
FOURTH	2	6.67

Economic Material

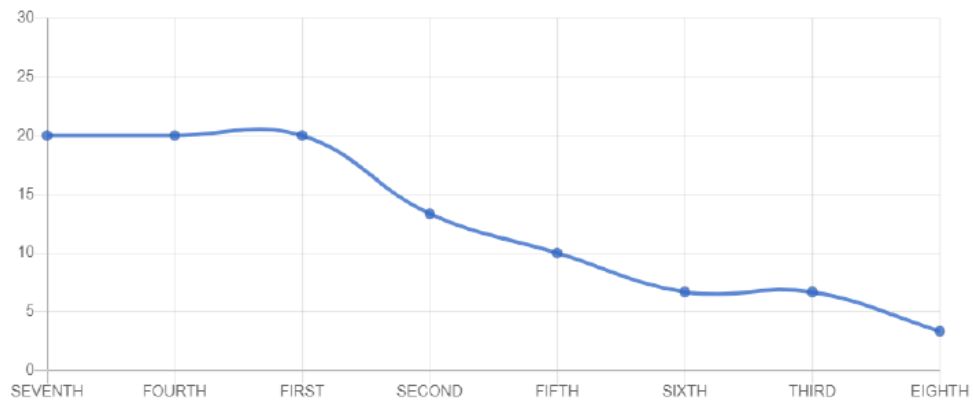
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
FOURTH	6	20
FIFTH	5	16.67
SIXTH	5	16.67
SECOND	5	16.67
FIRST	3	10
THIRD	3	10
EIGHTH	2	6.67
SEVENTH	1	3.33

Recycled Material

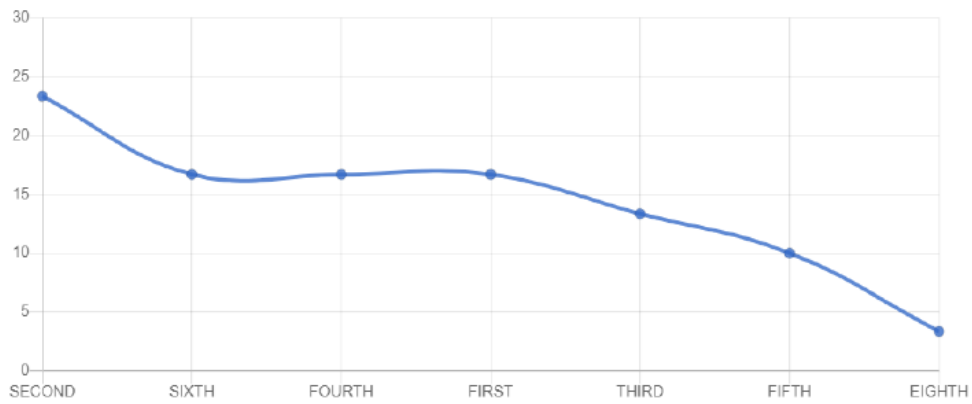
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
SEVENTH	6	20
FOURTH	6	20
FIRST	6	20
SECOND	4	13.33
FIFTH	3	10
SIXTH	2	6.67
THIRD	2	6.67
EIGHTH	1	3.33

Recyclable Material

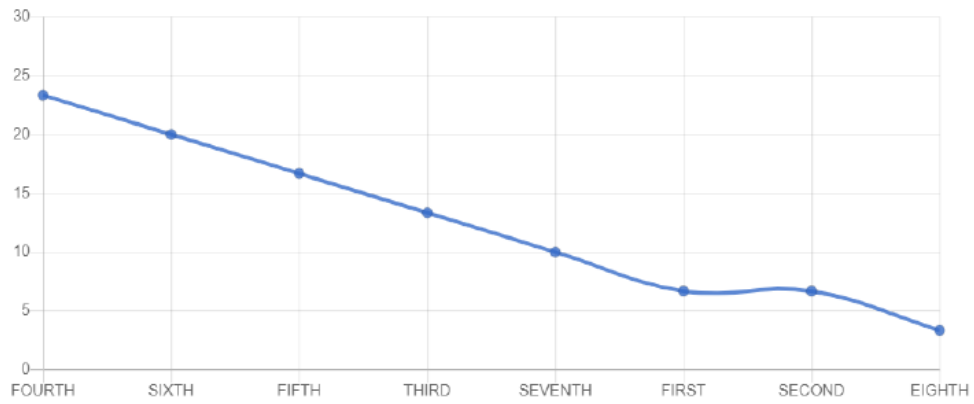
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
SECOND	7	23.33
SIXTH	5	16.67
FOURTH	5	16.67
FIRST	5	16.67
THIRD	4	13.33
FIFTH	3	10
EIGHTH	1	3.33

Durable Material

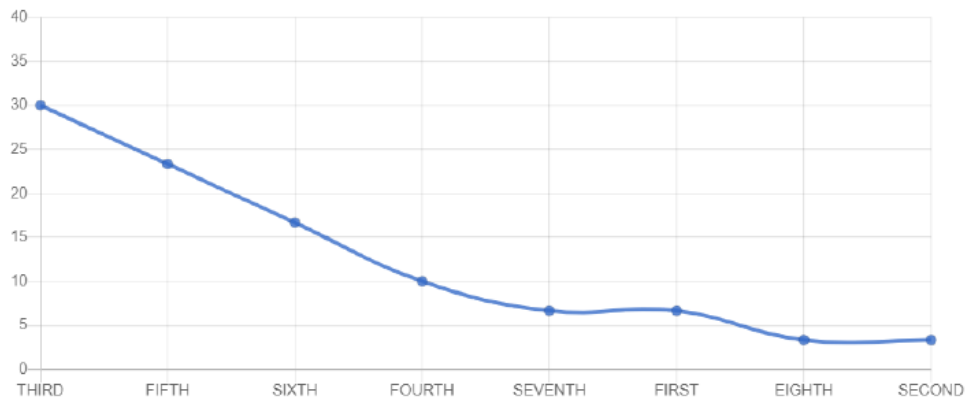
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
FOURTH	7	23.33
SIXTH	6	20
FIFTH	5	16.67
THIRD	4	13.33
SEVENTH	3	10
FIRST	2	6.67
SECOND	2	6.67
EIGHTH	1	3.33

Light-weight Material

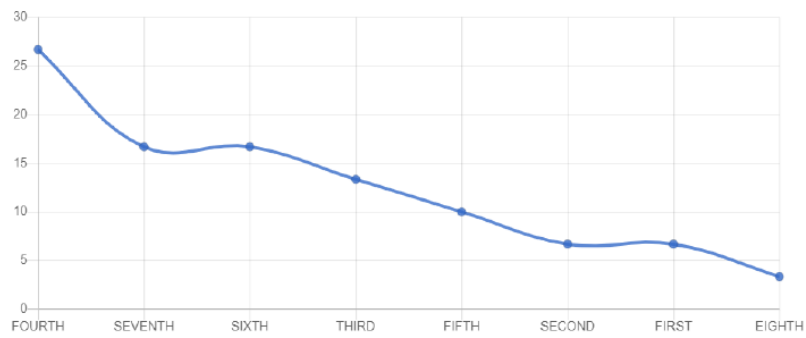
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
THIRD	9	30
FIFTH	7	23.33
SIXTH	5	16.67
FOURTH	3	10
SEVENTH	2	6.67
FIRST	2	6.67
EIGHTH	1	3.33
SECOND	1	3.33

