Applying the Visual Analysis and Design Principles of Postwar American Modern Furniture to Contemporary Home Living Furniture Design

By

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Abstract

This thesis discusses how to incorporate the visual analysis of Post War American Modern Furniture into the design of furniture that better suits contemporary lifestyles. Post War American Modern Furniture, also known as Mid-Century American Modern Furniture, holds a classic status in furniture history, and its work from that era remain popular in today's market. The article covers the development of Post War American Modern Furniture, analyzing its design style, elements, features, and concepts, including some classic design pieces. It also explores the differences between modern and post-war life, proposing guiding principles and methods to help designers apply this style to contemporary furniture design. The research results suggest that designing furniture aligned with modern life using the visual analysis of Post War American Modern Furniture is feasible. The thesis concludes by summarizing and condensing the methods, providing designers with a practical tool for successfully creating contemporary home living furniture reflecting the visual analysis of Post War American Modern Furniture.

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Chapter 1. Introduction

1.1. Problem Statement

Even with the rapid changes of the last few years, in 2024 people continue to invest in timeless classics like the Eames Lounge Chair, Saarinen Dining Table, and other postwar American Modern Furniture pieces from over 60 years ago. These furnishings remain enduring classics and high-quality collectibles. Despite the continued allure of postwar American Modern Furniture, contemporary living witnesses a surge in demand for diverse furniture types. While modern designs echo the past, a prevailing sense of inadequacy persists. Consumers seek furnishings that not only align with modern lifestyles but also encapsulate the refined aesthetic of postwar American modern Furniture. This research bridges the gap, acknowledging the disparity between current offerings and consumer preferences. It explores practical methodologies, empowering designers to create furniture seamlessly blending modern functionality with the sophisticated allure of postwar American Modern Furniture.

1.2. Need For Study

Although postwar American modern furniture boomed for only around 20 years, it changed people's aesthetics and cognition of interior furniture design, created an appreciation that belongs to Americans, and produced a lot of classic works that many people are still purchasing in admiration nowadays. Therefore, the study of American postwar modern furniture is very important.

With the advancement of technology and the progress of the times, people's lifestyles and economic standards have changed, but their pursuit of excellent furniture remains the same. Postwar American modern furniture is still influencing people's aesthetics. Many classic designs

of postwar American modern furniture are still on the market at a considerable price. Now many furniture designs bear the influence of postwar furniture, but there is always a sense of lack of the timeless essence. The furniture market now needs modern furniture that meets the kind of aesthetics of postwar American modern furniture, but also satisfies the needs of contemporary lifestyles.

Therefore, this research will analyze the visuals of postwar American furniture and study its style and characteristics. It will also examine people's current lifestyles and habits. Combining the two will provide designers with a way to design furniture that matches the aesthetics of postwar American modern furniture but is also suitable for modern people's lives.

1.3. Objectives of Study

This thesis presents a method to help designers create home living modern furniture that is consistent with the visual analysis and character of Postwar American furniture but also meets the needs of contemporary home living. The following are the objectives of this thesis.

- Study the history of postwar America modern furniture.
- Study the style, characteristic and element of postwar American modern furniture.
- Study the classic designs of postwar American modern furniture.
- Study the changes and differences in the lifestyle of contemporary Americans compared to postwar Americans.
- Study the lifestyle habits and furniture demand of contemporary Americans.
- Summarize ways to design furniture that fits the style and character of postwar American furniture.

- Summarize ways to design furniture that is consistent with contemporary American life.
- Apply the above two design approaches to product design.

1.4. Definitions of Terms

Postwar American Modern Furniture: Modern furniture designed and made in the United States between 1940-1970, as known as mid-century American modern furniture.

Ergonomics: It is a science that studies the interaction between people, machines, and the environment and their reasonable combination, so that the designed machines and system of the environment are suitable for the characteristics of human physiology and psychology, to achieve the purpose of improving efficiency, safety, health and comfort in production.

1.5.Assumptions

Postwar American modern furniture has had a significant impact on modern furniture design, and the visual analysis of postwar American modern furniture can be analyzed and incorporated into contemporary home living furniture design. American people's lifestyle influences the design and use of furniture. Incorporating the visual analysis of postwar American modern furniture into contemporary home living furniture design will not only give it a more attractive appearance, but also make it more sustainable and pleasing to the eye.

1.6. Scope and Limits

This section will clarify the coverage of this thesis and the limitations of it.

1.6.1. Scope

This thesis will focus on postwar American modern furniture, examining its history,

development, style and characteristics as well as the influence of postwar American habits on the interior and furniture design of the time. Contemporary American lifestyle will be analyzed in order to explore what contemporary Americans want in furniture. The results of these studies will be combined to create a tool that can be used by designers to create furniture that fits into contemporary life and has the style and characteristics of postwar American furniture. This study does not take into consideration consumer purchasing power or market trends.

1.6.2. Limits

This research cannot analyze all of the furniture from the postwar American period. The home living designs mentioned in this article will not include special highly functional office furniture. Also, this study is based on the information obtained by an individual to analyze and explore; it cannot satisfy everyone's point of view, and the research information is from the library and the Internet. Besides, people have different perceptions of aesthetics. This study cannot predict future developments, and the contemporary period referred to in this article is the recent years in which the thesis was completed.

1.7. Procedure and Methodology

Firstly, an in-depth study of a large number of books and literature on postwar American modern furniture is conducted in order to understand its styles and characteristics in a comprehensive manner. Existing books and literature will also be used to study the changing lifestyle patterns of contemporary Americans and analyze what their home living furniture needs are. These literature reviews will provide the theoretical foundation and background knowledge for subsequent research.

Through the findings of the literature review and personal understanding, a design

methodology will be created that will assist designers in creating furniture that is both aesthetically pleasing to postwar American furniture and suitable for contemporary home living.

Then, the practical application of this design methodology is demonstrated with specific case studies and detailed processes. Through this section, readers will be able to gain insight into the effectiveness and feasibility of the method in practice, and thus better understand its substance.

Finally, at the end of the article, the whole study is comprehensively summarized and its significance in theory and practice is emphasized.

1.8. Anticipated Outcomes

The intended outcome of this research is to create a design guideline to assist designers in creating home living furniture that is consistent with the visual analysis of postwar American and adapted to contemporary life. The design guideline will also be utilized to complete a product to demonstrate the applicability of the guideline and provide a practical case study reference for designers.

Chapter 2. Literature Review

2.1. Postwar American Furniture

In this section, this research will be focus on the postwar American furniture.

2.1.1 History

In order to have a good understanding of the postwar American furniture, it is important to learn the history of that time.

2.1.1.1 Before World-War-II

Modern furniture has already been around since the Bauhaus; Marcel Breuer's Wassily Chair and Lounge Chair and Mies Van Der Rohe's Mr. Chair are good examples. But for the designers at that time, this furniture was just a derivative of their art. They created clean, pure lines from steel tubes and bent plywood, which became the new aesthetic. After the Victorian period, the look of modern furniture was simplified, and "form follows function" was the Bauhaus slogan. At the time, Americans were discovering Bauhaus, but during the Great Depression, the coldness of the forms and the prices were very intimidating.

Figure 1,Wassily Chair (Breuer, 1925)

Throughout the 1930s, Americans had an excellent record on modern industrial design, such as Raymond Loewy's pencil sharpener and Henry Dreyfuss's Vacuum Cleaner, not even to mention the automobiles and trains and other transportation of that time. They all abandoned complex ornamentation and adopted long, clean lines with curved tails to indicate speed. This was all a sign of modernization. Unfortunately, there was not a single outstanding furniture design during this time. Russel Wright designed some modern furniture that was available to purchase individually and combine freely for consumers, but the designs were bulky and not as aesthetically pleasing as they appeared to be. American interior design and decoration was a clumsy imitation of European decorative arts of that time (Greenberg, 1984).

This shows that before World War II, the United States was not very well developed in the furniture field. Americans did not have their requests or tests for furniture, and they were blinded by European aesthetics and style. Also, it was during the period of the Great Depression, that Americans did not have the money to buy expensive modern furniture from Europe, so it wasn't

easy for them to accept this design at that time.

Figure 2, Pencil sharpener (Loewy, 1933)

Figure 3, Living Room, Russel Wright, 1935(Greenberg, 1984, p. 18)

2.1.1.2. Inflection point

The 1940 Organic Design in Home Furnishings Competition hosted by the Museum of Modern Art in New York City was a major turning point for modern furniture design in the United States. It changed the perception of modern furniture. Eames and Eero Saarinen's furniture designs were outstanding and became the prototypes for many of the products that

would be produced over the next 20 years (Greenberg, 1984).

The competition was very important to the development of postwar American modern furniture, and the three keywords of the competition were "Purpose, Flexibility, and Character". In order to attract more Americans to buy furniture, the museum gave a more specific interpretation of flexibility, which is adaptability, portability, and affordability (Neuhart & Neuhart, 2010).

This competition was significant for postwar American modern furniture and influenced the future development of postwar American modern furniture in later years. The ideas it proposed provided new concepts and styles for designers to work with and allowed good designers and work to attract more attention. It can be said that this period the foundation of the postwar American modern furniture.

2.1.1.3. Prime time

After the end of World War II, the economic recovery and the sale of houses led to an increased demand for furniture, and with the support of the relevant departments and excellent marketing communications, designers continued to create excellent pieces. Hamen Miller and Knoll, two American furniture companies, dominated the furniture market at that time (Greenberg, 1984). The designers who worked with them produced classic pieces such as the Eames Lounge Chair by Eames and the Tulip Pedestal Table by Eero Saarinen.

Figure 4, Eames Lounge Chair and Ottoman(Eames & Eames, n.d.)

Between November 1950 and January 1951, MoMA organized the exhibition "Good Design", which was directed by Edgar Kaufmann and presented the designers' understanding of good design at the time (*Good Design | MoMA*, n.d.). Some of the famous works that even now people are familiar with today were on the show, such as Eames's Molded Recycled Side Chair and Donald R. Knorr's Metal Side Chair. The exhibition once again inspired the designers to continue their work and the idea of good design influenced the designers' concepts.

Figure 5, Molded Plastic Side Chair (Eames & Eames, 1950b)

Figure 6, Metal Side Chair (Knorr, 1950)

2.1.1.4. Outstanding designers

This section will talk about the outstanding designers in the postwar American time.

2.1.1.4.1. Charles and Ray Eames

> *"Through their furniture, corporate projects, World's Fair displays, and in the aesthetics of their own California Case Study home, the Eames exemplified modern living in postwar America. The Eames Lounge and Ottoman, introduced by Herman Miller in 1956, remains a touchstone of American style."*(*Charles and Ray Eames - Herman Miller Store*, n.d.)

Charles and Ray Eames had an open mind and a strong spirit for exploring new techniques and materials that emerged during World War II. As pioneers of postwar American modernization, they created new aesthetic standards. Their revolutionary designs for furniture changed the look of the post-war American interior by mass-producing high-quality furniture on an industrial scale. Their designs promoted American culture to the world (Normandin, 2012).

Charles and Ray Eames were excellent at identifying problems and solving them. They

focused on the functionality of furniture and were committed to creating better products to improve people's quality of life. They considered the relationship between furniture and architectural space and used new materials such as plywood, aluminum, fiberglass, and resin to create furniture. Their designs influenced furniture forms for the next few decades.(Greenberg, 1984)

2.1.1.4.2. George Nelson

George Nelson was an architect, industrial designer, graphic designer, photographer, and writer. He was the design director of Herman Miller and is credited with hiring many of the best designers, including the Eames, into Herman Miller. He came up with 5 principles: what you make is important, design is an integral part of business, the product must be honest, you decide what you will make, and this is a market for good design. Under his direction, Herman Miller became one of the most influential furniture manufacturers in the United States.(Vegesack & Eisenbrand, 2008)

He liked to think about the connection between design and philosophy, and the connection between people and design. He saw design as a process of connecting the object to everything. He would focus on people's experience in his designs. He designed the storage wall which solved the storage problem of many people at that time. He had great achievements in office furniture design, and he pushed the development of modern office design. (Fehrman & Fehrman, 1987)

Figure 7, George Nelson and Action Office(Miller, 1964)

2.1.1.4.3. Eero Saarinen

Eero Saarinen is the son of the famous architect Eliel Saarinen and textile artist Loja Saarinen, and he grew up in a family with a passion for design. He went on to become an excellent architectural and industrial designer. He met Charles Eames in Cranbrook, where they shared a common interest in applying the new materials and technologies generated by the war to furniture design. Their collaboration was successful at the Organic Design Competition.

Like Eames, Eero Saarinen was interested in mass-producing furniture using new materials discovered during World War II. Due to his previous studies in sculpture, he paid more attention to the aesthetics of curves and liked to add organic curves to his designs. He also cared a lot about the connection between the furniture and the room. Besides, when designing chairs, he would consider whether people are comfortable sitting on them or not. So, the Womb Chair he designed is very cozy to sit on (Saarinen & Dachs, 2013).

2.1.1.5. The end of the era

Due to the excellent design and high quality of production, these great pieces of furniture were relatively expensive: the Eames Lounge Chair, for example, sold for as much as $430 at the

time. However, the refusal of the courts to grant patent protection for designer furniture in the 1950s led to a flood of cheap reproductions, which caused serious damage to designers and their original products.

To deal with this situation, some companies adopted different strategies. Herman Miller, for example, began to focus on contract furniture for offices, airports, and stadiums, instead of dealing with retailers, supplying its products directly to corporate clients, and Knoll shifted to public design, seeking new market opportunities.

In addition to patent issues, the influence of other popular elements also led to the decline in the quality of furniture design in the late 1950s. People's interest in modern design faded, their taste was affected, and many useless decorations appeared on the furniture. After 1955, the Good Design Show at the Museum of Modern Art was also canceled, which meant that the focus on good modern design began to diminish (Greenberg, 1984).

On top of that, some political considerations make people's optimism fade away. For example, the assassination of President Kennedy in 1963 and the Watergate scandal in 1972 caused people's trust in the government to slip. Postwar enthusiasm faded. The declining positivity of people towards things also led to the output of good design.

2.1.2. Postwar American modern furniture design in contemporary market

Postwar American modern furniture still holds a place in the market today. There are specialized websites for selling and buying postwar American modern furniture, such as 1stdibs and Incollect. Even though they come with a hefty price tag, many people are willing to pay for them. Even if they are sold second-hand, the prices are not bad. Besides this, Herman Miller and Knoll have been selling some of the classic designs of the time at equally high prices. In addition to this many marketers are selling some classic postwar American modern furniture, again at

high prices. It shows the love and admiration of contemporary people for postwar American modern furniture.

