

**An Approach of Applying One Specific Culture to Footwear Design Through
Function and Fashion**

by
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Abstract

Culture is a diverse, complex, and extensive concept. It includes all aspects of a society or group: living habits, language, expression, social consensus, rules, technical content, education system, knowledge structure, and so on (Linton, 1945). The consideration and investigation of culture is an important part that designers can't avoid in the design process.

In today's industrial design, shoes are one of today's multicultural collections of consumer goods and have played a non-negligible role in design considerations. The necessity of shoes in people's lives has provided a lot of cultural symbols in the eyes of designers. Most shoe designers mix multiculturalism into the design of a pair of shoes; however, there is no unified and specialized research to separate the specific cultural background required for shoes into two important considerations: function and fashion. Shoe design is usually a balance in these two directions, and the trade-off between function and fashion has always been a problem that designers need to pay attention to. How to apply one specific culture to shoe design through function and fashion? This is the main discussion of this thesis. Based on these two parts (function and fashion), this thesis will discuss and summarize various cultural scenarios. Mainly two main directions are discussed in this thesis: Different sports are used as examples to discuss the influence of footwear design to reflect the important role of functionality in shoe design; the thesis discusses the appearance and inspiration of footwear products with the design thinking of fashion designers to show the graphic culture, social relationship culture, and visual culture.

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CHAPTER 1 Introduction

1.1 Problem Statement

Applying a particular culture to shoe design is a question that designers often consider, but how to do it reasonably and respectfully? Most shoe designers mix multiculturalism into the design of a pair of shoes, but there is no unified and specific research to summarize the two cultural segments that need to be understood in shoe design: function and fashion. However, how to express and apply "one specific culture" from these two parts is missing in footwear design research. Generally, designers will learn about a certain type of culture or the culture of a certain group through Internet surveys and investigations; however, there are cycle limitations of the design process, which leads to not a lot of time or cost allowed. Meanwhile, cultural experience is one of the very important parts of cultural design. Therefore, it is of great help to designers to give guidance in these two established directions in order to analyze and understand the culture more efficiently. This guidance will give a deeper understanding of the cultural elements needed. Innovative and practical references for design while respecting other cultures and more detailed and sophisticated systems are needed to give designers direction and imagination. Additionally, shoe design is usually a balance in these two directions, and the choice of function and fashion has always been a problem that designers need to pay attention to. Two questions people usually consider when buying shoes: "Are the shoes comfortable?" "Do these shoes look good?" These two simple questions also illustrate the importance of function and fashion in footwear design.

1.2 Need for study

First, shoes are one of the world's high-consumption products. In 2022, the global footwear market size was 409.5 billion US dollars (Footwear Market Research, 2023), and the number is growing every year. As one of the most important consumer goods in life, shoes cover many aspects of lifestyle, sports, fashion, social style, and collection. Therefore, in addition to the identity of necessities of life, shoes have added multiple product attributes in a certain range. The influence of the luxury and fashion industries cannot be ignored. In a global context, the life cycle of this consumption product will only be extended through continuous evolution and update. Such development will certainly bring more cultural integration, so the main challenge of this thesis is to help designers cope with development like this. Meanwhile, the thesis helps designers consider cultural complexity and design efficiency. The direction of progress in footwear design will change with the rise of different minority movements, will change with the influence of the fashion field, and will produce new thinking with the iteration of technology. The development and wide application of artificial intelligence are also bound to have an impact on industrial design, and this paper will also have a small section to discuss the production possibility of artificial intelligence and the possibility of tool utilization of artificial intelligence. In terms of functionality, this thesis will also involve the discussion of human movement patterns and muscles related to foot movement, which will help designers have a preliminary understanding of the process of functional research. Understanding one or more sports allows designers to understand how shoes functionally aid athletic performance and reduce the risk of injury. Also including ideas related to fashion design can inspire designers. How to apply one specific culture to shoe design through function and fashion? This is the main challenge of this thesis.