Waterproof Material

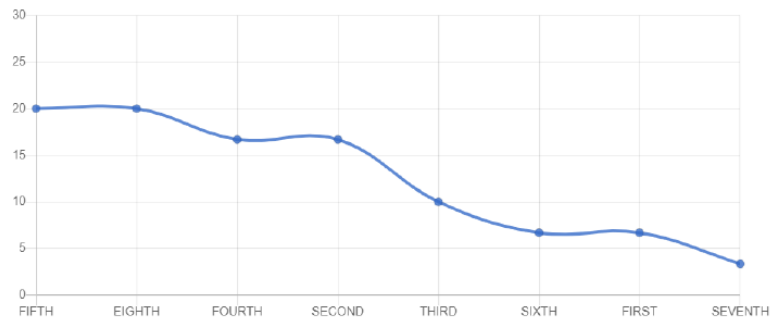
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
FOURTH	8	26.67
SEVENTH	5	16.67
SIXTH	5	16.67
THIRD	4	13.33
FIFTH	3	10
SECOND	2	6.67
FIRST	2	6.67
EIGHTH	1	3.33

Organic Material

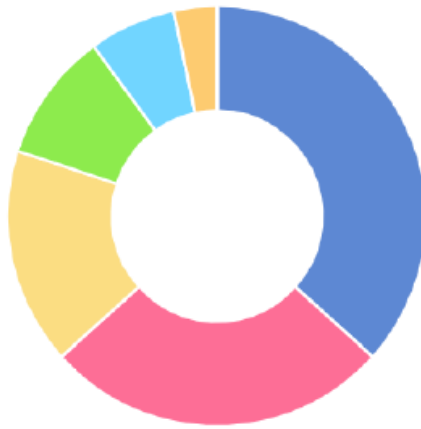
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
FIFTH	6	20
EIGHTH	6	20
FOURTH	5	16.67
SECOND	5	16.67
THIRD	3	10
SIXTH	2	6.67
FIRST	2	6.67
SEVENTH	1	3.33

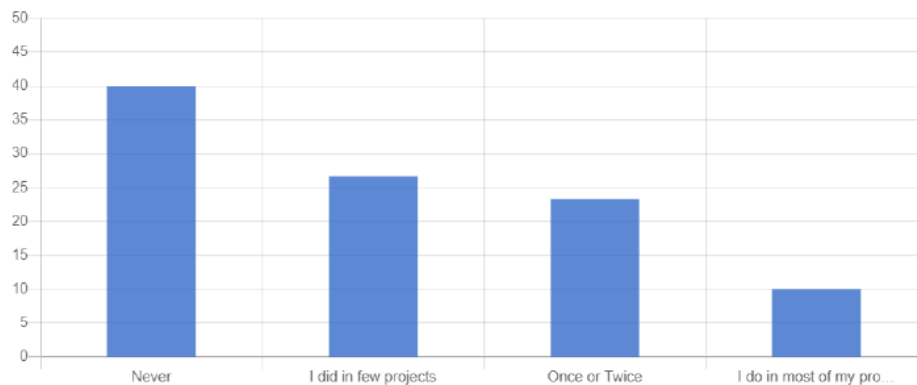
15- How often do you use recycled or upcycled materials in your designs?

Rarely Only if my clients asked Sometimes Always Very often Often



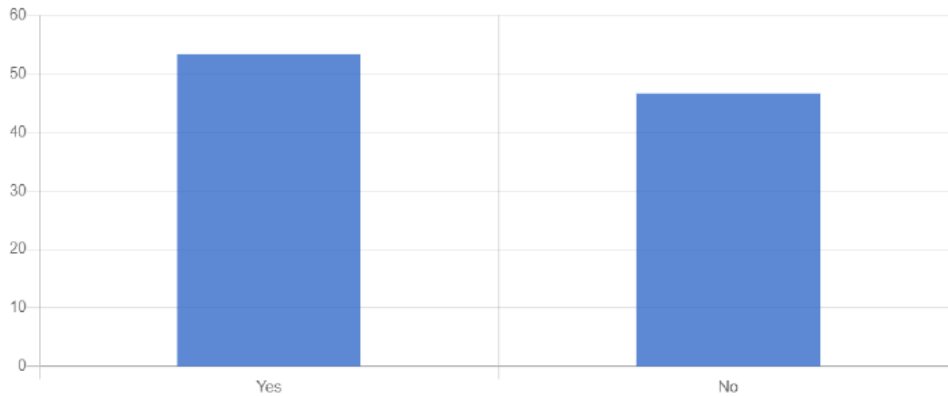
Value	Frequency	Percentage
Rarely	11	36.67
Only if my clients asked	8	26.67
Sometimes	5	16.67
Always	3	10
Very often	2	6.67
Often	1	3.33

16- Have you designed or incorporated any design elements that can be disassembled and repurposed at the end of product's life in any of your projects?



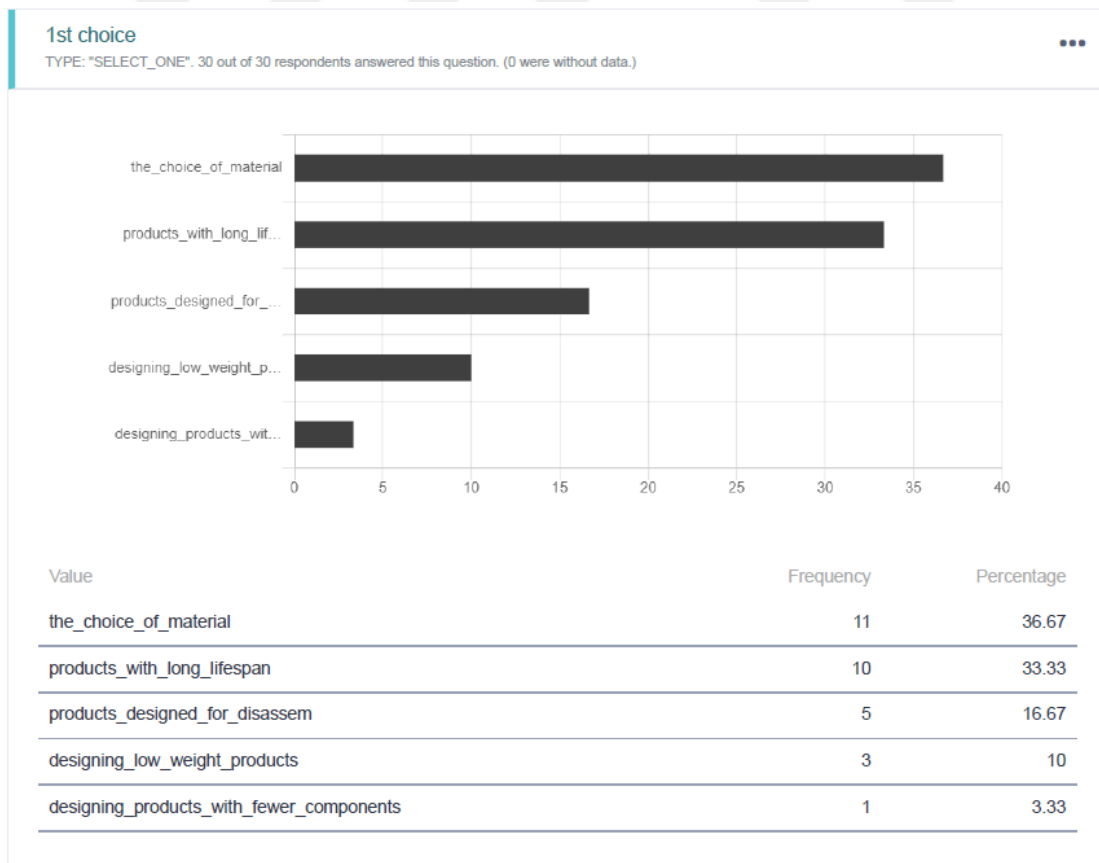
Value	Frequency	Percentage
Never	12	40
I did in few projects	8	26.67
Once or Twice	7	23.33
I do in most of my projects	3	10

17- Do you know what is the concept of Circular Economy?