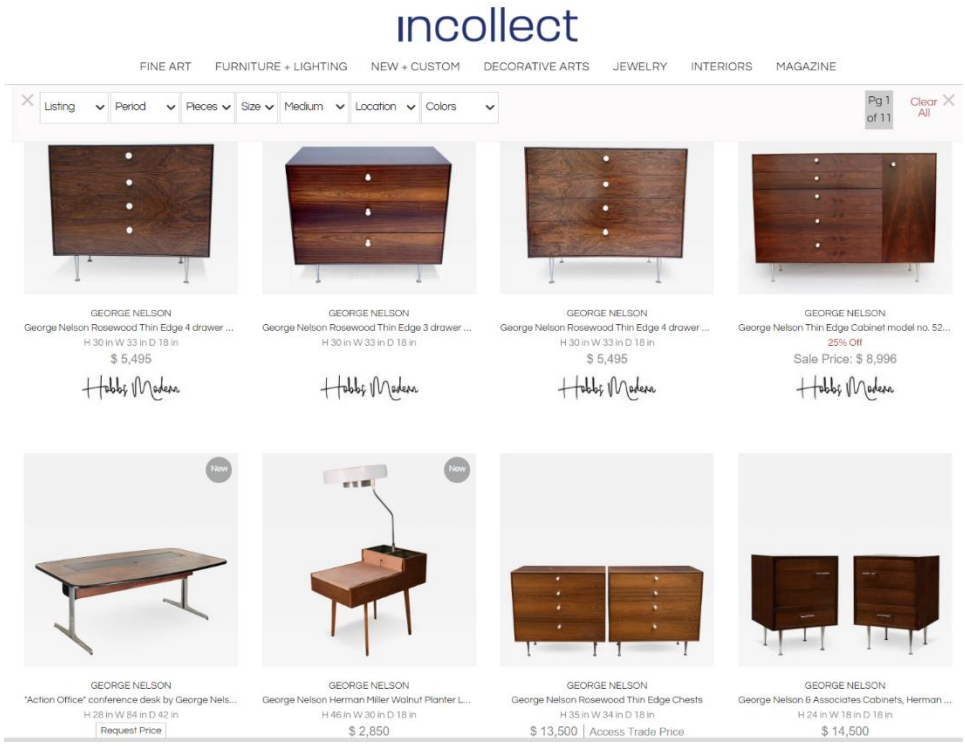


Figure 8, Postwar American Modern Furniture Sell on Incollect

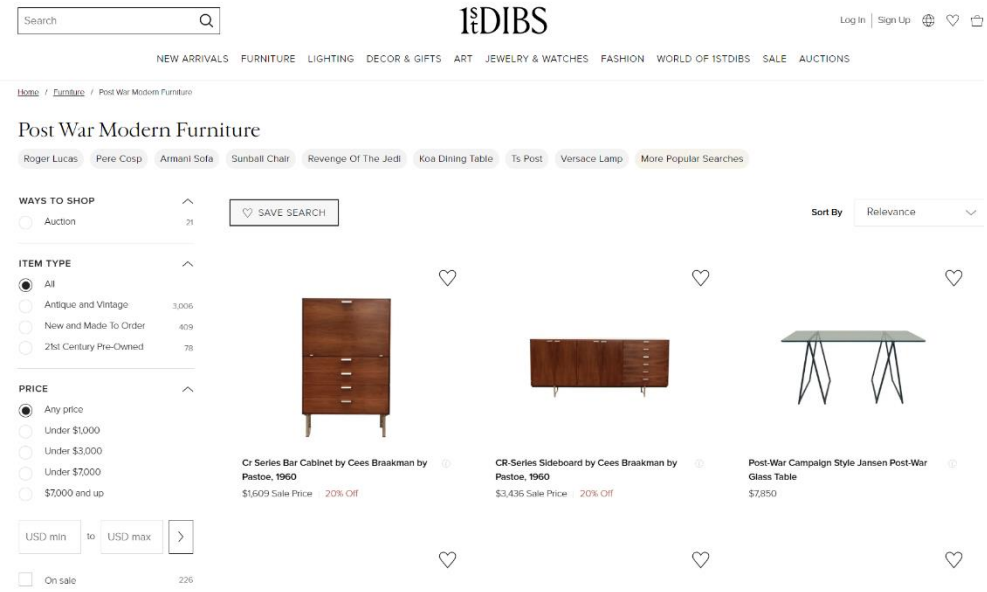


Figure 9, Postwar American Modern Furniture Sell on 1stdibs

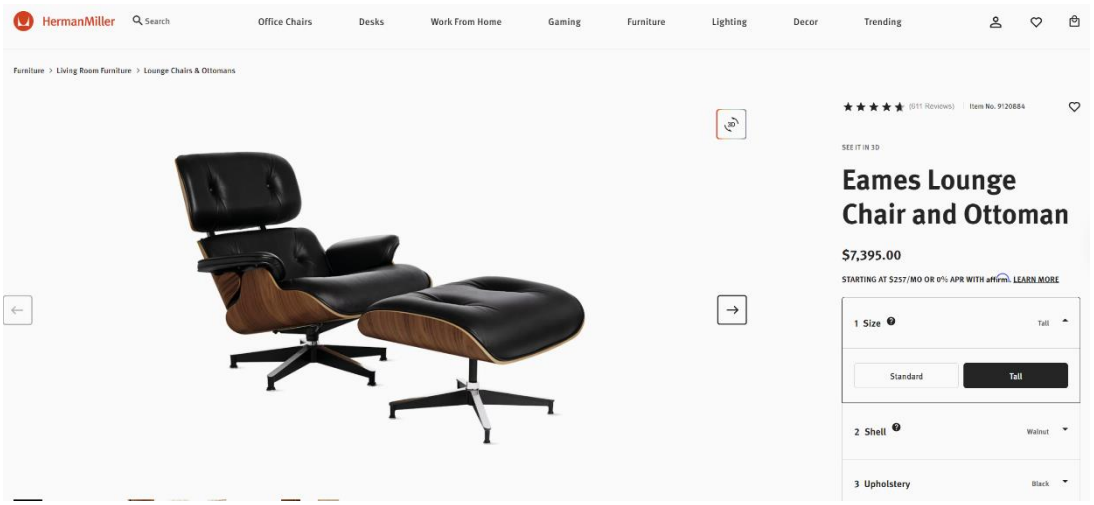


Figure 10, Eames Chair Sell on Herman Miller

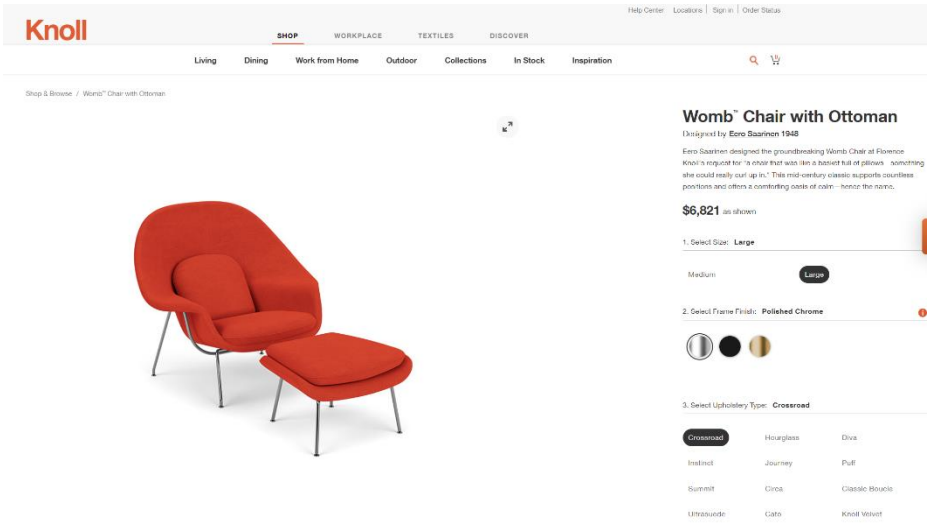


Figure 11, Womb Chair Sell on Knoll

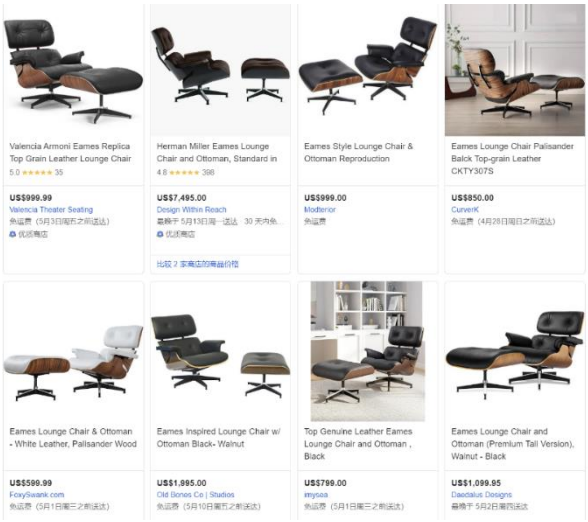


Figure 12, Eames Chair Sell on Different Markets

2.2. Technology and Material

This section will discuss the technology and material about postwar time and contemporary time.

2.2.1. Postwar American

There would be no postwar furniture without the war. The materials used in postwar furniture were all by-products of the research and development that happened during the development of heavy industry to support the war effort. For example, the aircraft industry brought methods of making aluminum and plastics; Eames developed lightweight, stackable leg decks for the Navy using new methods of molding and laminating plywood; and The Chrysler Corporation invented spot-welding to combine wood, metal, rubber, and plastic. Because of the war, many lightweight, durable, low-maintenance materials were created, such as fiberglass, cast aluminum, acrylic, resin, and foam rubber (Greenberg, 1984, p. 25).

DuPont's nylon and synthetic fibers also gained increased recognition after World War II with the joining of Dorothy Liebes. Dorothy Liebes was an accomplished female fabric designer. Both materials were applied in many post-war home and interior designs as well (Blaszczyk, 2008).

The technology and materials of World War II forever changed the foundation of the aesthetics on which a piece of furniture would be evaluated. The industrialization of mass production replaced handmade craftsmanship (Greenberg, 1984, p. 25).

It can be seen that the technology and materials of World War II had a significant impact on post-war modern furniture and set the foundation for postwar furniture in the U.S. They brought new possibilities and inspirations for postwar modern furniture design and shaped the

development pattern of the postwar furniture industry in the U.S. at that time. Therefore, technology and materials have influenced furniture design to a great degree, and it is a necessary part of furniture design to be considered.

2.2.2. Contemporary

With the advancement and development of the times, more and more new technologies and materials were brought into people's lives. These new technologies also influenced and changed people's lives. For example, the creation of computers, the internet, and smartphones has directly changed people's lifestyles. Since 2006, the global sales of computers have not been less than 230 million units a year, and in 2021 the sales of computers reached 340 million units a year. (*PC Unit Shipments Worldwide 2023*, n.d.) The sales of smartphones in 2021 were 1433.86 million units.(*Smartphone Sales Worldwide 2007-2023*, n.d.) This shows that people basically cannot live and work without electronic devices. But electronic devices need electricity to work, and chargers and a variety of wires also appear in people's lives. Contemporary furniture has also begun to take these electronic devices into account, leaving space for chargers and cords.

The furniture industry was also affected by the creation of new technologies and materials that could be used to make furniture. New technology has also been created to make furniture production easier than ever before. For example, 3D printing, CAD modeling, and rendering have made it easier for designers to create test models. More and more new materials are available for people to choose and use in furniture, such as a wide variety of plastics, carbon fiber, and various metal compounds. This allows for more styling possibilities in furniture design.

2.3. Lifestyle difference

This section will discuss the lifestyle difference between postwar American and

contemporary people.

2.3.1. Population

According to official figures, the total number of people living in the United States in 1945 was about 139,934,000; in 1950 it was 151,132,000; in 1960 it was 179,245,000; and in 1970 it was 206,433,000. The U.S. population estimate for July 2023 is that the number of people living in the U.S. has reached about 3,349,148,950 people (Bureau, n.d.-a). Population growth affects housing and land use, and it also changes people's lifestyles and consumption philosophies.

2.3.2. Housing

This section will discuss the housing difference between postwar American and contemporary time.

2.3.2.1. Postwar American

In the decade following the war, the minimum house became a popular housing type in the U.S. Minimum houses met the minimum federal requirements at the time and it was easy to build with roughly 4-6 rooms. The small space had limitations on formality, privacy, and separation of functions. Although the space was limited, the high level of technology inside, such as central heating, complete electrical systems, kitchen appliances, and bathroom equipment, greatly increased the acceptance of the small house. Promoting outdoor living and adding large windows to small rooms to create a feeling of openness is also one of the strategies used to sell the minimum house. Another strategy is to promote the versatility of the room, such as a children's room and dining room that can be used as an entertainment space, or a bedroom and study that could share the same room (Jacobs, 2015).

Because of the popularity of the minimum house, the average size of a newly built home in the United States dropped from 1,177 square feet in 1940 to 983 square feet in 1950. In terms of the number of rooms, the percentage of new homes with 4 rooms in 1940 was 22%; with 5 rooms it was 47%; and with 6 rooms it was 26%. By 1950, the 4-room percentage increased to 46%; the 5-room percentage became 35%; and the 6-room percentage dropped to 17% (Jacobs, 2015).

In the post-World War II period, American suburbs sprawled out, and many young people gave up their parents' big Victorian houses and moved onto 1/4 acre lots in the suburbs. They didn't have servants, but they had the dishwasher and the refrigerator. Rooms became fewer and smaller. Each room had to be multi-functional, and the furniture in it even more so. Small rooms had large windows with furniture that was long and low. Therefore, multi-functional furniture began to be produced. Chairs were designed to do many things; tables were able to use for eating, writing, and playing cards (Greenberg, 1984, p. 39).

It appears that postwar houses were smaller in size and had few rooms, each of them serving a different purpose. Furniture is linked to people and rooms; postwar modern furniture was designed based on the needs of the house and the people at that time. The living spaces affected the people's living habits as well as the furniture inside. As houses at that time were generally smaller and had a limited number of rooms, each room was designed to meet different functional needs. In such cases, the postwar furniture is also affected by this, so for example, the size of the furniture will be smaller, so that the room will not look very crowded; the function of the furniture will become diversified to meet the different needs of the room and the people.

2.3.2.2. Contemporary

According to the survey, the average household size in the United States in 2022 was 2.5

persons, while in 1940 the average household size was 3.7 persons. The average living space in the United States in 1940 was 321 square feet, but in 2022 the average living space per person in the United States was 741 square feet. The average size of a new manufactured house in the U.S. in 2022 is about 2,299 square feet (Xiao, 2023). In 1950, the size of new homes built in the U.S. was 983 square feet. Today's new homes are more than twice as large as 70 years ago.

As can be seen, all new contemporary American houses are much larger than those built in the postwar period, and the living space per person is much larger. This means that there are more rooms and more square feet to use. The increase in rooms makes the rooms singularly functional so that people need some new, specialized furniture for one thing rather than multifunctional furniture.

According to surveys, more and more people are choosing to work from home since 2019, and in 2021 the number of people working from home reached about 27.6 million (Xiao, 2023). With the increase in the size of houses plus the increase in the number of rooms, many families would have home offices. The demand for home office furniture is also increasing.

With the increase in housing areas, the diversity of functional areas in the home is increasingly emphasized, and the kitchen island, as a notable example, has become an essential element in modern housing design. According to a recent survey, the global Kitchen Island market size reached USD 10.38 billion in 2022 and is expected to increase to USD 14.58 billion by 2029. Particularly notable is the fact that North America holds more than half of the global market, demonstrating the high demand and acceptance of kitchen island units in the region (“Kitchen Island Market,” n.d.). As the popularity of kitchen islands has increased, so the demand for barstools has also increased. Seventy years ago, the use of barstools in homes was relatively rare.

This discussion shows that the increase in the size of houses has led to an increase in the variety of furniture, with many furniture items that did not exist during the postwar time. And the increase in rooms leads to singularity in the function of the furniture. Furniture in houses nowadays is designed to specialize in one function in order to better serve contemporary living habits, such as gaming chairs and gaming tables. The furniture is to serve people, the change in the house will affect people's living habits, and people's living habits will affect the design of the furniture.

2.3.3. Consumer & market

This section will discuss the consumer and market during postwar American and contemporary life.

2.3.3.1. Postwar American

The average family income in 1950 was $3,300 a year (Bureau, n.d.-c). The average car price was $1,510, which was 46% of the average family income. The average medium house price was $7,354, which represented 220 percent of the average family income (thinkbiglivetiny, 2016).

World War II ended the Great Depression in the United States, and it started a new period for all Americans. Americans' suppressed desire to purchase was unleashed. This had a positive effect on many businesses, including the furniture industry. In the five years after World War II, purchases of household furniture and electrical appliances increased by 240 % (Nickles, 2002). Many women planned to get married after the war, so there was a rush to buy furniture. Also, after the war, everyone became very patriotic and stopped adoring European culture and aesthetics. Instead, there was a strong nationalism and confidence in America's own culture. This

brought support for American-made and designed furniture (Greenberg, 1984, p. 28).

After the war, the government issued a number of bills and policies to assist and promote the purchasing of houses. These bills and policies promoted the sale of houses by reducing financial risk and minimizing class and income distinctions, although they were not friendly to other races except the whites. In this marketing and sales side of the industry, builders used advertisements, model homes, and annual home festivals to attract more consumers. Sample homes would not only cover up the flaws of the house itself with the furnishings on display but would also give the consumer a nice fantasy of what life would be like in the future. This greatly encouraged the desire to purchase houses. Buying and maintaining a home also became a part of middle-class life in postwar America (Jacobs, 2015). The number of houses in the United States increased by about 954,000 from 1945 to 1950 (Pulos, 1988, p. 58). The growth in housing also had a positive effect on the development of the furniture market, which indicates that the demand for furniture gradually became greater.

With the rapid growth of the economy after World War II, museums began to give strong support to the designers to develop good products, and many museums and galleries began to organize design competitions and exhibitions. Most of their themes were close to the lives of consumers and served their needs. By the late 1940s, modern design had also gained attention in the academic world, and magazines started to publicize good designs. Designers and their products were gradually winning the hearts of consumers (Pulos, 1988).

The postwar market was a booming period. The end of the war led to a shortage of houses, the government issued bills to help people build and buy houses, and house marketers also used various tricks to encourage people to buy houses. As a result, a large number of people bought properties and there was a huge increase in the sale of houses. Most of the people could not live

in an empty house and they definitely would buy furniture to put in their rooms and use them, so there was a huge need for furniture as well.

After the war, many museums and other non-profit organizations promoted the creation of many good products, so many great designs flowed into the market. The victory of the war plus the excellent and fresh designs boosted the American national pride even more. Also, as the economy recovered in the United States after the war, many things needed to be placed in the new houses that were purchased, so the desire to purchase was very strong.

2.3.3.2. Contemporary

People's lives are very different now from 70 years ago after World War II, with so many new technologies and skills invented and utilized. People's ideas about consumerism have also changed a lot since then.

The average middle-class family income in 2022 is $74,580 a year (Bureau, n.d.-b). The average per-person income in Alabama in 2023 is $56,598 a year (Trustees (EOUST), n.d.). The average price of a newly built house in 2023 is $511,100 (*Average New Home Sales Price in the U.S. 2023*, n.d.). The average expenditure for an individual in 2022 is $40,859, and the average for a family of four is $92,989 a year (*Average Monthly Expenses Study 2024 – Forbes Advisor*, n.d.). This shows that there is a lot of money that needs to be spent by people, and houses have become a lot more expensive.

2.3.3.2.1. Innovation Optimism

In Kit Yarrow et al.'s book (2014) about the contemporary consumer's mind, he mentions the term "Innovation Optimism", which means that people are willing to spend money on a new product. According to his research, contemporary consumers are eager for new things, new

products, and new experiences. More and more people are willing to accept and try new products. Consumers hope that new technologies can be applied to their daily lives and make their lives more convenient. People's trust in technology and its reliability have increased, smart phones and computers are good examples. Most people could not live without them. The young generation is usually happy to buy new designs because they believe they can solve problems quickly.

In the survey of the top 100 global brands, the age of the brands is decreasing, from 84 years in 2006 to 64 years in 2012, so the influence of new brands is increasing. Traditional brands and classic designs are still recognized, but new technologies are more fascinating. Consumers are becoming more self-aware, and they prefer brands and designs that serve them. Many classic brands get more attention from consumers by innovating their products and services, such as Adidas: they introduced futuristic shoes and virtual 3D modeling, which increased their in-store sales by 77%-500%. An Atlanta fine dining restaurant increased 30% in wine sales after putting their wine menu, which hadn't changed in over 20 years, on the iPad (Yarrow et al., 2014).

From this point of view, the renewal of products is very important for contemporary people. New products and ideas can capture people's attention and money. Postwar modern furniture was designed 70 years ago, they are classic, and they are the original American modern furniture. Their style has been influencing people's aesthetics since then. But with the evolution of time and technology, people want to see new and more relevant designs that meet the needs of contemporary people. So, it's important to design new furniture by combining the styles and concepts of postwar design with the needs and technology of contemporary people.