1.3 Objective of Study

The objective of this thesis is to study the two domains related to footwear design: functionality and fashion. Also, the thesis provides reference directions and guidelines for designers to consider cultural relevance when designing shoes. In terms of functionality, through the analysis of foot movement during exercise and the study of power muscle groups, the functional design of shoes is summarized. Secondly, this part discusses and summarizes the unity and difference of different movements through the case study. Therefore, the above directions are used to provide a functional direction guide. Fashion direction, through the comparison of fashion and industrial designers' design ideas and inspiration, summarizes the unity and differences across fashion. Then the thesis will combine advantages and disadvantages to provide a new inspired direction and design language for the guide, while analyzing the characteristics of fashion footwear. Taking Chinese culture as an example, the differences in fashion expression of different cultures are explained, and the design logic of fashion of footwear design is demonstrated through "graphic culture", "social relationship culture" and "design from culture", and at the same time, guidelines for different design goals are provided for designers.

1.4 Assumption

It is assumed that this study applies one specific culture to shoe design through motion function and fashion vision guidelines. It is assumed that all the literature, videos, pictures, and other cited publications involved in the research have been verified. It is assumed that the designer through this guide can combine diversity or monoculture culture through the main two areas (sports function and fashion vision) and apply it to footwear design.

1.5 Limits

This study is limited to the influence and role of the three footwear sectors (sports function and fashion vision) and their relationship to footwear design, and does not involve other design fields. The integration of world cultures is growing rapidly, and the influence of information culture is constantly changing. The research content of culture in this study is limited to 2023. At the same time, the focus on shoe design is only after 2000, when the fashion shoes and sports shoes branch, and cannot cover all historical shoes.

1.6 Anticipated Outcomes

The outcome of this study is that designers can better express and display a special culture through the understanding of the two segments (sports function and fashion vision) in the design of sneakers. Using the methods developed in this thesis is supposed to help designers have ideas and direction when facing the design demands of unfamiliar cultures. At the same time, it is also hoped that this design method can help designers understand and respect the importance of different cultural designs in footwear design and provide designers with reasonable solutions.

1.7 Procedure and Methodology

This thesis explores the connection between culture and footwear design, aiming to apply cultural elements to footwear. It combines traditional craftsmanship with modern design concepts, meeting user needs through crowd analysis and balancing fashion and function in the design process. Several traditional design methods were employed, including hand modeling and last design, which enhance the accuracy and feasibility of the designs.

1. Manual drawing techniques are used to solidify the design concept through detailed line work and scale drawings, establishing the design direction through concept exploration.
2. 3D models are constructed using computer software, and 3D printing is utilized to help designers better understand the models.
3. Prototypes are created and tested using traditional manual shoemaking methods.
4. Finally, the designs are evaluated based on the design brief to ensure they meet both the aesthetic standards of fashion culture and the practical requirements of functional culture.

The methodology of this thesis emphasizes the integration of traditional techniques and modern research, expressed through culture as a medium. It provides designers with new directions and innovative ideas.

1.8 Definition of Terms

Shoe Last: “A shoe last is a mechanical form that shoemakers use to mold shoes, and is shaped like a human foot.” (Motawi, 2020)

3D Print: “3D printing, or additive manufacturing is the construction of a three-dimensional object from a CAD model or a digital 3D model.” (Ngo et al., 2018, p172-196)

Neoclassical: “of, relating to, or constituting a revival or adaptation of the classical especially in literature, music, art, or architecture” (Merriam-Webster’s Dictionary, n.d.)

Romantic: “attitude or intellectual orientation that characterized many works of literature, painting, music, architecture, criticism, and historiography in Western civilization over a period from the late 18th to the mid-19th century” (Britannica Dictionary, n.d.)

Rococo Revival: “The Rococo Revival style is characterized by its curvy cabriole legs, C- and S-shaped scrolls, and naturalistic carving.” (Harvey, 2022)

Haute couture: “Haute couture is a French phrase that translates to "high sewing" or "high dressmaking" and refers to high fashion and custom-made clothing.” (Cambridge Dictionary, n.d.)

Ready-to-wear: “(of clothes) produced in standard sizes and not made to fit a particular person.” (Cambridge Dictionary, n.d.)

Fast fashion: “clothes that are made and sold cheaply, so that people can buy new clothes often.” (Cambridge Dictionary, n.d.)