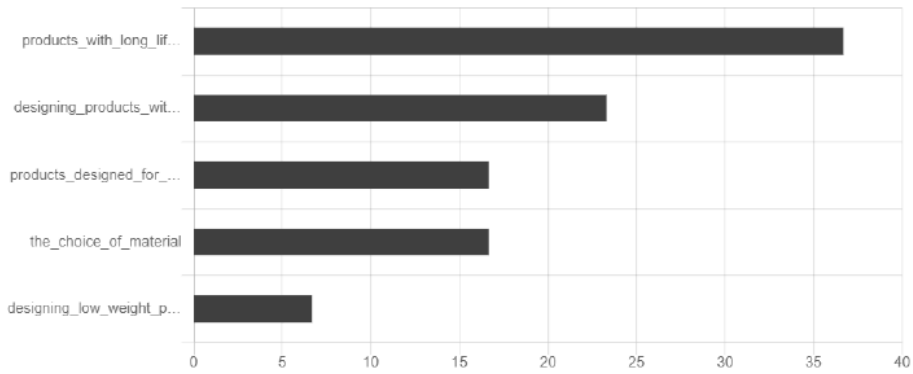
18- Which one of these principles of circular economy do you consider most important?

- The choice of materials*
- Products with long lifespan*
- Products designed for disassembly*
- Designing low weight products*
- Designing products with less components*



2nd choice

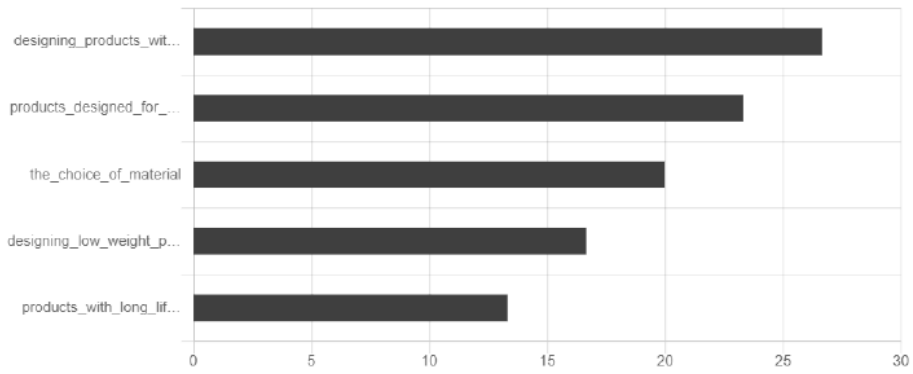
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
products_with_long_lifespan	11	36.67
designing_products_with_fewer_components	7	23.33
products_designed_for_disassem	5	16.67
the_choice_of_material	5	16.67
designing_low_weight_products	2	6.67

3rd choice

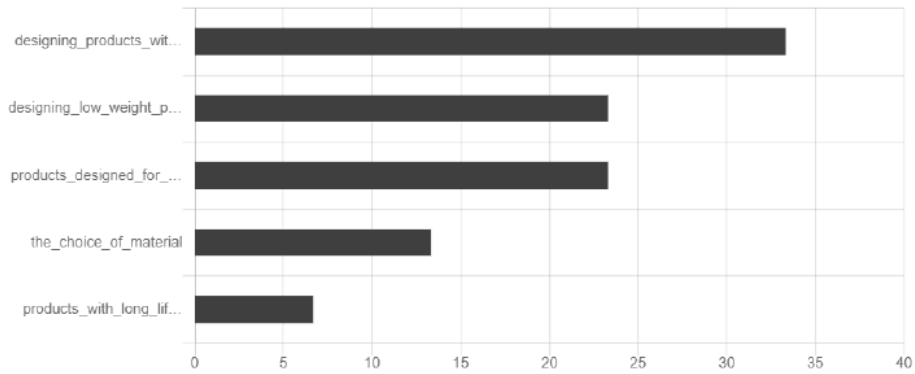
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
designing_products_with_fewer_components	8	26.67
products_designed_for_disassem	7	23.33
the_choice_of_material	6	20
designing_low_weight_products	5	16.67
products_with_long_lifespan	4	13.33

4th choice

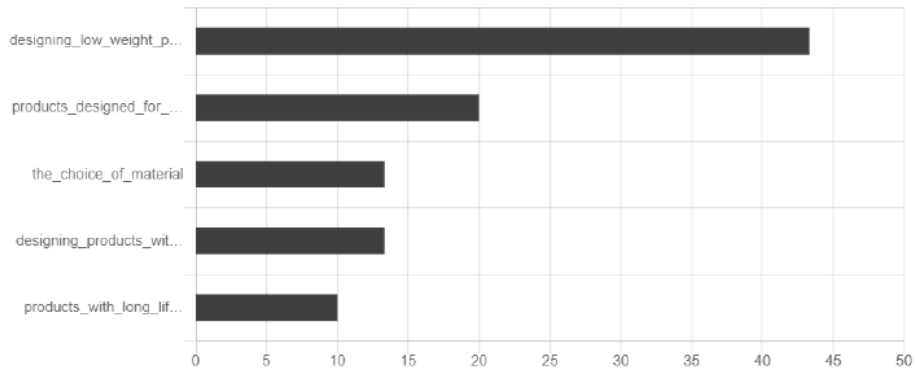
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
designing_products_with_fewer_components	10	33.33
designing_low_weight_products	7	23.33
products_designed_for_disassem	7	23.33
the_choice_of_material	4	13.33
products_with_long_lifespan	2	6.67

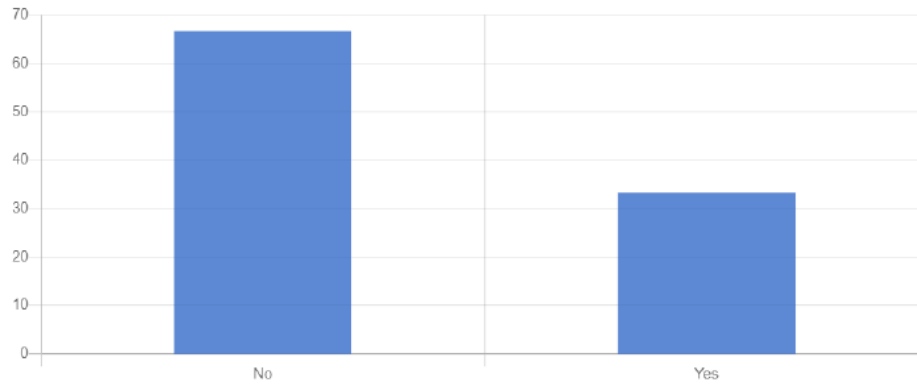
5th choice

TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



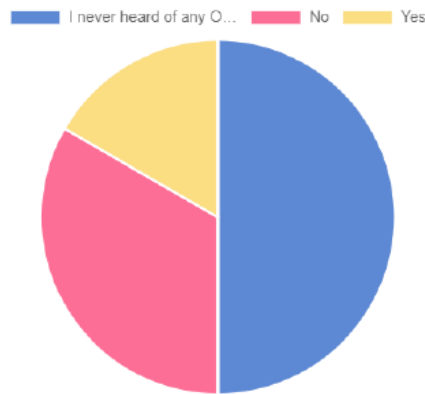
Value	Frequency	Percentage
designing_low_weight_products	13	43.33
products_designed_for_disassem	6	20
the_choice_of_material	4	13.33
designing_products_with_fewer_components	4	13.33
products_with_long_lifespan	3	10

19- Have you worked on any project that promotes the principles of circular economy?