2.2.3.2.2. Individualism

As mentioned before, people are starting to become more self-conscious and prefer products and brands that serve them. People want to own products that represent them, and they want to

use products and consumables to show off who they are (Yarrow et al., 2014). When it comes to purchasing products, people want to have more of their own choices. More and more people are choosing to customize products for themselves. To satisfy consumers, many manufacturers have also introduced customization services; there are also many manufacturers who offer many different colors and models of products for consumers to choose from in order to satisfy consumers. For example, when purchasing an Eames lounge chair from Herman Miller now, there are up to 60 different colors and materials to choose from. This shows that it is very necessary to provide consumers with more choices.

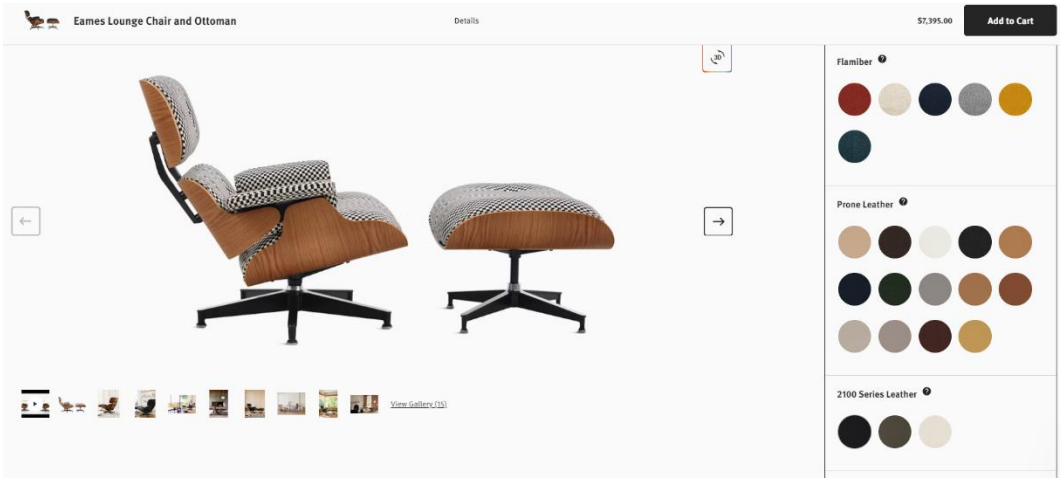


Figure 13, Material and Color Options Eames Lounge Chair(Miller, 2024)

2.2.3.2.3. Sustainability

According to market research, sustainability marketing products have been growing twice as fast as traditional products since 2017, even with the heavy premiums for sustainability products. In 2021, the marketing of sustainability products amounted to $3.4 billion (*Sustainable Market Share Index™ - NYU Stern*, n.d.). This shows that people take the idea of sustainability seriously and are willing to spend money on eco-friendly products. So, when it comes to the selection of contemporary furniture, designer should make environmentally friendly materials the first choice, which is different from 70 years ago.

2.2.4. Human Body

According to the research from 2016, the average height of men in the United States is 175.4cm, and the average height of women in the United States is 161.7 cm. The average weight of man in the United State is 89.8 kg, and the average weight of women in the United States is 77.4kg (*National Health Statistics Reports, Number 122, December 20, 2018*, 2018).

The average height of American man about a century ago was 171cm, and the average height of American women was 159cm (*How Humans Have Changed in Height in the Last 100 Years | CNN*, n.d.). In 1960, the average weight of man in the United States was 75 kg, the average weight of women in the United States was 63 kg (Klayko, 2015).

According to the data, it is clear that people in the United States are getting taller and bigger in size. People may feel uncomfortable when they use furniture from 70 years ago, because that furniture is designed for people at that time. Human size becomes more and more important to furniture design because people now pay more attention to their physical health, so anthropology and human engineering become an integral part of the modern furniture design process.

2.2.4.1. Anthropology

In fact, back in World War II, people began to consider the problem of human body size, but basically, these data come from soldiers; the use of these dimensions of the design of the product is basically used in the military. Although the postwar American modern furniture design also put people first, considering the comfort level of people using furniture, there is no specialized anthropometric data to provide reference. To solve the problem, what designers did is to make models and then people feel the design to assess comfort. In the 1970s, Henry Dreyfuss launched scientific anthropometric data for people and designers to use (Kries & Eisenbrand, 2019).

For contemporary designers, ergonomics is very important. Contemporary people pay much attention to furniture design that conforms to the human body, and the market has more and more ergonomic chairs. Designers refer to ergonomic data when designing furniture sizes. These data did not exist in the postwar era of modern American furniture.

2.4. Conclusion

In conclusion, drawing from the above research and analysis, American postwar modern furniture has had a great impact on American modern furniture. It has led to an increase in the acceptance of American modern furniture. The classic American postwar furniture is perceived as contemporary favorites even now.

Over time, people's lives have changed a lot. The creation of new technology has brought new materials to people and many new techniques can be applied to furniture design. Population growth and the increase in housing areas also affect the design and application of furniture in the house. People's consumerism has also changed, with contemporary people looking forward to new products and wanting more choices, as well as being more environmentally conscious and willing to spend money on sustainable products. Not only that, but people's bodies have changed too, with increases in average height and weight meaning that people are bigger on average than they were 70 years ago.

Furniture serves people and is also influenced by the size and application of the house. Life after World War II was very different from contemporary life, meaning that furniture designed in the postwar period may not be fully adaptable to contemporary life. However, people's love for the style of American postwar furniture continues to this day, so it is necessary to use the visual analysis and concepts of modern American postwar furniture to design home living furniture that is more compatible with contemporary people. According to the research, there are a limited

number of studies and articles that could specifically analyze and summarize the style and design concepts of American postwar modern furniture. Therefore, this thesis will conduct a case study in the next chapter to analyze and summarize the design styles and concepts of American postwar modern furniture.

Chapter 3. Case Study

3.1. Objectives of the Case Study

To analyze and summarize specific design styles and methods of postwar American modern furniture.

3.2. Background

This section will discuss the information that will be used for the case study.

3.2.1 Postwar American Modern Furniture Characteristicse

This section will discuss the characteristics of postwar American modern furniture.

3.2.1.1. Lightness

Because of the development of plywood and other materials combined with war technology, people were able to have furniture that is both visually light and weightless (Fehrman & Fehrman, 1987). In 1953, Edgar Kaufmann Jr. also wrote in his book *What Is Modern Interior Design*:

> *"Today, lightness seems a natural trait in a room.... Lightness in the modern interior is sometimes said to originate in practical or functional considerations... Lightweight furniture can make housekeeping less burdensome... It has tended to reinforce the modern*

designer's interest in an open structure free space and light line." (p. 24)

Because World War II brought materials and techniques to make lightweight and strong furniture, plus, as mentioned before, postwar houses had very little space, designers came up with lightweight-looking furniture to enhance the feeling of space in the house. Also, the organic furniture competition displayed at events organized by the Museum of Modern Art in New York showcased the need to focus on the portability of furniture. So, lightness was one of the pursuits of designers at that time in furniture design.

3.2.1.2. Functional

In 1958, Charles Eames published his ideas in the San Francisco Examiner, expressing his want to apply the high quality and functionality of architectural design to furniture design. Determining functionality is the first step in design, never based on appearance. The appearance of furniture is developed over time through the behavior and relationships of materials and craftsmanship. Eames and their office staff are always guided by the philosophy of "less is more." (Neuhart & Neuhart, 2010) Not only Eames, but also George Nelson and Eero Saarinen focused on the functionality of their furniture (Fehrman & Fehrman, 1987).

Basically, the designers of the time put a lot of emphasis on the functionality of the furniture. Because of the small size of the houses and the small number of rooms at that time, there were many responsibilities in one room. People needed functional and even multi-functional furniture, so the designers would value the functionality of the furniture. Another point is that the word "purpose" was highlighted in the 1940 New York Museum of Art's Organic Furniture Competition, and the purpose of furniture is to serve human beings, so designers would focus on the function of the furniture in order to accomplish the purpose of the furniture. This laid the direction and set the foundation for the postwar design of modern furniture in the United States.

3.2.1.3. Organic

Similarly, the Museum of Modern Art's Organic Furniture Design Competition in New York led the way for modern furniture in postwar America. The ideas presented by the competition have continued to influence designers' ideas and styles. This, coupled with the new materials and technology that came through the war, was what gave people the ability to make smooth line shapes. This also led designers to explore organic shapes. In the 1940s and 1950s, Alexander Calder's Mobile arts and Henry Moore's sculptures also began to be exhibited at MoMA. (*Exhibition history | MoMA*, n.d.)(*Mobile | MoMA*, n.d.) Their work was characterized by its organic forms and flowing lines, which inspired designers to work with organic shapes.

Figure 14, Recumbent Figure(Mooree, 1938)

Figure 15, Spider(Calder, 1939)

In the *Atlas of Furniture Design*, there is a description of furniture from 1940-1973, and one

paragraph reads:

> *"The increase in prevalence of organic modernism in the late 1940s brought together several that versus international tendencies. The increase in prevalence of organic modernism in the late 1940s brought together several that versus international tendencies. Organic modernism can be defined as an interest in softer abstracted nature forms desire from sciences and art; it also refers to a desire to see design solutions emerge 'originally' from the solutions of furniture and materials. Organic design was perceived as bringing more human-centered bring a closer relationship to the body and to nature."(Kries & Eisenbrand, 2019, p. 364)*

Organic is not just about the smooth curves of a product's exterior. The deeper meaning is to be human-centered, closer to nature, so that people can use it more comfortably. Therefore, designers not only consider the natural smoothness of the shape but also consider the people's feelings of use.

3.2.2. Postwar American Modern Furniture Design Concept

This section will discuss some postwar American modern furniture design concept.

3.2.2.1. Modern Design Principles

The Curator at the Museum of Modern Art, Edgar Kaufmann Jr. (1950), came up with this Modern Design Principles in his book *What is Modern Design*, which states:

> *"01. Modern design should fulfill the practical needs of modern life. 02. Modern design should express the spirit of our times. 03. Modern design should benefit by contemporary advances in the fine arts and pure sciences. 04. Modern design should take advantage of new materials and techniques and develop familiar ones. 05. Modern*

design should develop the forms, textures, and colors that spring from the direct fulfillment of requirements in appropriate materials and techniques. 06. Modern design should express the purpose of an object, never making it seem to be what it is not. 07. Modern design should express the qualities and beauties of the materials used, never making the materials seem to be what they are not. 08. Modern design should express the methods used to make an object, not disguising mass production as handicraft or simulating a technique not used. 09. Modern design should blend the expression of utility, materials and process into a visually satisfactory whole. 10. Modern design should be simple, its structure evident in its appearance, avoiding extraneous enrichment. 11. Modern design should master the machine for the service of man. 12. Modern design should serve as wide a public as possible, considering modest needs and limited costs no less challenging than the requirements of pomp and luxury."(Kaufmann & Kaufmann, 1950, p. 7)

It can be seen that these concepts have a lot in common with modern postwar American furniture design. In terms of functionality, it shares the same ideas as mentioned above in 1, 6, 9, and 10. As mentioned before, postwar American modern furniture is all about the practicality of the design, and none of them have any unnecessary embellishments. Postwar American modern furniture followed number 3 in terms of appearance, and many designers were influenced by the art of the time, creating furniture with beautiful curves. The use of materials and technology was also used because of the new materials and technology produced during the war. It can be said that without World War II there would be no postwar American modern furniture, which also complies with number 4. The production of postwar American modern furniture also used mechanized mass production and manufacturing, which is also consistent with number 11. For

number 12, the Eames Lounge Chair and Ottoman is a good example. It was designed for luxury, and the designer wanted it to look like a gentleman's club chair, with beautiful rosewood, fine Scottish leather, and down padding. (*Eames Lounge Chair & Ottoman, Eames Lounge Chair*, n.d.) Therefore, Kaufmann's idea of modern design principles is basically the same as that of modern furniture designed in postwar America.

3.2.2.2. Good Design

As mentioned in Chapter 2, the 1950 Good Design exhibition organized by MoMA had an impact on postwar American modern furniture design. At that time, MoMA organized many outstanding designers for the concept of "good design", the following are some of the more influential and famous concepts:

> *"'A good design should have nothing that is irrelevant, accidental, or unrelated to the main idea.'*
>
> *'Good design 1 Fulfills its function 2 Respects its materials 3 Is suited to the method of production 4 Combines these in imaginative expression.' Eliot Noyes, Director, Department of Industrial Design, MoMA*
>
> *'A frequent misconception is that the principal purpose of good modern design is to facilitate trade, and that big sales are a proof of excellence in design. Not so. Sales are episodes in the careers of designed objects. Use is the first consideration.'*
>
> *'Good design in any period is simply ... a thorough merging of form and function, and an awareness of human values expressed in relation to industrial production for a democratic society.'*
>
> *'Good modern design will be quiet, honest and functional.'*
>
> *'Good: "Satisfactory for its purpose; ample; full; considerable, not insignificant;*

possessing attractive qualities; agreeable, pleasant; adapted to a useful end; valid, adequate; of comparative excellence in its kind, admirable; commercially sound or reliable. This seems like a good word to use in our title.' Edgar Kaufmann, Jr., Director, Department of Industrial Design, MoMA

'Good design depends on the harmony established between the form of an object and its use.' Max Bill, designer and curator of Die gute Form exhibition, Basel, Switzerland"(*The Value of Good Design | MoMA*, n.d.)

It is easy to see that these concepts of "good design" are similar to the concepts of postwar American modern furniture design, or rather, that the concepts of good design are exactly what postwar American modern furniture designers were looking for. "Good design" is also concerned with the integration of function and form, which postwar American modern furniture design also achieved, and which is analyzed in more detail in the next subsection.

3.2.2.3. Material, Form and Function

"From aims point of view it was automatically preferable to use the two different material-wood and metal-for the two different functions, emphasizing their differences rather than trying to minimize them." (Fehrman & Fehrman, 1987, p. 19) Determining functionality is the first step in design, never based on appearance. The appearance of furniture is developed over time through the behavior and relationships of materials and craftsmanship. Eames and their office staff are always guided by the philosophy of "less is more." (Neuhart & Neuhart, 2010)

Combined with the concept of "good design" mentioned earlier, it can be seen that not only Eames but also postwar American designers pursued the integration and balance of function and form, which will be explained and illustrated in more detail in the case study that follows. Eames was particularly good at this, as they used different materials for different functions of their

products. The function is determined first, the material is determined, and the form is created according to the material. Furniture designed according to this sequence naturally achieves a fusion of function, material, and form.

3.3. Product Analysis

This section selects and categorizes products and then analyzes them.

3.3.1. Product Classification and Selection

This case study will divide postwar American modern furniture into four categories: chair, sofa, table and desk, and storage, which basically encompasses the types of furniture designed by the designers of the time, as well as the types of home living furniture.

This case study will select representative products from these four categories. They were designed between 1940-1970 and were all designed and produced in the United States, as the purpose of this case study is to analyze the appearance of postwar modern furniture in the United States. Products from at least five designers are included in each category, which ensures a diverse selection of products. They are composed of at least two materials, both because furniture of the time basically consisted of at least two materials, and to analyze the relationship between material and function. In addition to the chair categorization, eight products from each category will be selected for overall analysis. Since designers were keen on designing chairs at the time and there were a large number of products in the chair category, 15 different chairs will be selected for analysis to ensure a diverse selection of products.

3.3.2. Chair Analysis

Figure 16, No. 939(Komai, 1949)

Figure 17, 72P Chair(Saarinen, 1945)

Figure 18, Conversation Chair(Eames & Saarinen, 1940)

Figure 19, Matel Side Chair(Knorr, 1950)

Figure 20, DCM plywood chair(Eames & Eames, 1946)

Figure 21, Molded Plastic Chair(Eames & Eames, 1950b)

Figure 22, 422L Diamond Chair(Knoll, 1960a)

Figure 23, Eames Lounge Chair(Eames & Eames, n.d.)

Figure 24, Womb Chair(Saarinen, 1948a)

Figure 25, Grasshopper(Saarinen, 1946)

Figure 26, No. 66301 Lounge Chair(Girard, 1965)

Figure 27. Nelson Coconut Chair(Nelson, 1955a)

Figure 28, No. 100A(Kagan, 1949)

Figure 29, Plia Chair(Piretti, 1969)

Figure 30, 175D Chair(Kagan, 1953)

Based on the observation and the previously mentioned postwar American modern furniture design concepts, all of the selected chairs are free from unnecessary decoration. Their function is to provide places where people can sit down, so their designs are simple. Just like the Eames design concept mentioned before, each part of the furniture has its own function, and each function possesses different materials. Functional distinctions are demonstrated with different materials. Every chair has at least two parts: a place for people to sit, which can be described here as part of body support, and the legs of the chair, which can be described here as structural support. Some chairs have cushions attached to them to make them more comfortable, which can be described here as upholstery, and each of these parts has its own function. Each of these parts has a different material. Each function is a different material, and the same function will have the same colors. If the body support is not a thin, lightness piece, such as one made of plywood, plastic or fiberglass, the upholstery part may share the same material with the body support part.

As mentioned before, because postwar houses were small, designers needed to create furniture that had a thin, light form so that the room would look larger. Therefore, the legs of the chairs, the structural support part, were made thin enough to give the room a sense of space.

Based on the observation, it could be seen that all the selected chairs have organic shapes, and all of them have adopted the appearance of having smooth curves. It is easy to see that none of them has a 90° right angle, neither in the body support part nor in the structural support part. Also, they are all symmetrical in appearance.