Tarsus: “the part of the foot of a vertebrate between the metatarsus and the leg

also: the small bones that support this part of the foot and include bones of the ankle, heel, and arch.” (Merriam-Webster’s Dictionary, n.d.)

Metatarsus: “the metatarsal part of a human foot or of a hind foot in quadrupeds.” (Merriam-Webster’s Dictionary, n.d.)

CNC: “Computer numerical control (CNC) is a manufacturing method that automates the control, movement, and precision of machine tools through the use of preprogrammed computer software, which is embedded inside the tools.” (Yasar, 2023)

CAD: “CAD (computer-aided design) design is used in almost every industry, in projects as wide-ranging as landscape design, bridge construction, office building design, and movie animation.” (Autodesk, n.d.)

CHAPTER 2 Literature Review

2.1 Broad Definition and Understanding of Culture

"Culture" in some situations is subconsciously considered to be some kind of elegant quality or behavior. For example, when people mention culture, they often think of elegant music, listening to traditional Peking Opera, appreciating traditional Chinese paintings, enjoying tea, and visiting art exhibitions. Of course, these are all part of the culture, but individuals also like to watch anime at home; play video games with friends; and eat traditional food with their family, people even need to take off their shoes when they enter a house in East Asia. Tipping is expected when eating in North America; In Japan, you bow to someone older than you. These details have long been a part of people's lives, and also part of the culture.

Ralph Linton (1945) defined the culture of a society as “the way of life of its members: the collection of ideas and habits which they learn, share and transmit from generation to generation” (p. 45).

Edward B Taylor (1871) defines culture as "the complex whole that includes knowledge, belief, art, law, morality, custom, and any other capacity that man acquires as a member of society." (p. 27).

In their words, culture is the collection of various things that define a society, and culture is also absorbed and learned from people's birth. Everything in life is a manifestation of cultural form. Robert L. Welsch is a teacher at the Department of Anthropology, Dartmouth, New Hampshire. As an anthropologist, he describes and summarizes the characteristics of culture in his book *Cultural Anthropology: Asking Questions about Humanity* (2014):

Culture is learned; Culture uses symbols; Culture is dynamic, always changing and adapting to the changes of the world and environment; Culture is integrated into everyday experience; Culture shapes everyone's life; Culture is shared; Understanding culture involves overcoming ethnocentrism. Precisely because culture is learned, it is the views and behaviors that a group of people takes as natural and self-evident, then, when encountering people with cultural conflicts, people will often show incomprehension and even some extreme behaviors of disrespect (p.38).

In the 1960s, China faced the "three difficult years " a widespread famine disaster that brought unimaginable disasters to the people of the country, and in this context, the range of food intake people in the difficult years became more extensive. More "strange" foods have been preserved from that era in China, which has already a diverse food culture. However, for many people in the "Western world" or other countries who have not been exposed to these cultures, some ingredients are considered "abnormal" and even "scary". It is like some people who have never eaten blue cheese will feel uncomfortable after trying this food for the first time. That discomfort can lead to ethnocentrism. If ethnocentrism cannot be overcome, it will be impossible for differing cultures to be understood. It's also a key feature of culture, that it makes us feel like we're doing things the right way; That is, we do things or think about problems in the "right" way, while others think and do things wrong (Welsch & Vivanco, 2014).

2.1.2 Cultural Change and Stability

Culture is constantly adapting to changes in society, but it remains stable (Welsch & Vivanco, 2014). However, this kind of stability is not forever, so people often refer to "lost culture" in daily life. On the surface, culture changes with the changes of time. Looking at the

world hundreds of years ago, culture now seems to have many conflicts with that time. For the world's lost civilizations, then, this cultural stability is only a relative term. The stability of culture is not only determined by the symbols, values, norms, and traditions of the culture itself but also influenced by its groups, scope, and development. Furthermore, the group, scope, and development have not changed too much. (Welsch & Vivanco, 2014). The famous American anthropologist Leslie White (1949) once said that symbols are "the origin and foundation of human behavior" (p. 229). Symbols can be more than just images or concepts; people also use their bodies as symbols (Welsch & Vivanco, 2014). For example, the fist bump before the boxing match shows mutual respect, the bow of the Japanese in daily life, and the “fists lock” (figure 2.1) before the traditional Chinese martial arts performance or Chinese fight game is the embodiment of the body as a symbol.