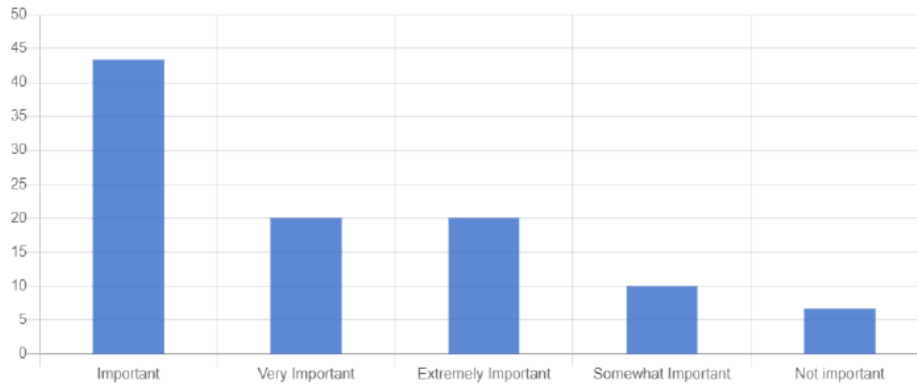
Value	Frequency	Percentage
No	20	66.67
Yes	10	33.33

20- Have you established partnerships or collaborations with organizations promoting circular economy practices?



Value	Frequency	Percentage
I never heard of any Organization of this kind in my country before	15	50
No	10	33.33
Yes	5	16.67

21- How important do you think it is for designers to promote a circular economy, sustainable design, or any other concept to the general public?



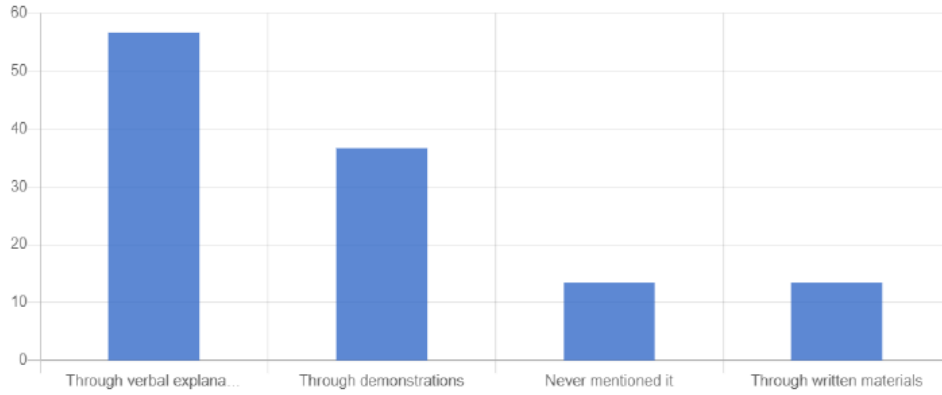
Value	Frequency	Percentage
Important	13	43.33
Very Important	6	20
Extremely Important	6	20
Somewhat Important	3	10
Not important	2	6.67

22- How do you keep yourself updated on the latest developments in circular economy and sustainable design or any other trend?



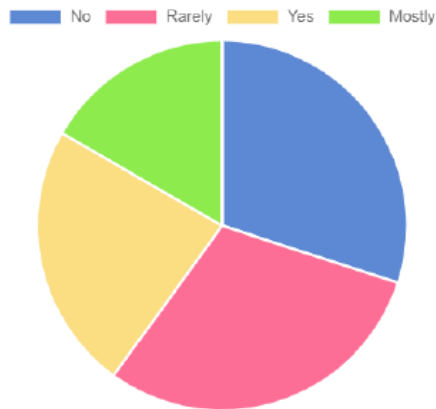
Value	Frequency	Percentage
By checking the market's newest trends and best sellers	18	60
By reading relevant articles and books	16	53.33
By networking with other designers and experts in the field	12	40
By attending workshops and seminars	11	36.67
I don't keep updated	1	3.33

23- How do you engage with your clients to educate and encourage them to adopt circular economy principles in their operations and maintenance practices?



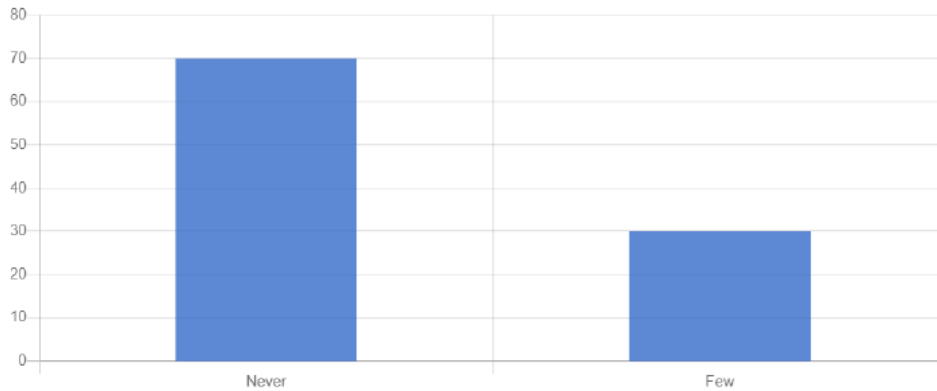
Value	Frequency	Percentage
Through verbal explanation	17	56.67
Through demonstrations	11	36.67
Never mentioned it	4	13.33
Through written materials	4	13.33

24- Have you faced any client resistance when proposing designs that align with circular economy principles, or any new Design Trends?



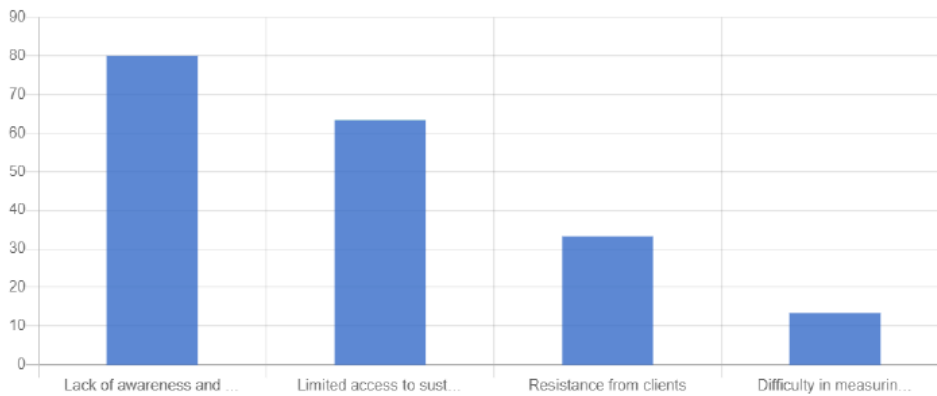
Value	Frequency	Percentage
No	9	30
Rarely	9	30
Yes	7	23.33
Mostly	5	16.67

25- Have you had any clients who specifically asked you to design their project according to the Circular Economy Principles?