3.3.3. Sofa Analysis

Figure 31, Florence Knoll Sofa(Knoll, 1954)

Figure 32, GT Line Sofa(Grossman, 1949)

Figure 33, Model 2165(Baughman, 1968)

Figure 34, Marshmallow Sofa(Nelson, 1955b)

Figure 35, Fifth Avenue Sofa(Kagan, 1955)

Figure 36, No.66303(Girard, 1967)

Figure 37, Womb Settee Sofa (Saarinen, 1948b)

Figure 38, Freeform Sofa(Noguchi, 1948)

Based on the observation and the previously mentioned postwar American modern furniture design concepts, it can be noted that all of the selected sofa designs are simple, and none of them have any unnecessary decorations. Their function is to provide a place where people can sit or lie down to rest, and they are basically made up of two-three parts: the legs of the sofa, the support to sit on, or the seat shell of the seating part of the sofa, and the cushions to soften the sofa. As previously mentioned in the analysis of the design concept of Eames and the design of the appearance of the chair, it is possible to divide the sofa's design into three parts: the structural support part which represents the legs of the sofa, the body support part which represents the seat of the sofa and the upholstery part which represents the cushion of the sofa. The structural support part and the upholstery part could have the same material since their function is to provide support for sitting or lying down, and each function is made of a different material.

As I mentioned before, the postwar American houses were small, so in order to make the houses look bigger and more spacious, the designers added feet to all the sofas, the structural support, which was made very thin under the premise of guaranteeing sufficient strength.

Based on the observation, it could also be discovered that there are two kinds of sofa appearance: one is the organic appearance, and the other is the geometrical appearance. the organic appearance has smooth curves and there is no 90° right angle. It is similar to a chair's

appearance design analysis but does not need to be completely symmetrical. The geometric look has a uniform geometric shape, with both the body support part and the upholstery part being rectangular, and Nelson's Marshmallow Sofa has the same kind of rounded cushion.

3.3.4. Table and Desk Analysis

Figure 39, CTM Coffee Table(Eames & Eames, 1950a)

Figure 40, Saarinen Dining Table(Saarinen, 1957)

Figure 41, IN-50 Coffee Table(Noguchi, 1944)

Figure 42, Rudder Dining Table(Noguchi, 1949)

Figure 43, Swaged Leg Desk(Nelson, 1956)

Figure 44, DTM Drop Leg Table(Eames & Eames, 1947)

` Figure 45, No. 6200(Grossman, 1952)

Figure 46, Home Office Desk(Nelson, 1946a)

Combining the observations and the previously mentioned postwar American modern furniture design concepts, it can be noted that they are both very simple in design, with no unnecessary decorations. The table and desk are analyzed together here because their functions are to provide a platform for people to put things on, in which they can eat, work, or carry out other recreational activities. They are basically composed of two parts: the legs of the table and desk and the desktop that provides space for people to use. Some desks will have another part: a place for people to store their items. According to Eames' design concept and the previous analysis of the appearance of chairs and sofas, we can also divide tables and desks into three parts: the structural support part represents their legs, the body support part represents the tabletop - because they are places for people to use, and the storage part represents the storage space. Different materials are used for each function. The structural support part and storage part are sometimes made of one material because they are both for human services. The basket on the right side of the home office desk is also made of different materials because the designer wants to emphasize its function. The hollowed-out basket is actually a drawer, so that people can browse through the contents quickly, and it is designed for storing documents.

Of course, there are special cases. The Saarinen Dining Table looks smooth and one piece, but actually the tabletop and legs are not the same material. The designer wanted to make it look

like a whole, but the material and technology could not do it at that time, so he used a similar material and finished the surface later to make it look like a whole.

According to the observation of the shape of the table and desk, it can be found that their shapes are also divided into two categories: one is the organic shape, and the other is the geometrical shape. For tables, which are less functional, they usually have an organic shape; for desks, which are more functional, they have a more geometrical shape. Like the profile of a sofa, the organic shape has smooth curves and no 90° right angles; the geometrical shape will have a uniform geometric shape which is rectangular.

3.3.5. Storage Analysis

Figure 47, Planner Shelving(McCobb, 1949)

Figure 48, Comprehensive Storage System(Nelson, 1957)

Figure 49, ESU, Eames Storage Unit(Eames & Eames, 1949)

Figure 50, Steelframe Case(Nelson, 1950)

Figure 51, Nelson Thin Edge Group(Nelson, 1952)

Figure 52, Vertical Storage(Knoll, 1960b)

Figure 53, Nelson Basic Cabinet(Nelson, 1946b)

Figure 54, Platform Bench with Storage Cabinet(Kries & Eisenbrand, 2019, p. 531)

Combining observations and analysis of previous research on the design concepts and appearance of modern furniture in postwar America, it can be noted that storage furniture was also designed to be very simple and free of unnecessary decoration. The function of storage furniture is to provide a place for people to store their items. They are basically made up of two to three parts: frames and legs, platforms or spaces for storing things, and handles. Based on Eames' design concept and the analysis of the appearance of the storage units, it is possible to divide the storage units into three parts according to their function: the structural support part represents the frames and legs of the storage furniture, the storage support part represents the surfaces and spaces where the objects are stored and the handle part. Each function has a different material. Sometimes designers use different materials or colors to highlight a particular function, such as the Eames Storage Unit.

According to the shape of the storage units, they are geometrically designed and are basically made up of rectangles of various styles. Also, based on the previous analysis of the appearance of tables and desks, it can be seen that as long as there is a storage space, it will have a geometric appearance.

Since postwar houses were smaller in size, the designers also added legs to all the storage spaces in order to make the rooms appear larger and more spacious. These structural support parts are made thin while ensuring that they have enough strength.

3.3.6. Summary

According to the previous analysis of the characteristics of postwar American modern furniture, the design concept and the appearance of the product. It can be noted that the design concept of postwar American modern furniture affects the appearance of postwar American modern furniture. Basically, all postwar American modern furniture has some commonality in their appearance. They all use the function of the piece to determine the material and appearance of the product. Different functions have different materials, and the same function has the same materials. Functional distinctions could be expressed through different materials, or different materials could be used to emphasize a certain function. The combination of function and material could be flexible, not static and unchanging, but could be changed according to the idea that the designer wants to express.

Here is a table to show the design patterns of postwar American modern furniture in a clearer and more concise way.

Table 1, Case Study Conclustion

<table>
<tr><th rowspan="8">Postwar American Modern Furniture</th><th>Categories</th><th>Design Concepts</th><th colspan="3">Function Parts</th><th>Visual Analysis of Appearance</th></tr>
<tr><td>Chair</td><td rowspan="7">NO Useless Decoration (Simple and Clean Design for Functional Use)

Different Function Parts have Different Materials Same Function may Share the Same Material (Usually Has 2-3 Parts and Materials)

Sense of Space (Furniture Must Have Legs)</td><td rowspan="7">Structural Support Part (Frame and Legs)</td><td rowspan="5">Body Support Part (Provides Support for the Human Body)</td><td rowspan="3">Upholstery Part (Cushions)</td><td>Organic Design: Curved Line with NO 90° Right Angle

Symmetry between Left and Right</td></tr>
<tr><td rowspan="2">Sofa</td><td>Organic Design: Smooth Curved Line</td></tr>
<tr><td>Geometrical Design: Formed with a Single Geometric Figure</td></tr>
<tr><td rowspan="2">Table/Desk</td><td rowspan="4">Storage Part (Provision of storage space)</td><td>Organic Design: Smooth Curved Line (Mostly for table that doesn’t require a highly functional)</td></tr>
<tr><td>Geometrical Design: Formed with a Geometric Figure-- Most are Different Rectangles (Mostly for desk that require more functional)</td></tr>
<tr><td>Storage</td><td>Handle Part</td><td>Geometrical Design: Formed with a Geometric Figure-- Most are Different Rectangles</td></tr>
</table>

Chapter 4. Guideline

Based on the reorganization and summary of the literature, it can be found that it is feasible to design homing living furniture that fits contemporary people based on the design appearance and principles of postwar American modern furniture. Postwar American modern furniture has had a significant impact on the development of modern furniture in the U.S. Furniture designed and produced at that time is something that many people are seeking to this day, and even after 70 years, postwar American modern furniture is still on the market and is still very popular. There are many differences and changes between life in postwar America and contemporary life.

So, it is necessary to combine the visual analysis and concept of postwar American modern furniture at that time with the contemporary way of life to design home living furniture that fits contemporary life.

This chapter will combine a comprehensive review of the literature and the outcome of the case study to propose a series of specific steps and strategies to analyze and summarize a method of applying the visual analysis of postwar American modern furniture to contemporary home living furniture design.

4.1. Design Guideline Flow Chart

This section will provide a flow chart of design guideline of applying the visual analysis of postwar American modern furniture to contemporary home living furniture design.

The flow chart for this design method is the result of understanding and analyzing the literature, analyzing the shapes and concepts of modern postwar American furniture design, and my insights into furniture design.

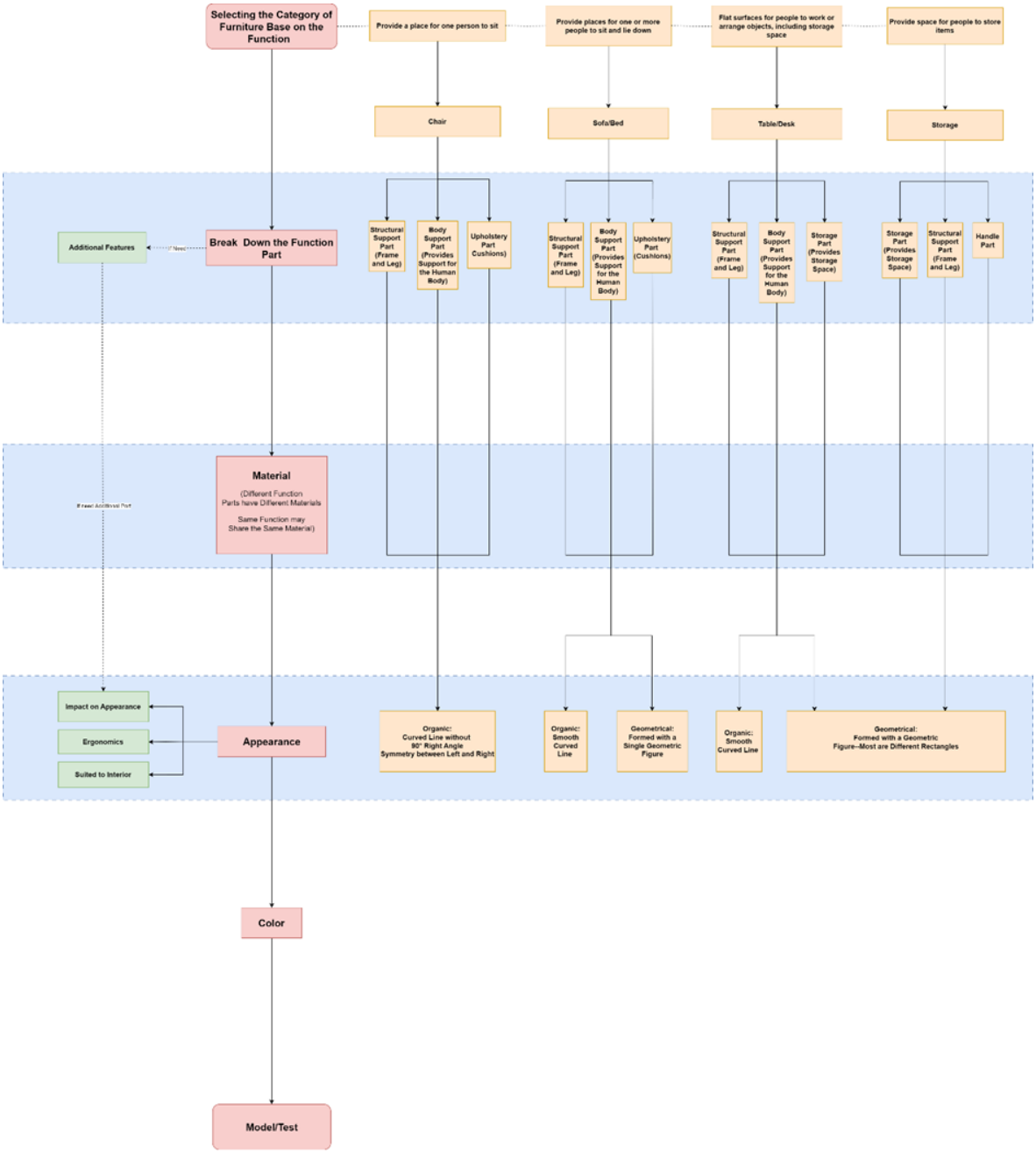


Figure 55, Design Flow Chart

4.2. Detailed Explanation of the Design Guideline Following the Flow Chart

This section will explain each step of the design guideline follow flow chart, and the way to use it.

4.2.1. Division of the Design Guideline

According to this flow chart, the guideline could be divided into three different sections to make it easier for the user to understand, and each section has a different color.

The red part is the major step of the design guideline, the yellow part is the suggestions and references based on the visual analysis of postwar American modern furniture, and the green part is the suggestions and references based on contemporary living. The blue background indicates that these points should be considered together.

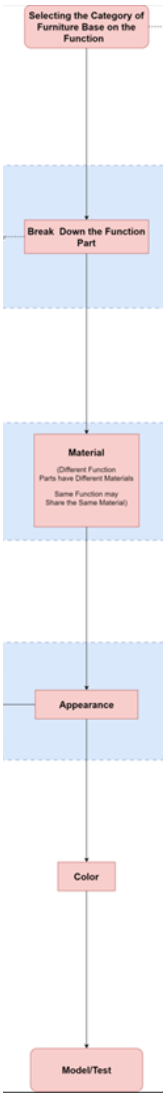


Figure 56, Major Steps

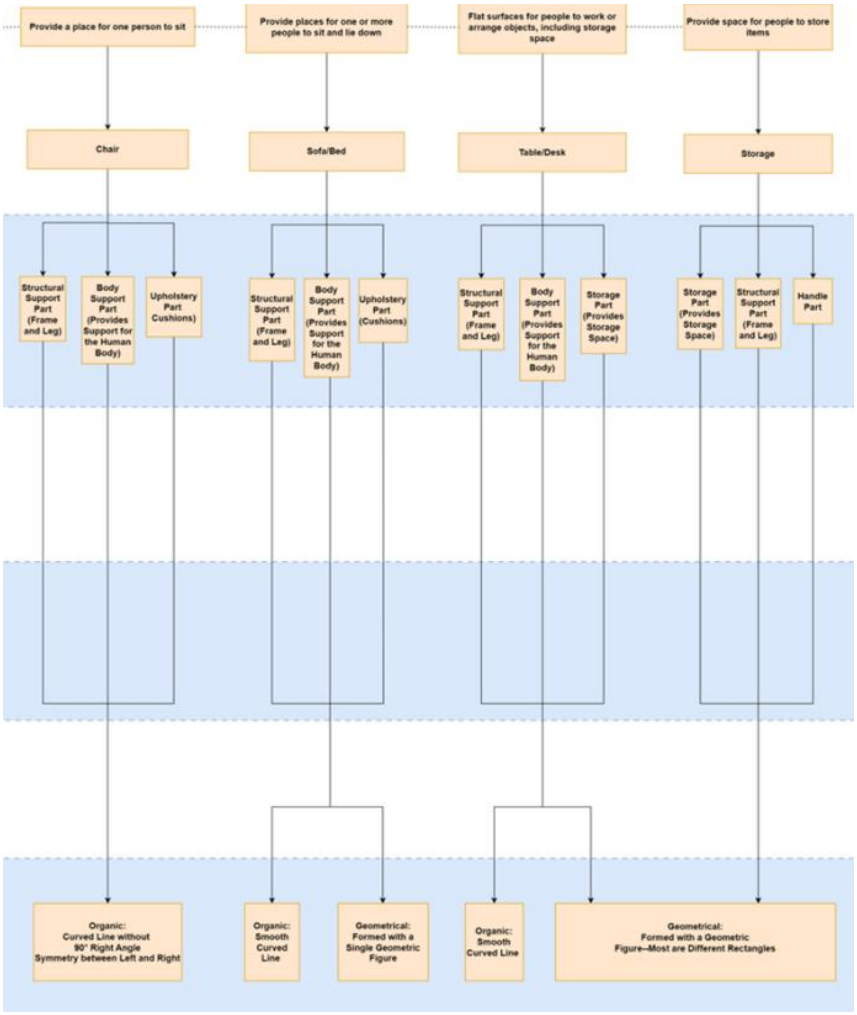


Figure 57, Suggestions and References Based on the Visual Analysis of Postwar American Modern Furniture

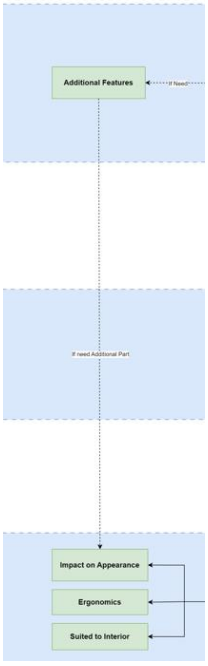


Figure 58, Suggestions and References Based on Contemporary Living

4.2.2. Step One: Selecting the Type of Furniture

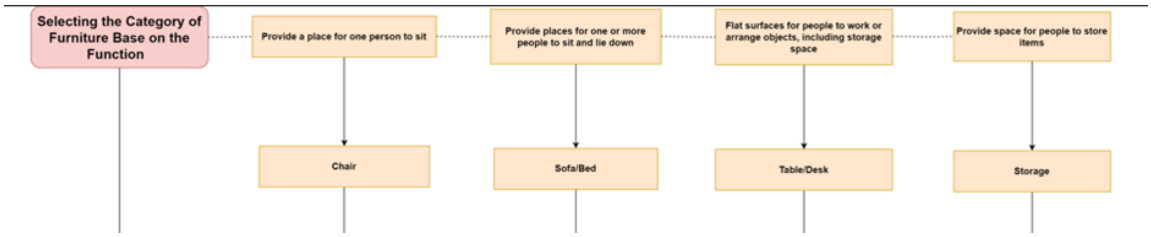


Figure 59, Step One: Selecting the Type of Furniture

The first step is very simple; it is to determine what kind of furniture to make. In this guideline there are four categories for the user based on the function of the furniture.

The first category is chairs. Any furniture that provides a place for a single person to sit (excluding laying down) is categorized as a chair, for example, dining chairs, lounge chairs, rocking chairs, baby chairs, barstools, lounge chairs, armchairs, and sofa chairs, etc.

The second category is sofas and beds. Any furniture that provides a place for single or multiple people to sit or lie down is categorized as sofas and beds, for example, sofas, single beds, double beds, loveseats, futons, sleepers, benches, ottomans, recliners, etc.

The third category is tables and desks. Any furniture that provides a flat surface where people can place items and work with, are categorized as tables and desks, for example, a dining table, coffee table, side table, dresser, home desk, etc.

The fourth category is storage. Any furniture that provides people with storage space as its main function is categorized as storage (sofas or beds with hidden storage space are not included here because their main function is not storage but to provide people with a place to rest), for example, bookshelves, shelves, cupboards, TV cabinets, closets, and shoe racks, etc.

Users need to determine what kind of furniture they want to make, choose a furniture

category based on the above, and proceed to the next step.

4.2.3. Step Two: Break Down the Furniture Function

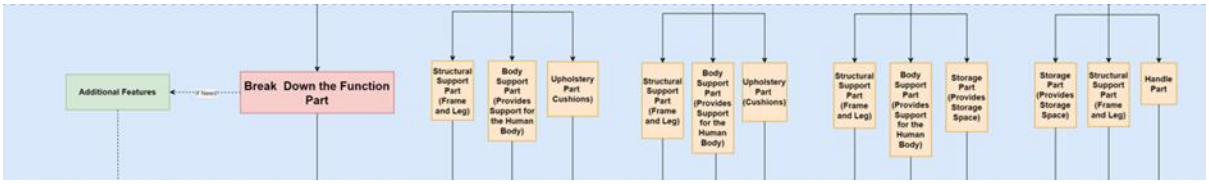


Figure 60, Step Two: Break Down the Furniture Function

The second step is to break down the furniture features into different functional parts. Based on the furniture categories selected in the previous step, the counterpart functional part breakdown references will also be presented here.

The breakdown of function parts is actually very easy to understand, as mentioned in Chapter 3, which is to divide the furniture to be designed into parts according to its function.

For the chair category, there are three parts, which are the chair legs, the part used to support the structure of the chair; the chair seat, the part that provides a place for people to sit; and the cushion, the part that is designed to make people sit more comfortably, which correspond to the structural support part, the body support part, and the upholstery part of the chair. The upholstery part is not necessarily required. It is the designer's decision whether to have the upholstery part or not. The other two parts are necessary. The body support part and the upholstery part could be united, because their function is to provide support for people to sit.

For sofas and beds, the functional subdivision has three parts, the legs of the sofa and bed, the part of the sofa and bed that provides support for the person, and the padding of the sofa and bed; the structural support part represents the legs of the sofa and bed, the body support part represents the part of the sofa and bed that supports the human body, and the upholstery part

represents the padding of the sofa and bed. The body support part and the upholstery part can be one and the same, as they both function to provide support for people sitting or lying down.

For this functional subdivision of the table and desk category, there are two or three parts. Essentially, this category basically has two parts: the legs of the table and desk and the platform that provides space for people to use it. For some desks, there is another part: a space that provides storage for people. The structural support part represents the legs, the body support part represents the platform - because they are for people to use it, and the storage part represents the storage space.

The functional subdivision of the storage category has three parts, frames and legs, platforms, or spaces for storing items, and handles; the structural support part represents the frames and legs of the storage furniture, and the storage support part represents the surfaces and spaces for storing items, and the handles. The handle part is not necessary to have.

If the furniture to be designed requires other features to fit contemporary life, it has to be considered during this step.

For example, when designing a chair, if the designers want to design a chair that contains a spinning swivel that could be turned around, the swivel part has to be taken into consideration. When designing a desk, the designer needs to consider the part of the wire space, because many homes nowadays need computers desk lamps, and other products that need power to be used on the desk. When designing a dresser, the guideline users need to consider the space for the lamp and the power supply part. Similarly, when designing a TV stand, they need to consider the part of the TV's wire space. When designing furniture that contains an electronic device, it is important not to forget the functionality of its electronic device and to put it into a separate part.

These contents are the suggestions for the functional breakdown of furniture. These

suggestions are not rigid rules, the designer could be flexible with the application according to the function of the piece of furniture. But its essence has not changed, which is the division of furniture's functional parts. In addition to this, it should also be considered how the parts are connected to each other.

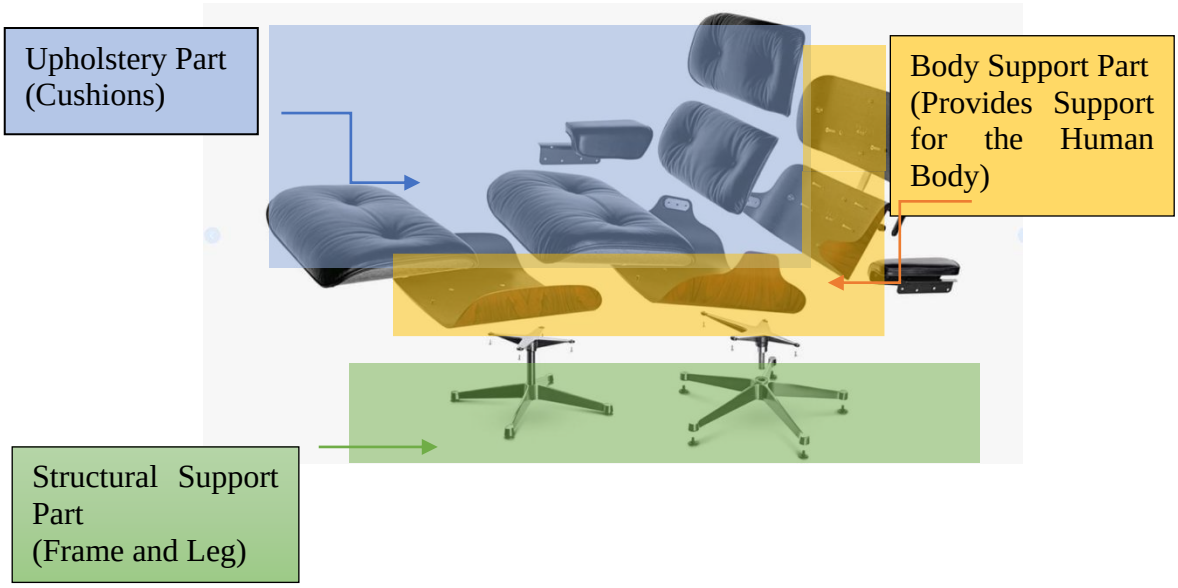


Figure 61, Chair Breakdown Examples (*The Components of Comfort*, n.d.)

4.2.4. Step Three: Material Selection

The third step is the selection of materials. The previous step breaks down the function of the furniture to be made - dividing a piece of furniture into smaller parts. This step is to consider what materials will be used for these parts, which means considering what materials will be used for this furniture.

Based on the analysis of the appearance and principles of postwar American modern furniture in Chapter 3, it could be determined that different functions are going to have different materials, and the same function may have the same materials.

Common materials used for modern furniture in postwar America are bent plywood, aluminum, epoxy resin, nylon, fiberglass, and plastic. These are great choices if someone wants to go for a

classic look. But if someone wants to have a more sustainable and contemporary material, there are a lot of choices, and here are some examples:

- Various kinds of wood, such as rosewood, mahogany, oak, pine, walnut, etc.
- Various metals, such as steel, stainless steel, aluminum, magnesium, etc.
- Polystyrene (PS), polyurethane (PU), polyvinyl acetate (PVA), polyvinyl chloride (PVC), etc.
- Composites such as carbon fiber, MDF, veneer, etc.
- Various fabrics and textiles
- Eco-friendly, reusable materials such as cork, recycled TPU, cardboard, recycled PET, recycled sponge, etc.

The premise is that the material chosen should match the function of the corresponding part. For example, the structural support part needs to be strong enough to support the furniture and the people who use it; the upholstery part needs to be soft and comfortable so that the people will not feel uncomfortable sitting on it. For the selection of connection, parts should consider metal materials, such as screws, because metal is very strong. Adding rubber padding between parts (or with ground) should also be considered to reduce friction and provide a buffering effect.

4.2.5. Step Four: Appearances Design

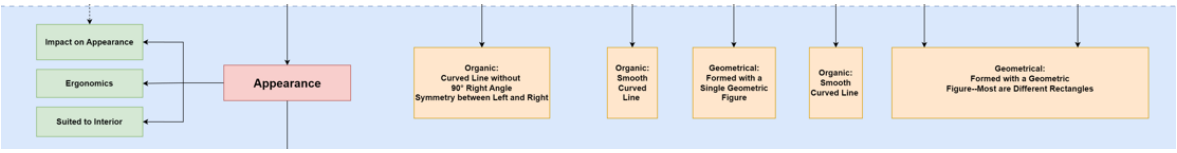


Figure 62, Step Four Appearances Design

The fourth step is to design the appearance of the furniture. Based on the chosen type of furniture, material, function, ergonomics, and interior environment, the designer determines what

the appearance of the furniture will look like.

Through the analysis of the principles and appearance of postwar American modern furniture Chapter 3, the list below summarizes the rules and guidelines on appearance design:

- Chair: organic - curved line without 90° right angle, symmetry between left and right.
- Sofa/bed: organic - smooth curved line, geometrical - formed with a single geometric figure.
- Table/desk: organic - smooth curved line (mostly for tables that are less functional), geometrical - formed with a geometric figure--most are different rectangles (mostly for desk that requires more function). If the desk has a storage part, follow the storage rules.
- Storage: geometrical - formed with a geometric figure, most are different rectangles.

Based on these guidelines and patterns, it is feasible to design furniture that matches the appearance and principles of postwar American modern furniture. However, this is not enough for contemporary living; designers also should consider the lifestyle of contemporary people. Here are the factors that need to be considered for contemporary living:

- Additional functions: besides the basic functions provided by the furniture, other functions are counted as additional functions. If the design requires an additional part, designers should measure the additional part and leave enough space for this part.
    - For example, a swivel chair provides a place for people to sit is its basic function, and a swivel is its additional function. When designing the form of this swivel chair, besides considering how to provide people with a comfortable place to sit, it should also consider the function of rotation. A swivel chair requires a device to make it spin, and the designer needs to consider leaving enough space for the device.

    - A sofa with a cupholder and built-in speakers provides a place for people to sit and recline, as its basic function, while the cupholder and built-in speakers are its additional functions. Designers not only need to consider designing a sofa that provides a comfortable place for people to sit and lie down but also consider the space for cups, speakers, and wires.
    - Most contemporary work can't be done without electronics such as laptops, cell phones, printers, computer units, and monitors. Designers need to consider the storage of cables and sockets when designing tables and cabinets where electronics need to be placed. Leaving holes or slots in the flat surfaces depending on the situation to make room for cables.
- Ergonomics: In order to design more comfortable furniture, ergonomics must be taken into account. Here is some reference data needed.
    - Chair: The seat from the ground is about 16.5 inches, the seat depth is about 16 inches, the width should not be less than 16 inches, the armrest height is about 7-9 inches, the cushion thickness about 0.75 to 2 inches, lumbar support height about 7 to 11.5 inches, seat angle about 0-15 °, the backrest angle about 0-15 °, the seat above about 3 inches do not need support.
    - Table: 23-28 inches high, human eye size from screen around 28-30 inches. Legroom needed around 18-24 inches.
    - Bar chairs and table: The bar chair seat is about 28-32 inches off the ground, the minimum seat depth is 14 inches, the armrest height is about 7.8-11 inches, the foot support is about 10-14 inches, bar height is about 40-47 inches (Tilley, 2002).
    - If more size references are needed, designers could do their own web search

results. However, referring to ergonomic data is a necessity.

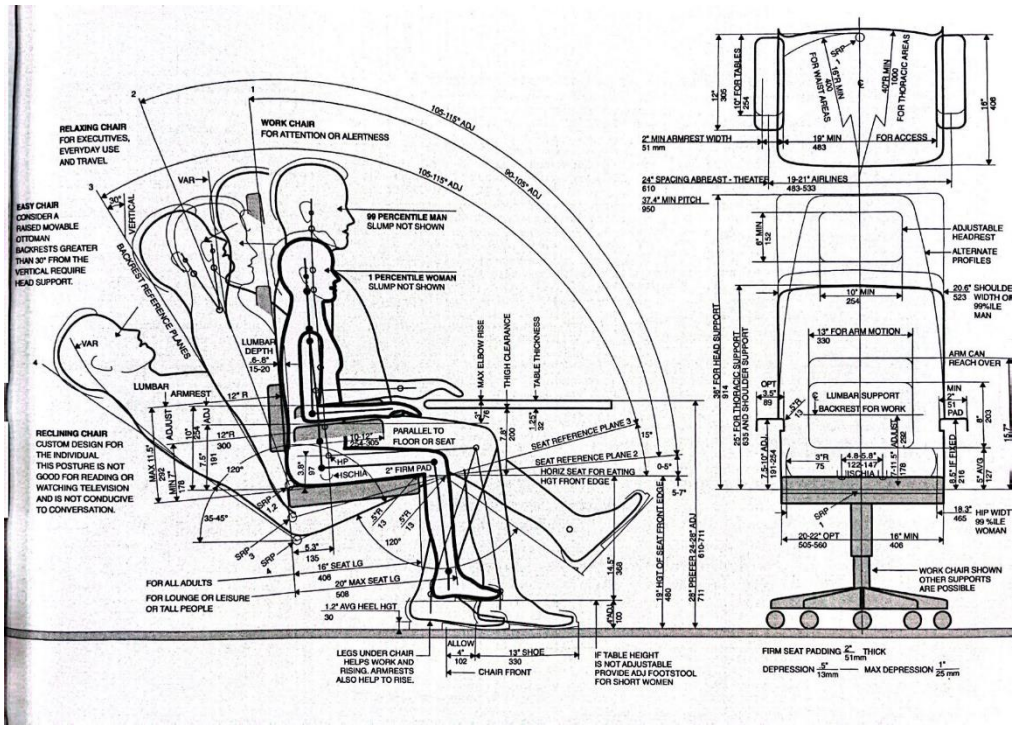


Figure 63, Seating Ergonomics(Tilley, 2002, p. 23)

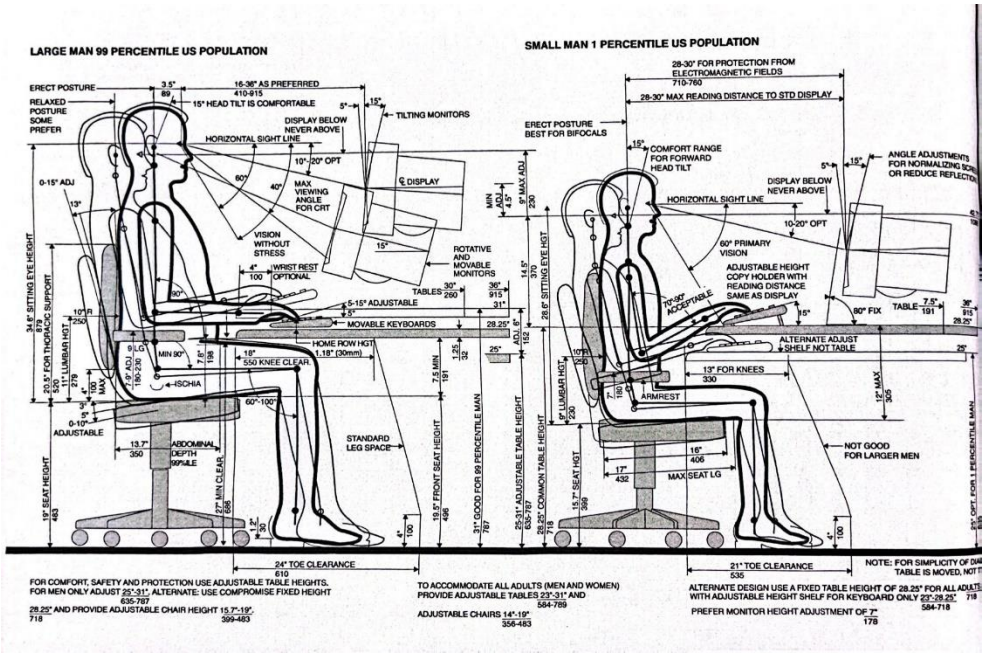


Figure 64, Man Seating Ergonomics(Tilley, 2002, p. 25)

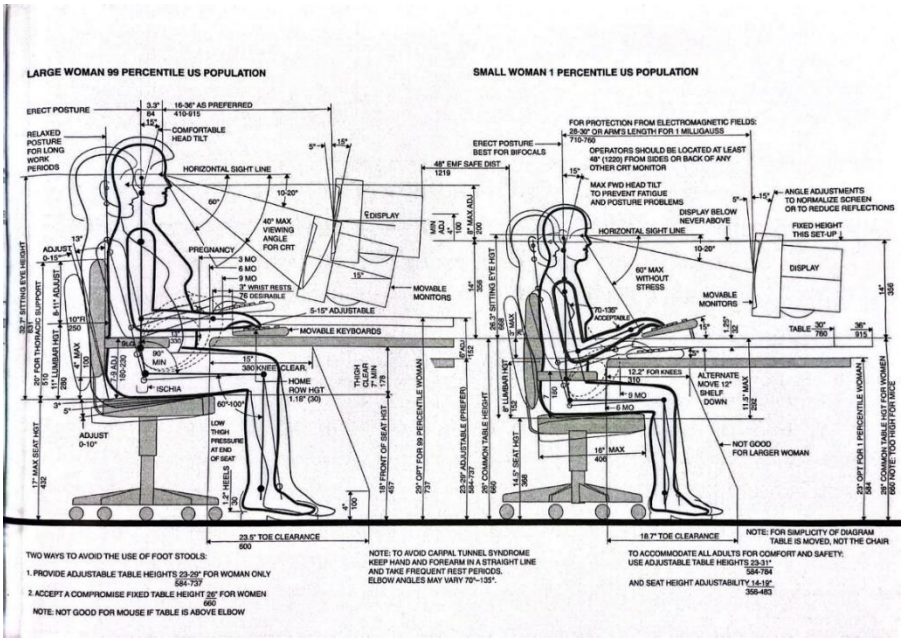


Figure 65, Woman Seating Ergonomics(Tilley, 2002, p. 26)

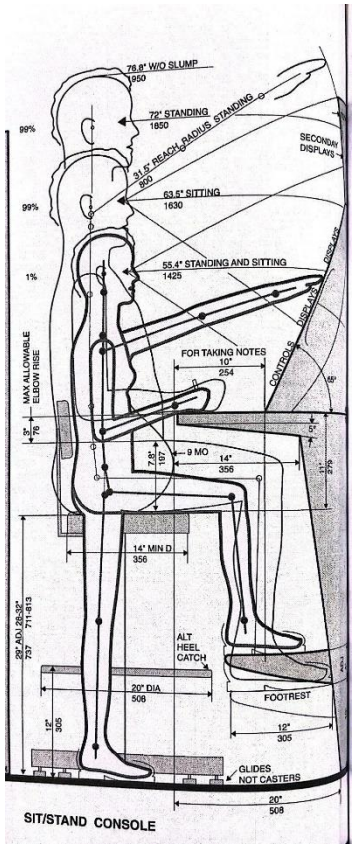


Figure 66, Bar Ergonomics(Tilley, 2002, p. 27)

- Adaptation with interior space: the space available in contemporary houses and rooms is getting larger and larger, and depending on the needs of the user, the designer could increase the size of the furniture without affecting the ergonomics and the space available for indoor activities. The following is a connection between indoor activity space and furniture.