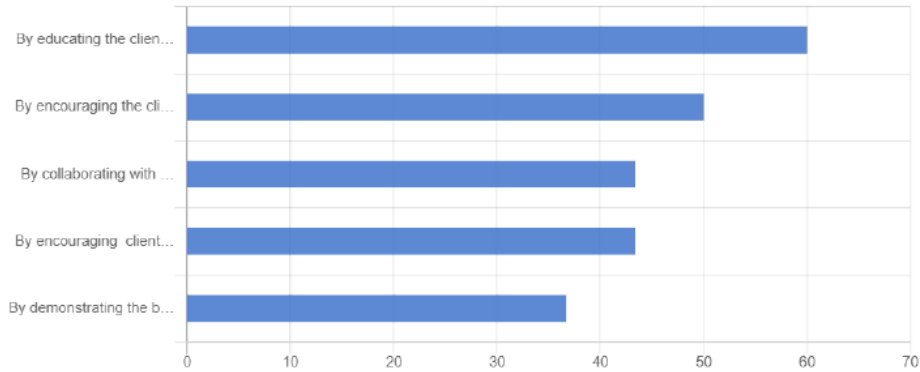
Value	Frequency	Percentage
Never	21	70
Few	9	30

26- In your opinion, what are the biggest challenges or obstacles in promoting and implementing a circular economy in the design industry?



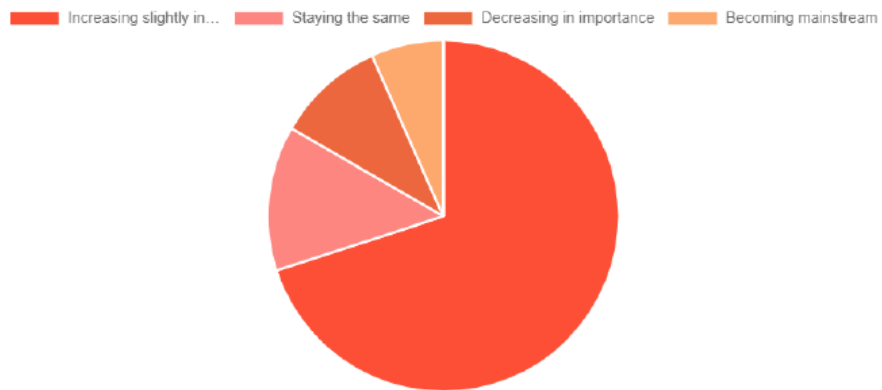
Value	Frequency	Percentage
Lack of awareness and understanding	24	80
Limited access to sustainable materials	19	63.33
Resistance from clients	10	33.33
Difficulty in measuring impact	4	13.33

27- How do you think you can overcome the challenges that prevent you from promoting a new concept like the circular economy to your clients?



Value	Frequency	Percentage
By educating the clients about the benefits and impact on their future	18	60
By encouraging the clients to take maintenance choices that help decrease waste and financial costs	15	50
By collaborating with stakeholders, such as contractors, suppliers and service providers to promote the principles of circular economy and sustainability	13	43.33
By encouraging clients to take sustainable choices which will help them financially	13	43.33
By demonstrating the benefits in a clear way with examples to show the efficiency	11	36.67

28- How do you see circular economy evolving in the design industry in the next 5-10 years?



Value	Frequency	Percentage
Increasing slightly in importance	21	70
Staying the same	4	13.33
Decreasing in importance	3	10
Becoming mainstream	2	6.67

29- On a scale of 1 to 5 how aware do you think people are about the environmental crisis and the lack of resources?

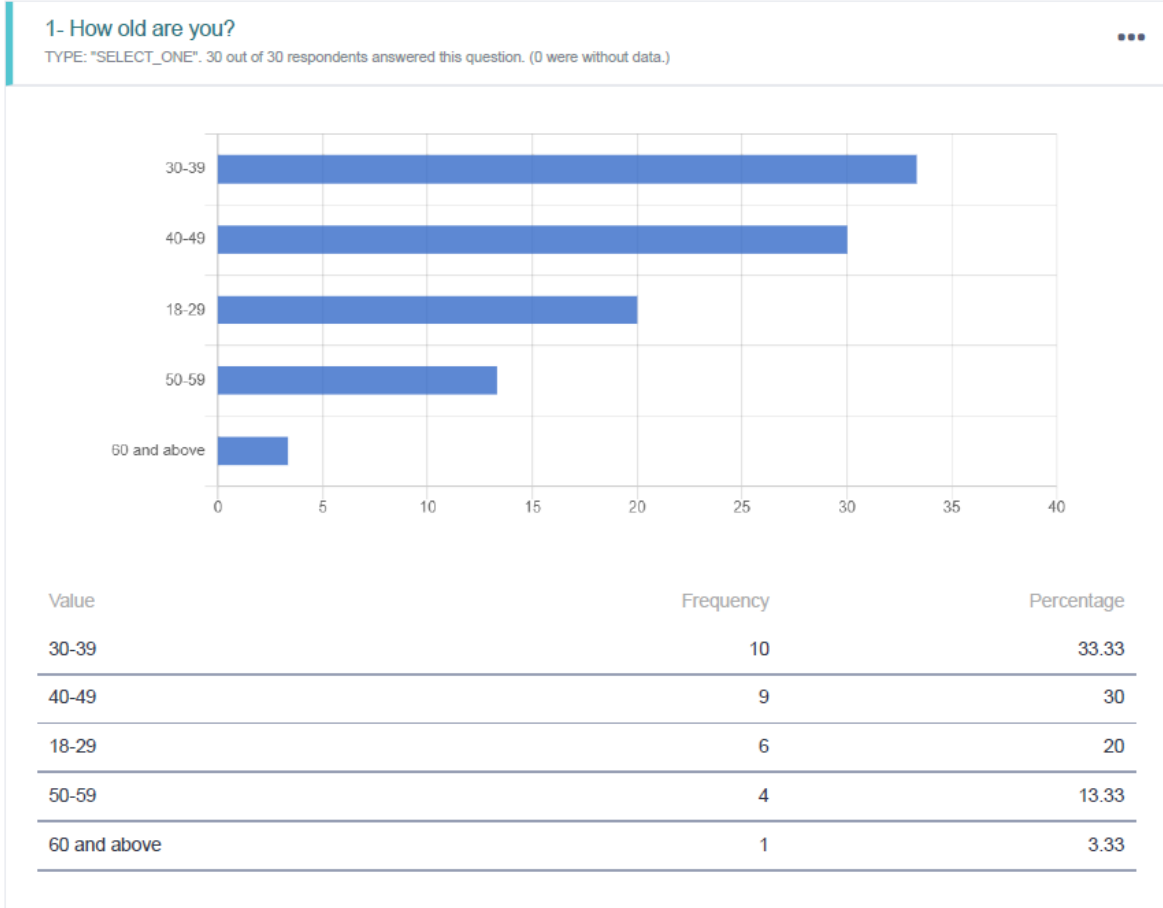
<i>Mean</i>	<i>Median</i>	<i>Mode</i>	<i>Standard deviation</i>
2.40	2.00	3.00	1.07

30- I Acknowledge that I accept sharing this information for the purpose of scientific research.

Value	Frequency	Percentage
OK	30	100

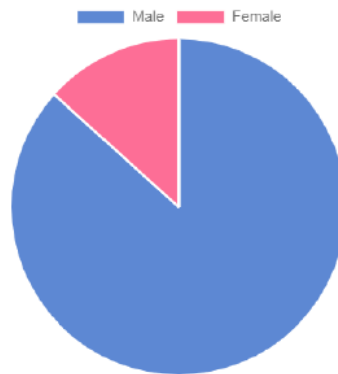
APPENDIX C

MARKET SURVEY



2- What is your Gender?