Figure 67, Living Room Space and Furniture(Li, 2019d)

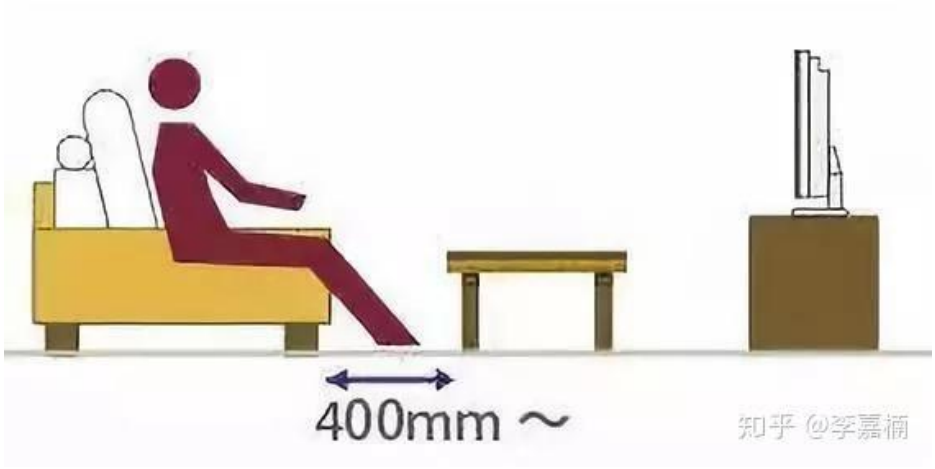


Figure 68, Living Room Space Sofa to Table(Li, 2019e)

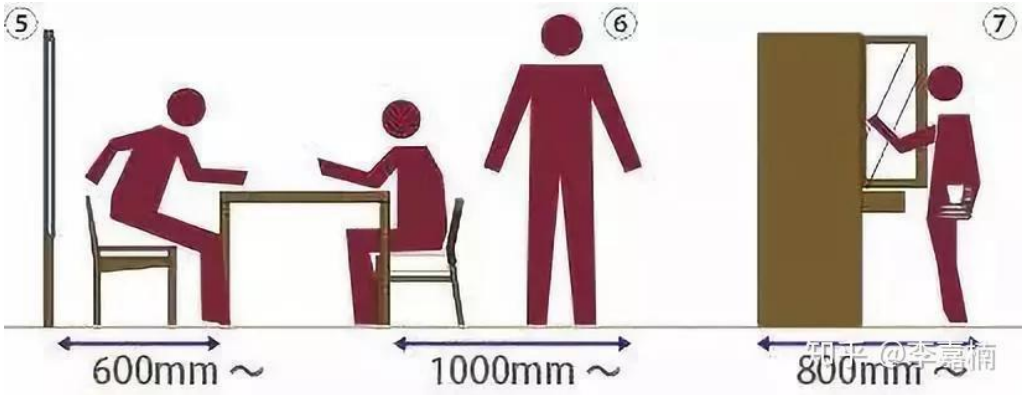


Figure 69, Dining Space and Furniture(Li, 2019b)

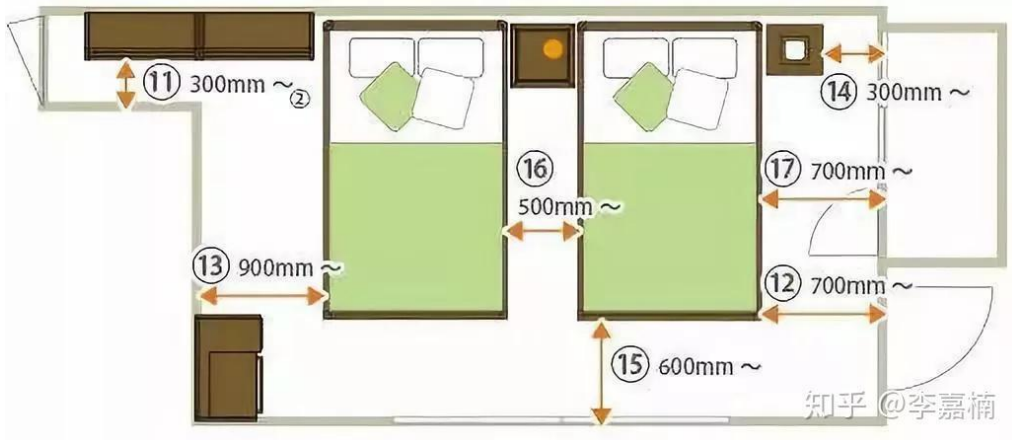


Figure 70, Bedroom Space and Furniture(Li, 2019a)

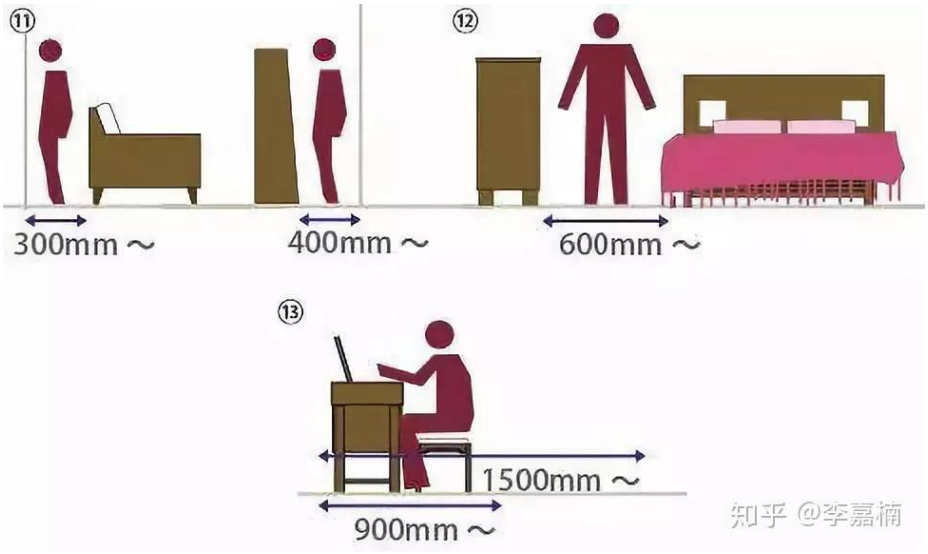


Figure 71, Furniture and Space(Li, 2019c)

4.2.6. Step Five: Color Selection

The fifth step is to choose the color. For a more diversified design, designers could apply any color. If the color is intended distinguish the function, each function part could choose a different color; if it is to unify the function, the same color could be used for the same function part. If it is meant to highlight a specific function, a different color could be considered for that functional part. In order to blend with the interior design, it is recommended that designers use colors that match the interior environment. It is recommended to consider the popular colors of the time as a priority.

4.2.7. Step Six: Modeling and Test

The sixth step is modeling and testing. This step is assembling the results from the previous steps. The designers could use their own preferences to choose the way of modeling, either CAD modeling and rendering, 3D printing, or handmade. If they are not satisfied with the results they get, they could always make changes. If the designer is satisfied with the result, the full-size model could be created next.

4.3. Conclusion

Table 2, Step One Guideline

	Furniture function	Category selection	Examples	Additions
Step One Selecting the category of furniture based on the function	Any furniture that provides a place for a single person to sit (excluding laying down)	**Chair**	Dining chairs, lounge chairs, rocking chairs, baby chairs, barstools, lounge chairs, armchairs, and sofa chairs, etc.	
	Any furniture that provides a place for single or multiple people to sit or lie down	**Sofa and Bed**	Dining chairs, lounge chairs, rocking chairs, baby chairs, barstools, lounge chairs, armchairs, and sofa chairs, etc.	
	Any furniture that provides a flat surface where people can place items and work with	**Table and Desk**	Dining table, coffee table, side table, dresser, home desk, etc.	
	Any furniture that provides people with storage space as its main function is categorized as storage	**Storage**	Bookshelves, shelves, cupboards, TV cabinets, closets, and shoe racks, etc.	Sofas or beds with hidden storage space are not included here because their main function is not storage but to provide people with a place to rest

Table 3, Chair Guideline

<table>
<tr><th colspan="7">Chair</th></tr>
<tr><td>Step Two
Breakdown Function</td><td>Structural Support Part (Frame and Leg)</td><td colspan="2">Body Support Part (Provides Support for the Human Body)</td><td>Upholstery Part (Cushions)</td><td>Additional Part (Other function besides main function)</td><td>Connection Part</td></tr>
<tr><td rowspan="4">Step Three
Material Selection</td><td>Material Selection Rules</td><td colspan="3">Material Options</td><td colspan="2">Material and Function Fitting Suggestion</td></tr>
<tr><td rowspan="3">Different Function Parts have Different Materials

Same Function may Share the Same Material</td><td rowspan="2">Bent Plywood

Aluminum

Epoxy Resin

Nylon

Fiberglass Plastic</td><td rowspan="2">Various kinds of wood, such as rosewood, mahogany, oak, pine, walnut, etc.
Various metals, such as steel, stainless steel, aluminum, magnesium, etc.
Various plastics, such as polyamide (PA), polycarbonate (PC), polyester (PET, PLA), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyurethane (PU), polyvinyl acetate (PVA), polyvinyl chloride (PVC), etc.
Composites such as carbon fiber, MDF, veneer, etc.
Various fabrics and textiles
Eco-friendly, reusable materials such as cork, recycled TPU, cardboard, recycled PET, recycled sponge, etc.</td><td colspan="2">The selected material must be durable, the material of the structural support part must have the strength to support the human body, and it is recommended to consider the comfortable and soft material for the part that is in close contact with the human body (upholstery part)</td></tr>
<tr><td colspan="2" rowspan="2">For the selection of connection, parts should consider metal materials, such as screws, because metal is very strong. Adding rubber padding between parts (or with ground) should also be considered to reduce friction and provide a buffering effect.</td></tr>
<tr><td>Want to go classic</td><td>Want to be innovative</td></tr>
</table>

	Appearances Design Suggestions	Appearances Examples	Ergonomics Suggestions	Interior Fitting Suggestions	Additional Part
Step Four Appearance design	**Organic: Curved Line without 90° Right Angle Symmetry between Left and Right**	    	Follow the economic suggestions chart (Table 7) that offered	Follow the Interior Fitting suggestions chart (Table 8) that offered	**Besides the basic functions provided by the furniture, functions other than these are counted as additional functions. If the design requires an additional part, measure the additional part, and leave enough space for this part.** For example, a swivel chair provides a place for people to sit is its basic function, and a swivel is its additional function. When designing the form of this swivel chair, besides considering how to provide people with a comfortable place to sit, it should also consider the function of rotation. A swivel chair requires a device to make it spin, and the designer needs to consider leaving enough space for the device.
Step Five Color Selection	• Different colors for different materials • Color can be used to differentiate functional differences • Color can also be used to indicate functional unity • Color considered to match the interior design • It is recommended to consider the popular colors of the time as a priority				
Step Six Model and Test	This step is assembling the results from the previous steps. The designers could use their own preferences to choose the way of modeling, either CAD modeling and rendering, 3d printing, or handmade. If they are not satisfied with the results they get, they could always make changes. If the designer is satisfied with the result, the full-size model could be created next.				

Table 4, Sofa and Bed Guideline

<table>
<tr><th colspan="6">Sofa and Bed</th></tr>
<tr><td>Step Two
Breakdown Function</td><td>Structural Support Part (Frame and Leg)</td><td colspan="2">Body Support Part (Provides Support for the Human Body)</td><td>Upholstery Part (Cushions)</td><td>Additional Part (Other function besides main function)</td><td>Connection Part</td></tr>
<tr><td rowspan="4">Step Three
Material Selection</td><td>Material Selection Rules</td><td colspan="2">Material Options</td><td colspan="2">Material and Function Fitting Suggestion</td></tr>
<tr><td rowspan="2">Different Function Parts have Different Materials

Same Function may Share the Same Material</td><td rowspan="2">Bent Plywood

Aluminum

Epoxy Resin

Nylon

Fiberglass Plastic</td><td rowspan="2">Various kinds of wood, such as rosewood, mahogany, oak, pine, walnut, etc.
Various metals, such as steel, stainless steel, aluminum, magnesium, etc.
Various plastics, such as polyamide (PA), polycarbonate (PC), polyester (PET, PLA), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyurethane (PU), polyvinyl acetate (PVA), polyvinyl chloride (PVC), etc.
Composites such as carbon fiber, MDF, veneer, etc.
Various fabrics and textiles
Eco-friendly, reusable materials such as cork, recycled TPU, cardboard, recycled PET, recycled sponge, etc.</td><td>The selected material must be durable, the material of the structural support part must have the strength to support the human body, and it is recommended to consider the comfortable and soft material for the part that is in close contact with the human body (upholstery part)</td></tr>
<tr><td rowspan="2">For the selection of connection, parts should consider metal materials, such as screws, because metal is very strong. Adding rubber padding between parts (or with ground) should also be considered to reduce friction and provide a buffering effect.</td></tr>
<tr><td></td><td>Want to go classic</td><td>Want to be innovative</td></tr>
</table>

	Appearances Design Suggestions	Appearances Examples	Ergonomics Suggestions	Interior Fitting Suggestions	Additional Part
Step Four Appearance design	**Organic: Smooth Curved Line** **Or** **Geometrical: Formed with a Single Geometric Figure**	   	Follow the economic suggestions chart (Table 7) that offered	Follow the Interior Fitting suggestions chart (Table 8) that offered	**Besides the basic functions provided by the furniture, functions other than these are counted as additional functions. If the design requires an additional part, measure the additional part, and leave enough space for this part.** A sofa with a cupholder and built-in speakers provides a place for people to sit and recline, as its basic function, while the cupholder and built-in speakers are its additional functions. Designers not only need to consider designing a sofa that provides a comfortable place for people to sit and lie down but also consider the space for cups, speakers, and wires.
Step Five Color Selection	• Different colors for different materials • Color can be used to differentiate functional differences • Color can also be used to indicate functional unity • Color considered to match the interior design • It is recommended to consider the popular colors of the time as a priority				
Step Six Model and Test	This step is assembling the results from the previous steps. The designers could use their own preferences to choose the way of modeling, either CAD modeling and rendering, 3d printing, or handmade. If they are not satisfied with the results they get, they could always make changes. If the designer is satisfied with the result, the full-size model could be created next.				

Table 5, Table and Desk Guideline

<table>
<tr><th colspan="6">Table and Desk</th></tr>
<tr><td>Step Two
Breakdown Function</td><td>Structural Support Part (Frame and Leg)</td><td colspan="2">Body Support Part (Provides Support for the Human Body)</td><td>Storage Part (Provides Storage Space)</td><td>Additional Part (Other function besides main function)</td><td>Connection Part</td></tr>
<tr><td rowspan="4">Step Three
Material Selection</td><td>Material Selection Rules</td><td colspan="2">Material Options</td><td colspan="2">Material and Function Fitting Suggestion</td></tr>
<tr><td rowspan="3">Different Function Parts have Different Materials

Same Function may Share the Same Material</td><td rowspan="2">Bent Plywood

Aluminum

Epoxy Resin

Nylon

Fiberglass Plastic</td><td rowspan="2">Various kinds of wood, such as rosewood, mahogany, oak, pine, walnut, etc.
Various metals, such as steel, stainless steel, aluminum, magnesium, etc.
Various plastics, such as polyamide (PA), polycarbonate (PC), polyester (PET, PLA), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyurethane (PU), polyvinyl acetate (PVA), polyvinyl chloride (PVC), etc.
Composites such as carbon fiber, MDF, veneer, etc.
Various fabrics and textiles
Eco-friendly, reusable materials such as cork, recycled TPU, cardboard, recycled PET, recycled sponge, etc.</td><td>The selected material must be durable, the material of the structural support part must have the strength to support the human body, and it is recommended to consider the comfortable and soft material for the part that is in close contact with the human body (upholstery part)</td></tr>
<tr><td>Want to go classic</td><td>Want to be innovative</td><td colspan="2">For the selection of connection, parts should consider metal materials, such as screws, because metal is very strong. Adding rubber padding between parts (or with ground) should also be considered to reduce friction and provide a buffering effect.</td></tr>
</table>

<table>
<tr><td></td><td>Appearances Design Suggestions</td><td>Appearances Examples</td><td>Ergonomics Suggestions</td><td>Interior Fitting Suggestions</td><td>Additional Part</td></tr>
<tr><td>Step Four
Appearance design</td><td>Organic: Smooth Curved Line (mostly for table that less functional)

Or

Geometrical: Formed with a Geometric Figure--Most are Different Rectangles (mostly for desk that requires more function)
(if desk has storage part, follow the storage rules)</td><td> 
 
  </td><td>Follow the economic suggestions chart (Table 7) that offered</td><td>Follow the Interior Fitting suggestions chart (Table 8) that offered</td><td>Besides the basic functions provided by the furniture, functions other than these are counted as additional functions. If the design requires an additional part, measure the additional part, and leave enough space for this part.
Most contemporary work can't be done without electronics such as laptops, cell phones, printers, computer units, and monitors. Designers need to consider the storage of cables and sockets when designing tables and cabinets where electronics need to be placed. Leaving holes or slots in the flat surfaces depending on the situation to make room for cables.</td></tr>
<tr><td>Step Five
Color Selection</td><td colspan="5">• Different colors for different materials
• Color can be used to differentiate functional differences
• Color can also be used to indicate functional unity
• Color considered to match the interior design
• It is recommended to consider the popular colors of the time as a priority</td></tr>
<tr><td>Step Six
Model and Test</td><td colspan="5">This step is assembling the results from the previous steps. The designers could use their own preferences to choose the way of modeling, either CAD modeling and rendering, 3d printing, or handmade. If they are not satisfied with the results they get, they could always make changes. If the designer is satisfied with the result, the full-size model could be created next.</td></tr>
</table>

Table 6, Storage Guideline

<table>
<tr><th colspan="6">Storage</th></tr>
<tr><td>Step Two
Breakdown Function</td><td>Structural Support Part (Frame and Leg)</td><td colspan="2">Storage Part (Provides Storage Space)</td><td>Additional Part (Other function besides main function)</td><td>Connection Part</td></tr>
<tr><td rowspan="4">Step Three
Material Selection</td><td>Material Selection Rules</td><td colspan="2">Material Options</td><td colspan="2">Material and Function Fitting Suggestion</td></tr>
<tr><td rowspan="3">Different Function Parts have Different Materials

Same Function may Share the Same Material</td><td rowspan="2">Bent Plywood

Aluminum

Epoxy Resin

Nylon

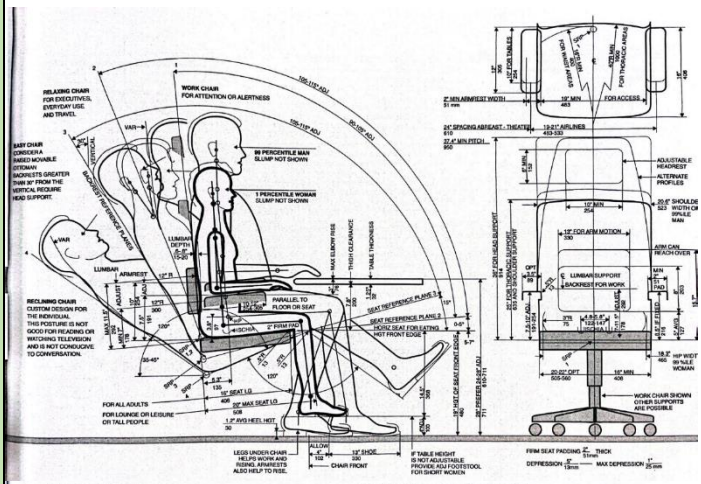
Fiberglass Plastic</td><td rowspan="2">Various kinds of wood, such as rosewood, mahogany, oak, pine, walnut, etc.
Various metals, such as steel, stainless steel, aluminum, magnesium, etc.
Various plastics, such as polyamide (PA), polycarbonate (PC), polyester (PET, PLA), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyurethane (PU), polyvinyl acetate (PVA), polyvinyl chloride (PVC), etc.
Composites such as carbon fiber, MDF, veneer, etc.
Various fabrics and textiles
Eco-friendly, reusable materials such as cork, recycled TPU, cardboard, recycled PET, recycled sponge, etc.</td><td colspan="2">The selected material must be durable, the material of the structural support part must have the strength to support the human body, and it is recommended to consider the comfortable and soft material for the part that is in close contact with the human body (upholstery part)</td></tr>
<tr><td>Want to go classic</td><td>Want to be innovative</td><td colspan="2" rowspan="2">For the selection of connection, parts should consider metal materials, such as screws, because metal is very strong. Adding rubber padding between parts (or with ground) should also be considered to reduce friction and provide a buffering effect.</td></tr>
</table>

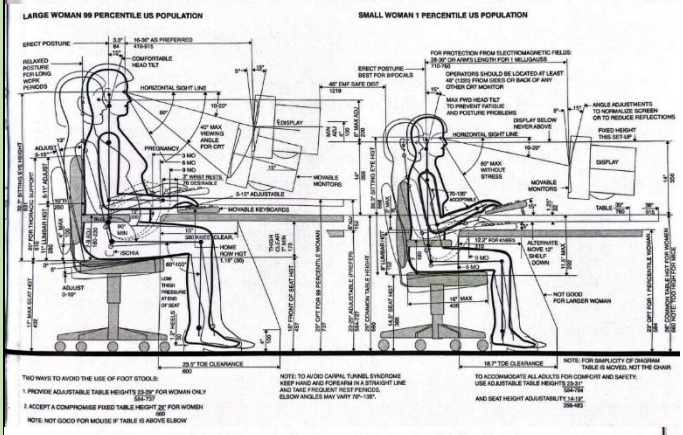
	Appearances Design Suggestions	Appearances Examples	Ergonomics Suggestions	Interior Fitting Suggestions	Additional Part
Step Four Appearance design	**Geometrical: Formed with a Geometric Figure--Most are Different Rectangles**	  	Follow the economic suggestions chart (Table 7) that offered	Follow the Interior Fitting suggestions chart (Table 8) that offered	**Besides the basic functions provided by the furniture, functions other than these are counted as additional functions. If the design requires an additional part, measure the additional part, and leave enough space for this part.** Most contemporary work can't be done without electronics such as laptops, cell phones, printers, computer units, and monitors. Designers need to consider the storage of cables and sockets when designing tables and cabinets where electronics need to be placed. Leaving holes or slots in the flat surfaces depending on the situation to make room for cables.
Step Five Color Selection	• Different colors for different materials • Color can be used to differentiate functional differences • Color can also be used to indicate functional unity • Color considered to match the interior design • It is recommended to consider the popular colors of the time as a priority				
Step Six Model and Test	This step is assembling the results from the previous steps. The designers could use their own preferences to choose the way of modeling, either CAD modeling and rendering, 3d printing, or handmade. If they are not satisfied with the results they get, they could always make changes. If the designer is satisfied with the result, the full-size model could be created next.				

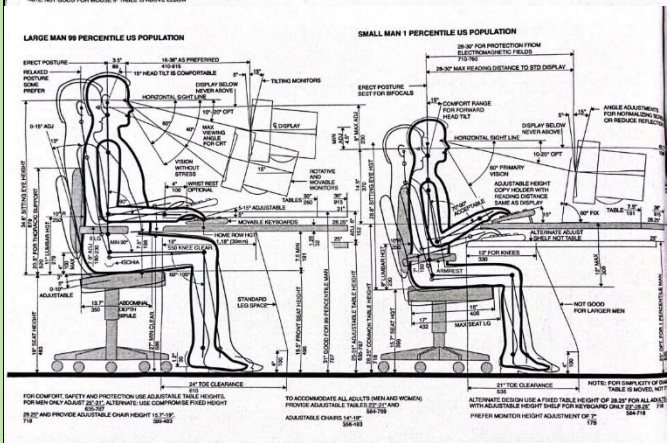
Table 7, Ergonomics Suggestions

Ergonomics Suggestions

- Chair: The seat from the ground is about 16.5 inches, the seat depth is about 16 inches, the width should not be less than 16 inches, the armrest height is about 7-9 inches, the cushion thickness about 0.75 to 2 inches, lumbar support height about 7 to 11.5 inches, seat angle about 0-15 °, the backrest angle about 0-15 °, the seat above about 3 inches do not need support.
- Table: 23-28 inches high, human eye size from screen around 28-30 inches. Legroom needed around 18-24 inches.
- Bar chairs and table: The bar chair seat is about 28-32 inches off the ground, the minimum seat depth is 14 inches, the armrest height is about 7.8-11 inches, the foot support is about 10-14 inches, bar height is about 40-47 inches.
- If more size references are needed, designers could do their own web search results. However, referring to ergonomic data is a necessity.







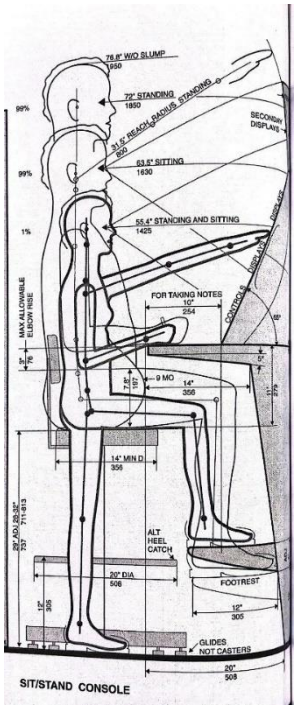
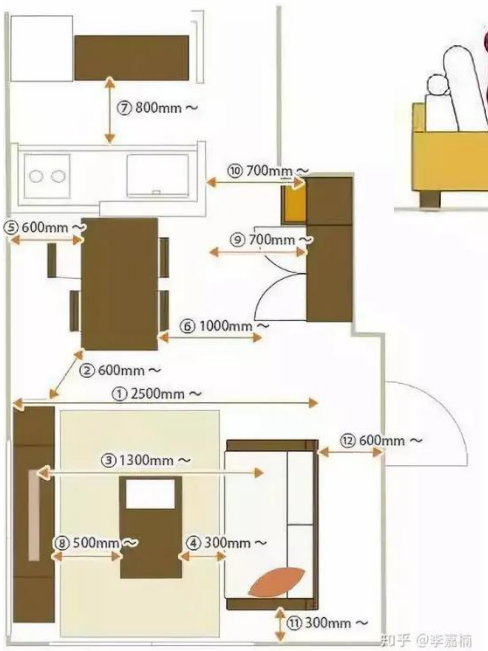
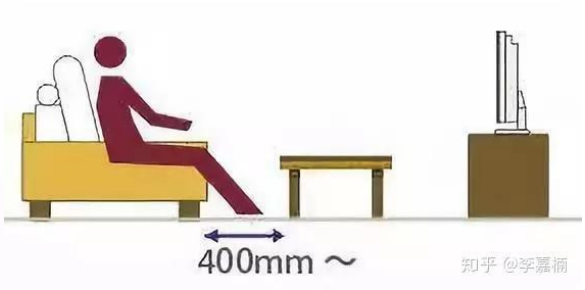
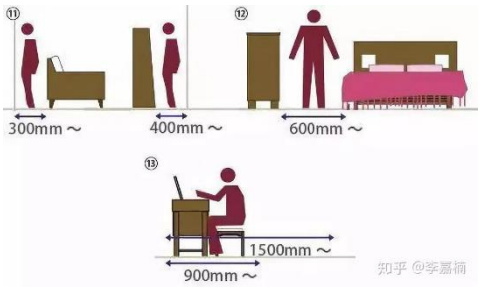


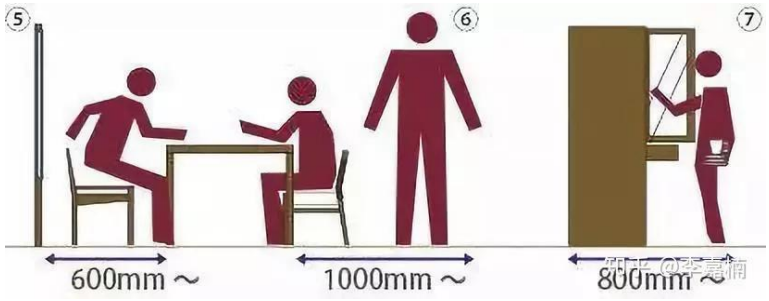
Table 8, Interior Fitting Suggestions

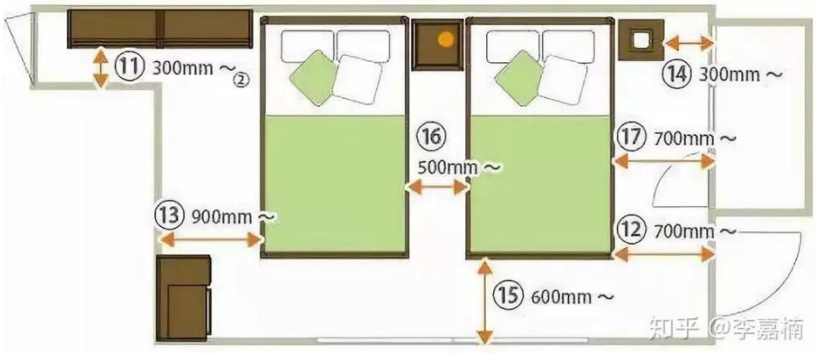
Interior Fitting Suggestions	The space available in contemporary houses and rooms is getting larger and larger, and depending on the needs of the user, the designer could increase the size of the furniture without affecting the ergonomics and the space available for indoor activities. The following is a connection between indoor activity space and furniture.











Chapter 5. Application

This chapter demonstrates the use of the design guideline, and for a better demonstration of the use of the guideline, this chapter will show how to design a bar chair for a contemporary home using postwar American modern furniture design appearance and principles, and a coffee table that provides a place for people to put their feet up.

5.1. Bar Chair

This section will demonstrate the process of designing a bar chair that applies visual analysis and design principles of postwar American modern furniture for contemporary home living.

5.1.1. Design Goal

To design a bar chair that applies visual analysis and design principles of postwar American modern furniture for contemporary home living.

Assuming that the house where this bar chair is to be used has a large kitchen island, the white background is favored and there is plenty of light.

5.1.2. Step One: Selecting the Category

Bar chair is a piece of furniture that is designed to provide a place for people to sit next to a bar or kitchen island, but its main function is to provide a place for people to sit, so the furniture category selection is the chair.

	Furniture function	Category selection	Examples	Additions
Step One Selecting the category of furniture based on the function	Any furniture that provides a place for a single person to sit (excluding laying down)	**Chair**	Dining chairs, lounge chairs, rocking chairs, baby chairs, barstools, lounge chairs, armchairs, and sofa chairs, etc.	
	Any furniture that provides a place for single or multiple people to sit or lie down	**Sofa and Bed**	Dining chairs, lounge chairs, rocking chairs, baby chairs, barstools, lounge chairs, armchairs, and sofa chairs, etc.	
	Any furniture that provides a flat surface where people can place items and work with	**Table and Desk**	Dining table, coffee table, side table, dresser, home desk, etc.	
	Any furniture that provides people with storage space as its main function is categorized as storage	**Storage**	Bookshelves, shelves, cupboards, TV cabinets, closets, and shoe racks, etc.	Sofas or beds with hidden storage space are not included here because their main function is not storage but to provide people with a place to rest

Figure 72, Step One Category Selection

5.1.3. Step Two: Breakdown Function

Here the preparation plan to make this bar chair has three parts, a place for people to sit, an upholstery to make people sit more comfortably, and the legs of the chair.

Chair				
Step Two Breakdown Function	Structural Support Part (Frame and Leg)	Body Support Part (Provides Support for the Human Body)	Upholstery Part (Cushions)	Additional part (Other function besides main function)

Figure 73, Step Two Breakdown Function

5.1.4. Step Three: Material Selection

According to the guideline, there should be different materials for different functions. Three functions were separated out before, and three different materials should apply here.

	Material Selection Rules	Material Options		Material and Function Fitting Suggestion
Step Three Material Selection	**Different Function Parts have Different Materials** Same Function may Share the Same Material	Bent Plywood Aluminum Epoxy Resin Nylon Fiberglass Plastic	Various kinds of wood, such as rosewood, mahogany, oak, pine, walnut, etc. Various metals, such as steel, stainless steel, aluminum, magnesium, etc. Various plastics, such as polyamide (PA), polycarbonate (PC), polyester (PET, PLA), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyurethane (PU), polyvinyl acetate (PVA), polyvinyl chloride (PVC), etc. Composites such as carbon fiber, MDF, veneer, etc. Various fabrics and textiles Eco-friendly, reusable materials such as cork, recycled TPU, cardboard, recycled PET, recycled sponge, etc.	**The selected material must be durable, the material of the structural support part must have the strength to support the human body**, and it is recommended to consider the comfortable and soft material for the part that is in close contact with the human body (upholstery part)

Figure 74, Step Three Material Selection

Here it is intended to make the body support part using environmental protection plastic PLA, which has enough strength to support the human body; the chair legs are intended to use stainless steel, which has enough strength; the cushion part is intended to use cork because it can be made very soft, and very environmentally friendly, which is matched with the contemporary consumption concept.

Figure 75, Cork

5.1.5. Step Four: Appearance Design

	Appearances Design Suggestions	Appearances Examples	Ergonomics Suggestions	Interior Fitting Suggestions	Additional Part
Step Four Appearance design	**Organic: Curved Line without 90° Right Angle Symmetry between Left and Right**		Follow the economic suggestions chart (Table 7) that offered	Follow the Interior Fitting suggestions chart (Table 8) that offered	**Besides the basic functions provided by the furniture, functions other than these are counted as additional functions. If the design requires an additional part, measure the additional part, and leave enough space for this part.** For example, a swivel chair provides a place for people to sit is its basic function, and a swivel is its additional function. When designing the form of this swivel chair, besides considering how to provide people with a comfortable place to sit, it should also consider the function of rotation. A swivel chair requires a device to make it spin, and the designer needs to consider leaving enough space for the device.