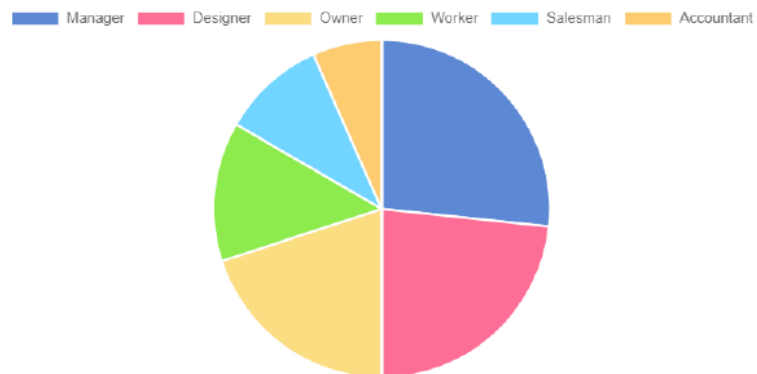
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Male	26	86.67
Female	4	13.33

3- What is your Job Title?

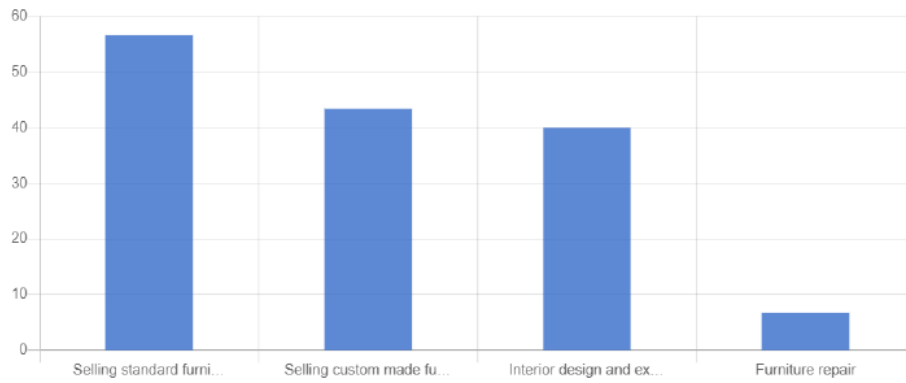
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Manager	8	26.67
Designer	7	23.33
Owner	6	20
Worker	4	13.33
Salesman	3	10
Accountant	2	6.67

4- What are the services you Provide?

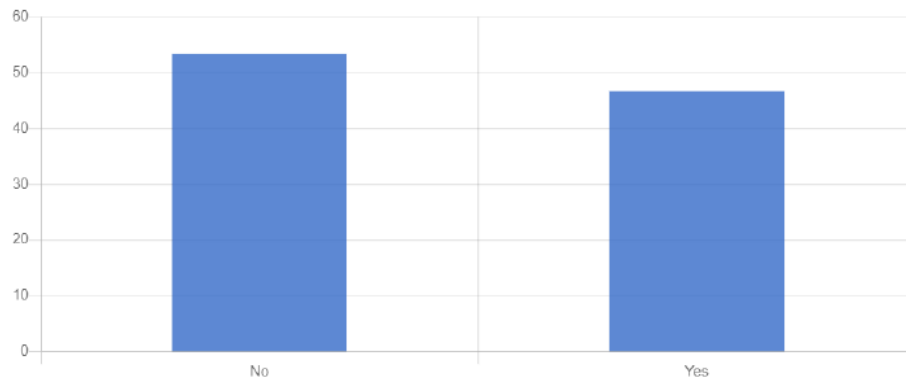
TYPE: "SELECT_MULTIPLE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Selling standard furniture	17	56.67
Selling custom made furniture	13	43.33
Interior design and execution	12	40
Furniture repair	2	6.67

5- Do you have a design consultant or customer service?

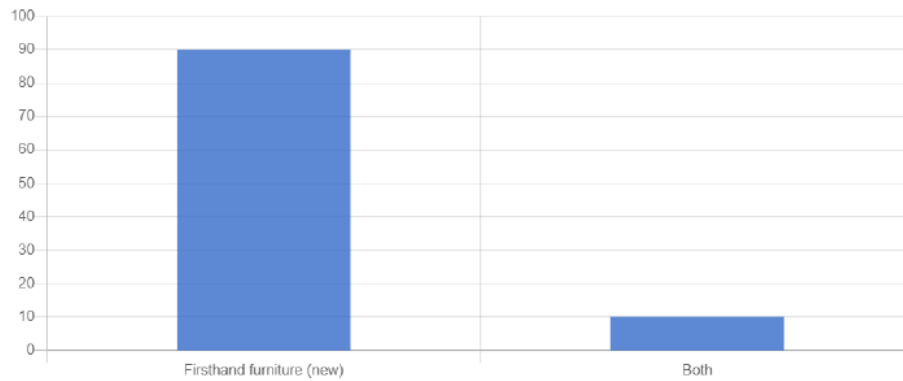
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
No	16	53.33
Yes	14	46.67

6- The standard furniture you provide is:

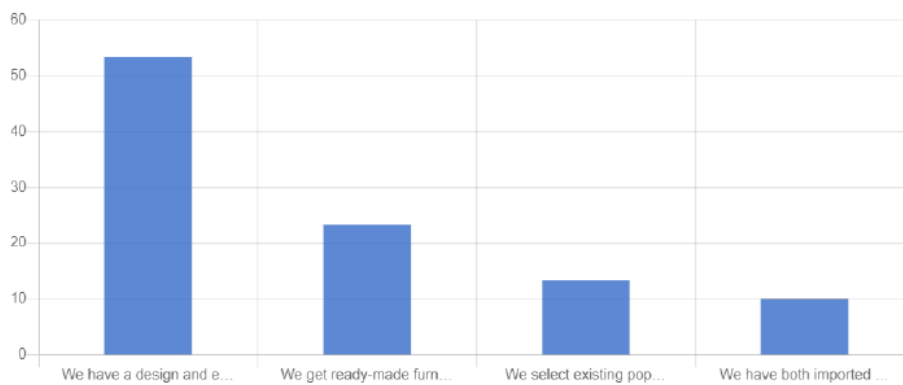
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Firsthand furniture (new)	27	90
Both	3	10

7- Do you design and make your own products?

TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
We have a design and execution team who makes our products	16	53.33
We get ready-made furniture	7	23.33
We select existing popular designs from market then our team makes Copy of original design	4	13.33
We have both imported (ready-made) and custom-made furniture by our team	3	10

8- Do you check if the material used in your products is recycled or raw material?

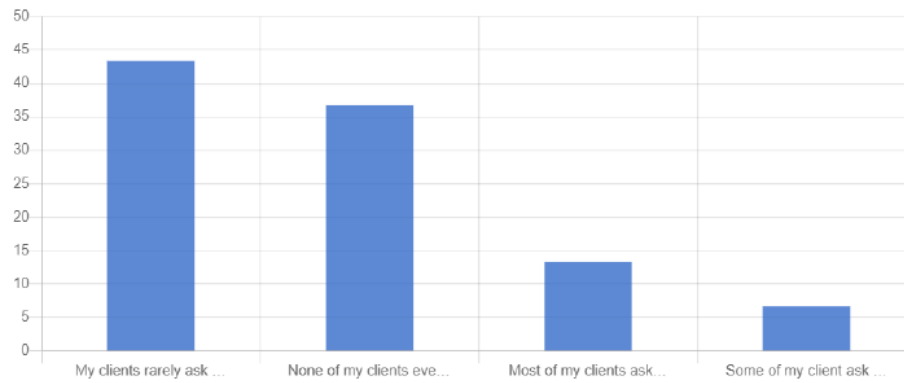
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
I check the materials but I often get the products that are more convenient for my sales	14	46.67
I never check	12	40
I try to get the products with recycled or recyclable materials	4	13.33

9- How often do your clients ask about eco-friendly products?