Figure 76, Step Four Appearance Design

According to the design guideline of the appearance, the appearance design of the chair should be organic. Here are some sketches of the body support part and the upholstery part.

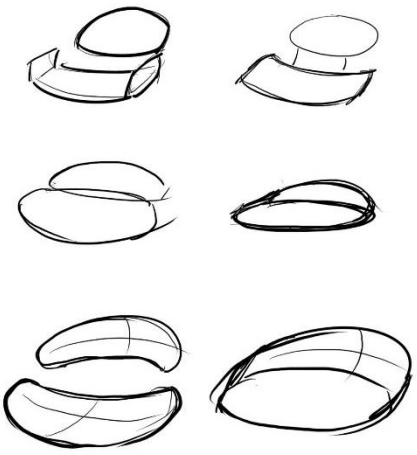


Figure 77, Body Support Part Sketches

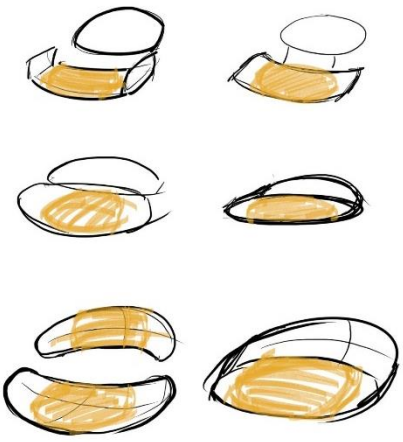


Figure 78, upholstery part Sketches

The legs of the chair are intended to be modeled with stainless steel tubing, and after some thought the designer settled on roughly the desired shape.

Figure 79, Chair Appearance Design Sketches

According to the design guideline, ergonomics is also considered in the design of the form. For ergonomic effects, the dimensions of the furniture are determined after the shape has been defined.

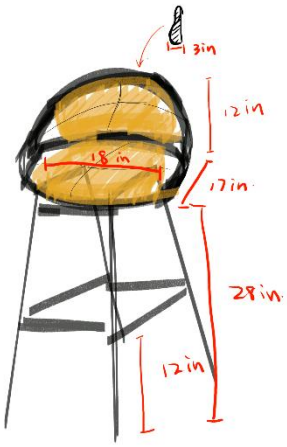


Figure 80, Bar Chair Ergonomic Dimensions

5.1.6. Step Five: Color Selection

Step Five Color Selection	• Different colors for different materials • Color can be used to differentiate functional differences • Color can also be used to indicate functional unity • Color considered to match the interior design • It is recommended to consider the popular colors of the time as a priority

Figure 81, Step Five Color Selection

According to the design guideline, different features should have different colors to show the difference in function. In order to fit in the room, white was chosen for the body support part and the upholstered part, and the legs were kept in the original color of the material. Therefore, the three different functions have three different colors.

5.1.7. Step Six: Model and Test

Step Six Model and Test	This step is assembling the results from the previous steps. The designers could use their own preferences to choose the way of modeling, either CAD modeling and rendering, 3d printing, or handmade. If they are not satisfied with the results they get, they could always make changes. If the designer is satisfied with the result, the full-size model could be created next.

Figure 82, Step Six Model and Test

Once the functions, materials, appearance, and colors have been determined, it is time to move on to the sixth step of the modeling and testing section. Here CAD modeling, 3D printing, and rendering techniques are used. First of all, the model is made on the computer according to the previous design. After determining the shape, 3D printing is applied to test the structure and effect, and then the computer rendering is applied to add materials and colors.

Figure 83, CAD Model

Figure 84, Render

5.1.8. Final Visual Delivery

Here is the final visual delivery.

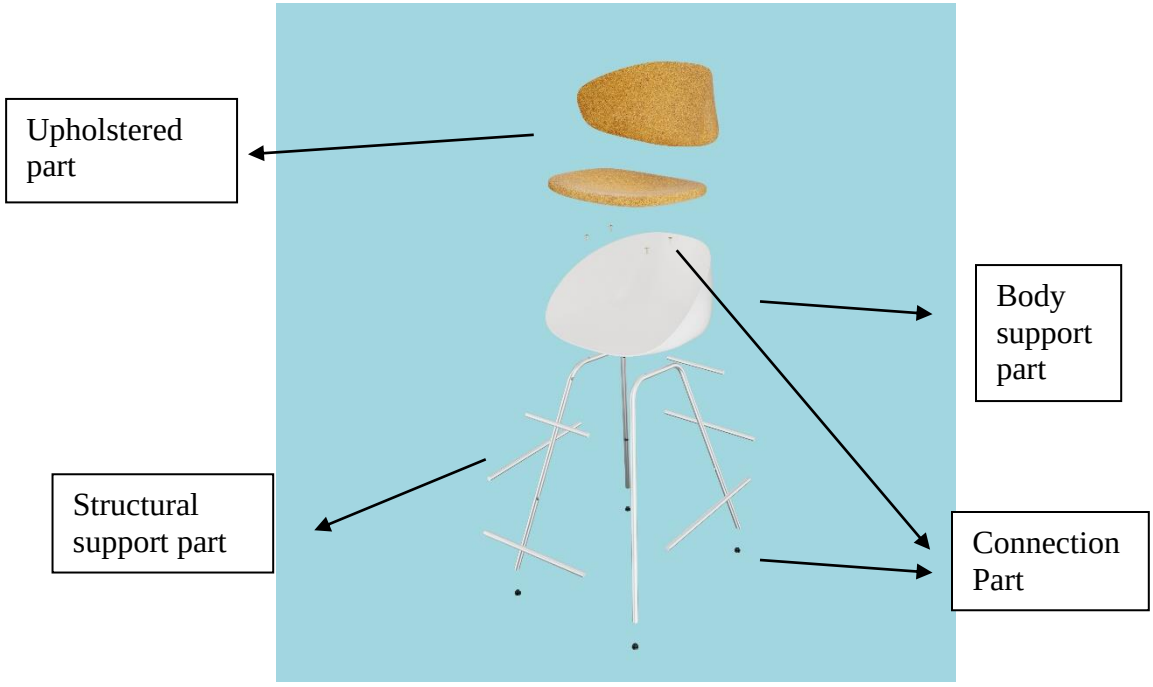


Figure 85, Bar Chair Exploded View

Figure 86, Bar Chair Final Visual Delivery

5.2. Coffee Table

This section will demonstrate the process of designing the coffee table that applies visual analysis and design principles of postwar American modern furniture for contemporary home living. In order to better demonstrate the application of the design guideline, this section will demonstrate the same functionality with two different looks of the coffee table.

5.2.1. Design Goal

To design two coffee table which provide a place for people to put their feet that applies visual analysis and design principles of postwar American modern furniture for contemporary home living.

5.2.2. Step One: Selecting the Category

The main function of a coffee table is to provide a platform for people to display objects and do some work. So here it should be chosen as table and desk category.

	Furniture function	Category selection	Examples	Additions
Step One Selecting the category of furniture based on the function	Any furniture that provides a place for a single person to sit (excluding laying down)	**Chair**	Dining chairs, lounge chairs, rocking chairs, baby chairs, barstools, lounge chairs, armchairs, and sofa chairs, etc.	
	Any furniture that provides a place for single or multiple people to sit or lie down	**Sofa and Bed**	Dining chairs, lounge chairs, rocking chairs, baby chairs, barstools, lounge chairs, armchairs, and sofa chairs, etc.	
	Any furniture that provides a flat surface where people can place items and work with	**Table and Desk**	Dining table, coffee table, side table, dresser, home desk, etc.	
	Any furniture that provides people with storage space as its main function is categorized as storage	**Storage**	Bookshelves, shelves, cupboards, TV cabinets, closets, and shoe racks, etc.	Sofas or beds with hidden storage space are not included here because their main function is not storage but to provide people with a place to rest

Figure 87, Table Step One Selecting the Category

5.2.3. Step Two: Breakdown Function

A coffee table provides a place for people to put their feet up, which includes both a major function and an additional function. The main function is to provide a platform for people to put items or do some work; the additional function is to have a special place for people to put their feet. Besides this, there are also the legs of the table. There is no need to have a specialized storage space in this.

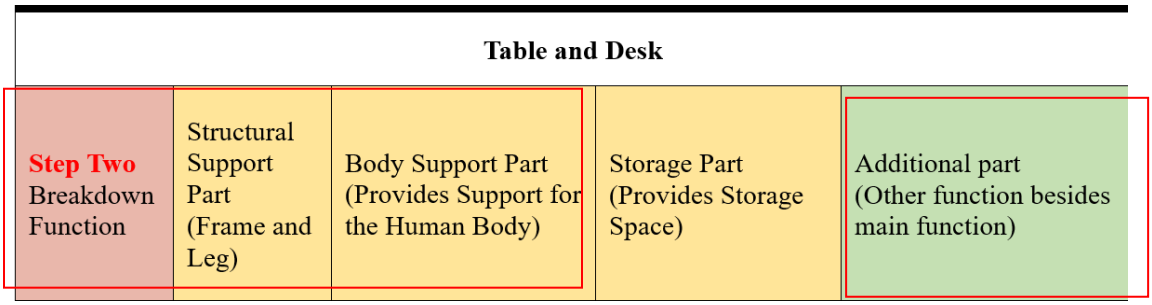


Figure 88, Table Step Two Breakdown Function

5.2.4. Step Three: Material Selection

Because different functions have to have different materials, here the plan is to use glass, marble, steel pipe, and wood as part of the material selection planned first, since here the desire make a more quality -looking coffee table.

5.2.5. Step Four: Appearance Design

In order to better demonstrate the use and understanding of the design guideline, here will be designed two appearances of the same function of the coffee table: one organic and one geometrical.

	Appearances Design Suggestions	Appearances Examples	Ergonomics Suggestions	Interior Fitting Suggestions	Additional Part
Step Four Appearance design	**Organic: Smooth Curved Line** (mostly for table that less functional) **Or** **Geometrical: Formed with a Geometric Figure--Most are Different Rectangles** (mostly for desk that requires more function) (if desk has storage part, follow the storage rules)	  	Follow the economic suggestions chart (Table 7) that offered	Follow the Interior Fitting suggestions chart (Table 8) that offered	**Besides the basic functions provided by the furniture, functions other than these are counted as additional functions. If the design requires an additional part, measure the additional part, and leave enough space for this part.** Most contemporary work can't be done without electronics such as laptops, cell phones, printers, computer units, and monitors. Designers need to consider the storage of cables and sockets when designing tables and cabinets where electronics need to be placed. Leaving holes or slots in the flat surfaces depending on the situation to make room for cables.

Figure 89, Table Step Four Appearance Design

5.2.5.1. Organic Appearance

Here are the sketches for the organic look following the guideline. The coffee table height will be 16 in according to the ergonomics measurement.

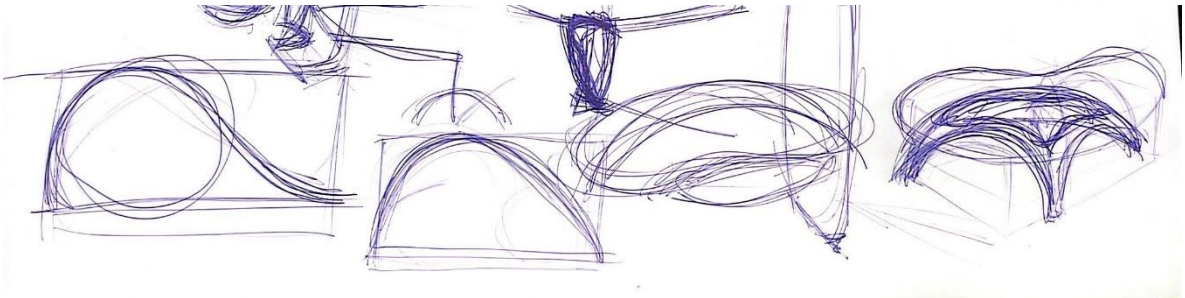


Figure 90, Organic Coffee Table Sketch One

Figure 91, Organic Coffee Table Sketch Two

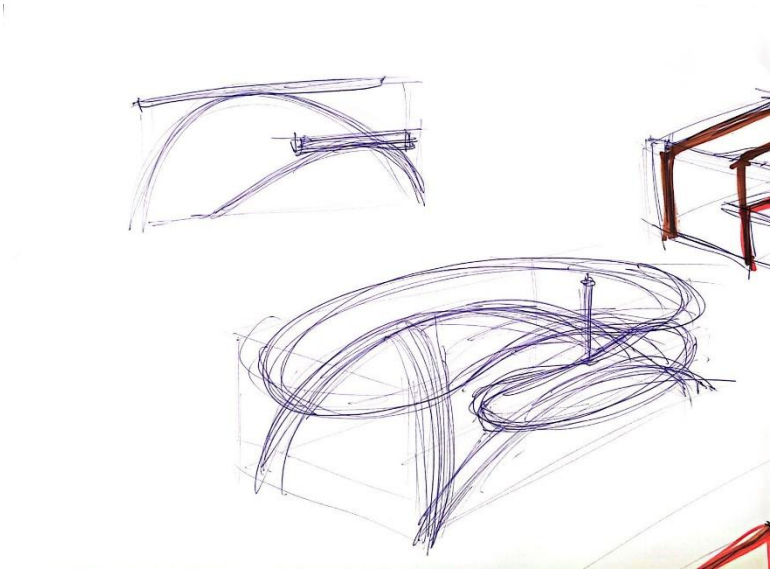


Figure 92, Organic Coffee Table Sketch Three

5.2.5.2. Geometrical Appearance

Here are the sketches for the geometrical look following the guideline. The coffee table height will also be 16 in according to the ergonomics measurement.

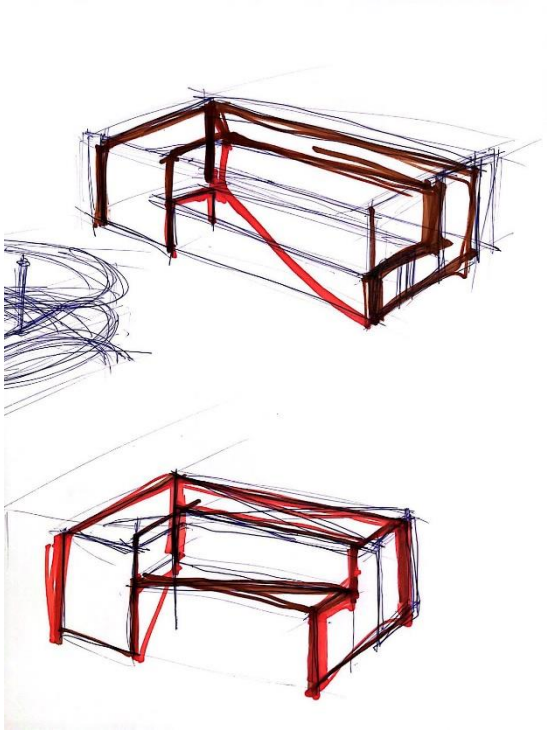


Figure 93, Geometrical Coffee Table Sketch

5.2.6. Step Five: Color Selection

Color selection here is the choice to keep the color of the material itself or a black and white style.

The geometric design of the table uses different colors of the same glass to differentiate between functions.

5.2.7. Step Six: Model and Test

Once the functions, materials, appearance, and colors have been determined, it is time to move on to the sixth step of the modeling and testing section. Here CAD modeling, 3D printing, and rendering techniques are used. First of all, the model is made on the computer according to the previous design. After determining the shape, 3D printing is applied to test the structure and effect, and then the computer rendering is applied to add materials and colors.

Figure 94, Organic Geometrical Coffee Table 3D Print Model

Figure 95, Organic Geometrical Coffee Table CAD Model

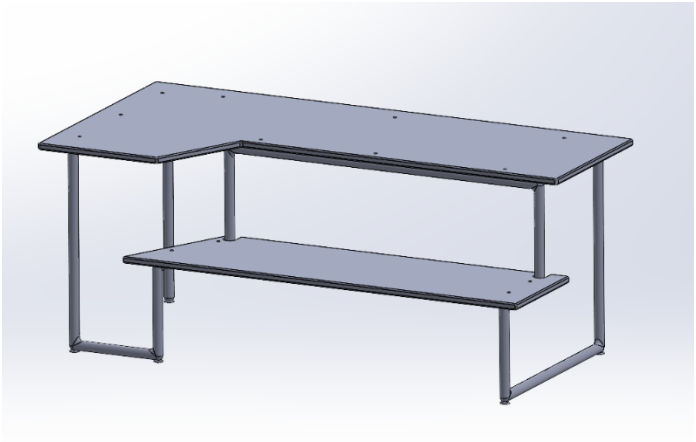


Figure 96, Geometrical Coffee Table CAD Model

5.2.8. Final Visual Delivery

Figure 97, Geometrical Coffee Table Render

Figure 98, Organic Coffee Table Render

Figure 99, Geometrical 1/6 Model with Dummy

Chapter 6. Conclusion

This thesis analyzes the differences between postwar American life and contemporary American life. The history and development of postwar American modern furniture is discussed. The appearance and design principles of postwar modern American furniture are analyzed. Furniture form is designed through furniture categories, functions, and materials so that it could conform to the appearance and design principles of modern postwar American furniture. At the same time, instruction is added on how to design furniture that is more relevant to contemporary life. This enables to design of furniture that conforms to the form and design principles of postwar American modern furniture, as well as to contemporary life.

This project focuses only on the furniture's style and does not do much research on the connection to interior design. Incorporating the connection between interior design and furniture is a direction worth exploring in the future.

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