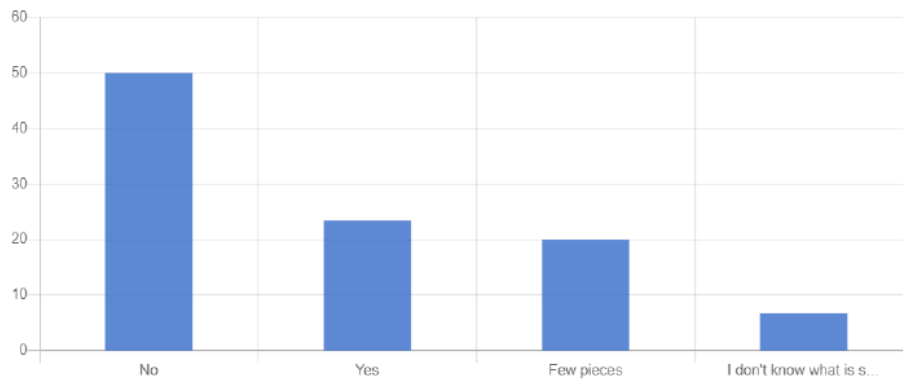
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
My clients rarely ask about it	13	43.33
None of my clients ever asked about it	11	36.67
Most of my clients ask most of the time	4	13.33
Some of my client ask sometimes	2	6.67

10- Do you have Smart furniture?

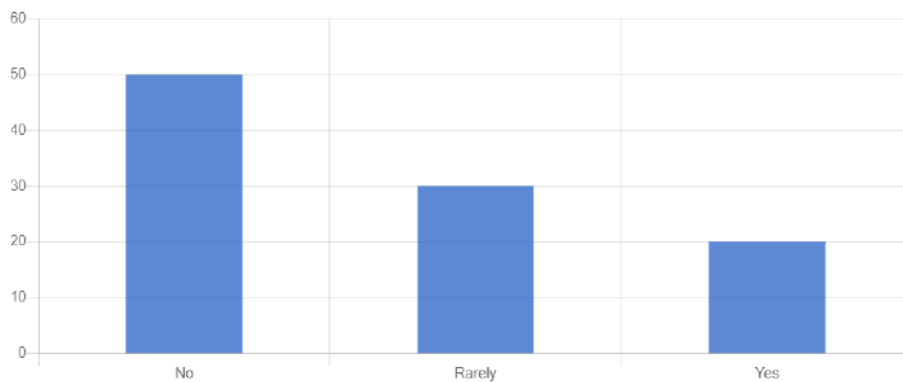
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
No	15	50
Yes	7	23.33
Few pieces	6	20
I don't know what is smart furniture	2	6.67

11- Do your clients ask for Smart furniture?

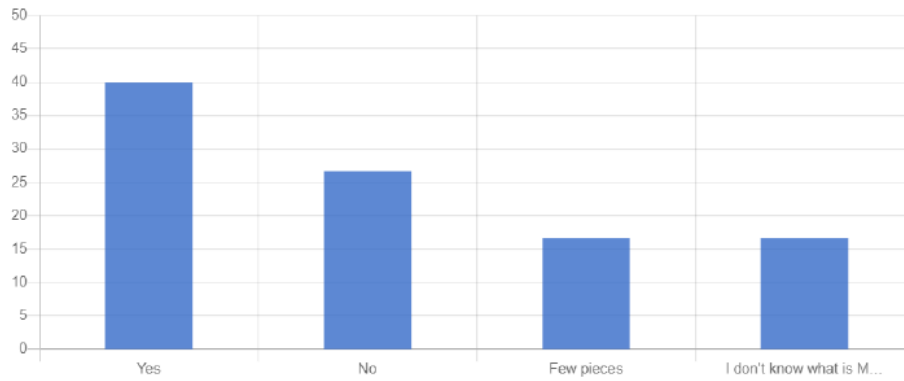
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
No	15	50
Rarely	9	30
Yes	6	20

12- Do you have Modular furniture?

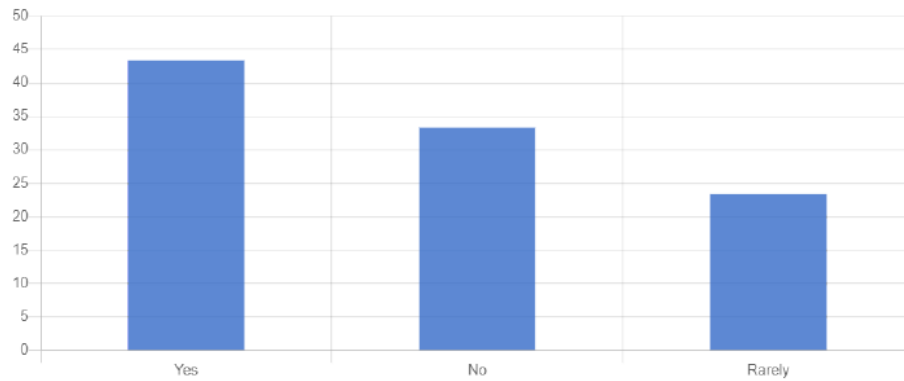
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Yes	12	40
No	8	26.67
Few pieces	5	16.67
I don't know what is Modular furniture	5	16.67

13- Do your clients ask for Modular furniture?

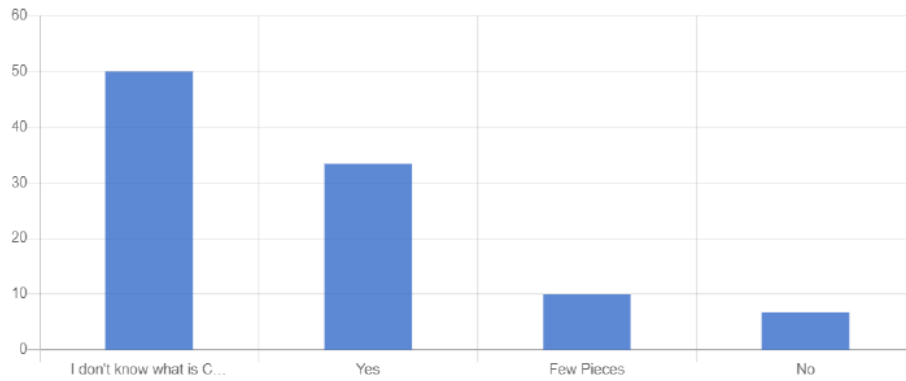
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Yes	13	43.33
No	10	33.33
Rarely	7	23.33

14- Do you have Circular Economy design furniture?

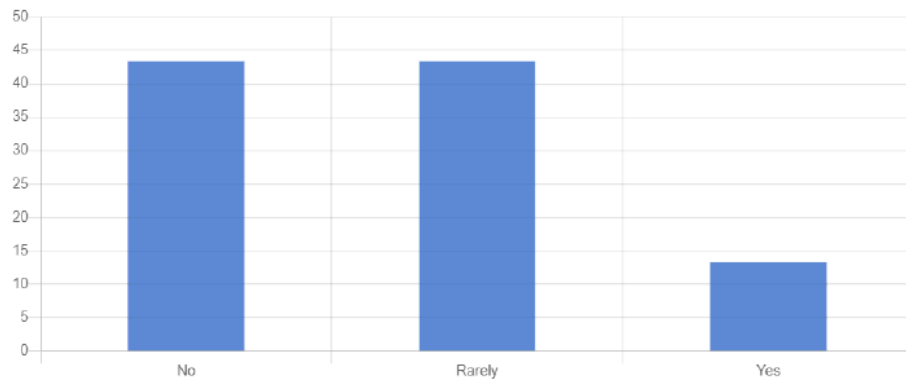
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
I don't know what is Circular Economy	15	50
Yes	10	33.33
Few Pieces	3	10
No	2	6.67

15- Do your clients ask for Circular Economy Design furniture?

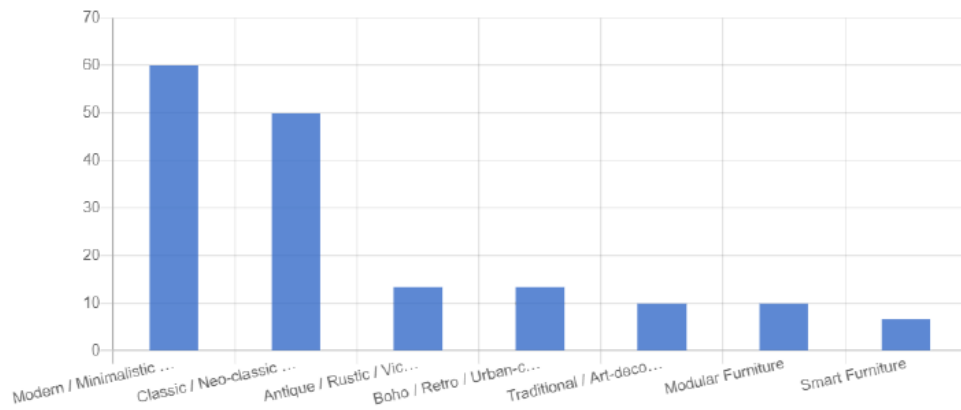
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
No	13	43.33
Rarely	13	43.33
Yes	4	13.33

16- Which one of these Furniture Styles do you sell the most?

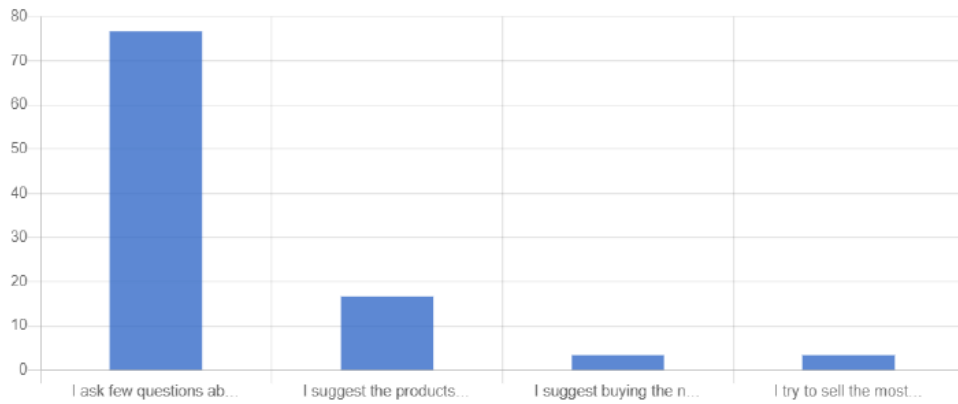
TYPE: "SELECT_MULTIPLE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Modern / Minimalistic / Contemporary	18	60
Classic / Neo-classic / Casual lux	15	50
Antique / Rustic / Victorian / Vintage	4	13.33
Boho / Retro / Urban-collective	4	13.33
Traditional / Art-deco / Scandinavian	3	10
Modular Furniture	3	10
Smart Furniture	2	6.67

17- When a new client comes for furniture, what are your suggestions or advice for them?

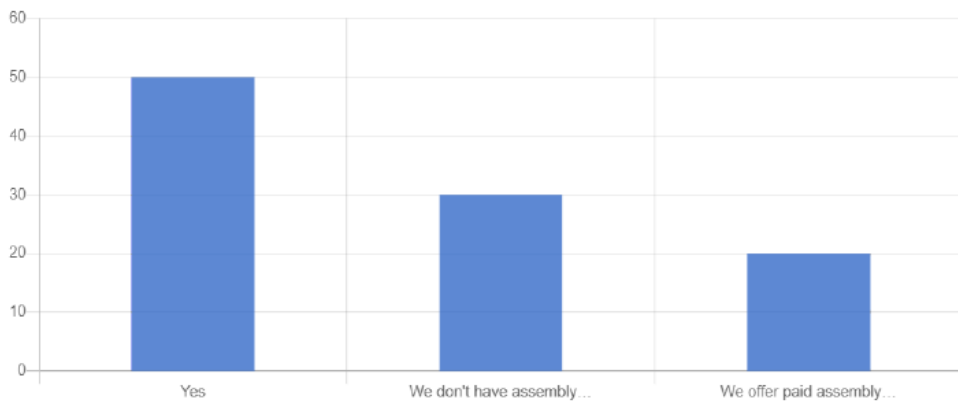
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
I ask few questions about their preferences and likings then I suggest what is best in their situation	23	76.67
I suggest the products with best and highest quality materials	5	16.67
I suggest buying the newest trends in the market	1	3.33
I try to sell the most expensive product I have	1	3.33

18- Do you provide free assembly services?

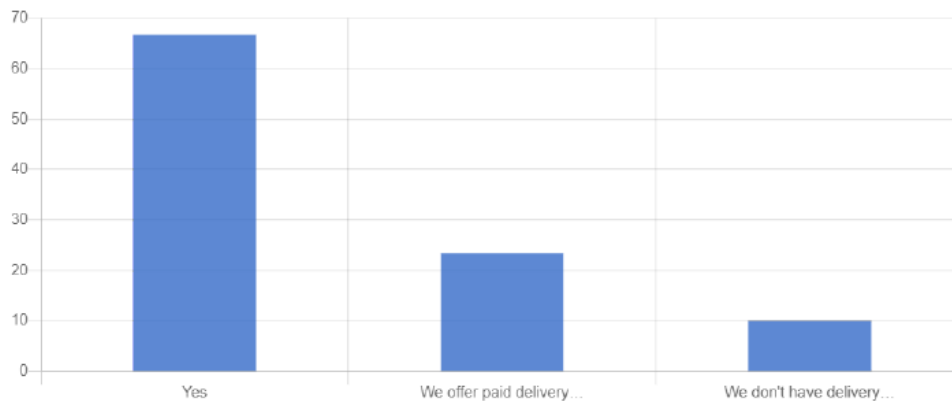
TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Yes	15	50
We don't have assembly services	9	30
We offer paid assembly services	6	20

19- Do you deliver the products you sell to clients address for free?

TYPE: "SELECT_ONE". 30 out of 30 respondents answered this question. (0 were without data.)



Value	Frequency	Percentage
Yes	20	66.67
We offer paid delivery services	7	23.33
We don't have delivery services	3	10

20- On a scale of 0 to 6 how much do you think the market can affect on clients choices and designers decisions?

TYPE: "RANGE". 30 out of 30 respondents answered this question. (0 were without data.)

Mean	Median	Mode	Standard deviation
4.47	4.50	*	0.90

I Acknowledge that I accept sharing these information for the purpose of scientific research

TYPE: "ACKNOWLEDGE". 30 out of 30 respondents answered this question. (0 were without data.)

Value	Frequency	Percentage
OK	30	100