Figure 2.1 Yong, T. (2022, June 10). UFC Chinese athlete Weili Zhang on the scale [Photograph]

A society stores its traditional meaning in symbols because symbols carry traditional information most directly. It is precisely because of the stability of signs that sign

phenomenology is an ancient social consciousness associated with human beings, accompanying the whole historical process of human formation. It is also a modern academic research object (Xu, 2008). Values are symbolic expressions of intrinsically desirable principles or qualities. (Welsch, 2020). The embodiment of values is the definition of morality and justice by a certain group. Perhaps not all people will do things that follow values 100%, but values must be the moral correctness recognized by the majority of the group. Values are a stable element of culture because values are conservative. After all, they retain mainstream ideas about social relations and morality. As Robert L. Welsch (2014) notes in his book, values provide general orientations for social relations, while norms are more closely related to actual behavior. When values are universally recognized by society, norms of behavior based on values will emerge in all aspects of society. The emergence of law is part of the embodiment of values in the development of human civilization. The reason why it is said to be part of the embodiment is that in the course of history, some legal provisions have been produced for the convenience of rulers. However, it is still undeniable that law is a typical example of a "normative set of values". Symbols, values, and norms are the main influencing elements of cultural stability. Tradition is an important element affecting the diversity of world cultures, the existence of cultural conflicts, and the limitations of regional cultures in the world. Tradition refers to the most enduring and ritualized aspects of a culture that are often considered timeless, or at least very ancient (Welsch & Vivanco, 2014). Tradition has been updated and replaced in the continuous historical generations, but it still retains the most representative values of a social group. In many traditional Chinese festivals, although people do not deliberately follow the traditional form, "family together" is the eternal theme in many festivals, and people always get together with their families and relatives through traditional festivals. Although the Chinese expression is subtle, "family together" may also be a

way to separate from the busy life to express love for the family. A culture of symbols, values, norms, and traditions is what keeps it changing while maintaining a stable core.

2.1.3 Cross-cultural Communication and Cultural Identity

Cultural identity is part of a person's identity or self-concept and self-perception, related to nationality, race, religion, social class, generation, region, gender, or any social group with its own unique culture (Usborne & de la Sablonnière, 2014). Therefore, cultural identity not only represents the cultural characteristics of individuals but also represents the cultural characteristics of a certain group. With the change of history, culture constantly influences and blends between groups and groups, individuals and groups, and individuals and individuals, thus achieving a state of dynamic stability and balance. Cross-cultural communication takes cultural identity as a tool or bridge to realize the communication and influence between different cultures. In the context of the globalization of the world, cross-cultural communication is a necessary trend for future life.

The premise of understanding different cultures and designing based on different cultures is to understand cultural identity and improve the ability of cross-cultural communication. A typical example is the contribution of Christmas to the global economy through cross-cultural communication. There is no doubt about the retail value of Christmas, one of the most widely celebrated holidays in the world every year. The report 2023 Deloitte Holiday Retail Survey by Lupine Skelly, Ram Sangadi, Kusum Raimalani, and Sangharsh Shinde (2022) shows some data:

American consumers' national spending on Christmas has been approaching or exceeding \$1 trillion since 2019, of which nearly \$150 billion will go to online retailers. If 5 percent of the

products consumed were Christmas-related (in this case, products containing the cultural content of Christmas: packaging, decorations, toys, etc.), that would amount to \$7.5 billion. (p. 9)

This example would be the most robust indication of the value of cultural consumption when looking at countries around the world. On the contrary, if you do not understand the premise of cross-cultural communication, it may be counterproductive. For example, in 2018, Dolce & Gabbana (figure 2.2) created a series of marketing ads to cater to the Chinese market. Because of the lack of understanding of Chinese culture and disrespect for cross-cultural communication, a wide range of Chinese public opinion was discussed, most people strongly resisted and condemned, and a series of results have been unfavorable to the brand. The content of the advertisement is an Asian female model with a typical Western aesthetic eating cannoli (a traditional Italian food) with chopsticks. However, the use of chopsticks and the form of advertisement are very disrespectful from the perspective of Chinese consumers. After the continuous anger of the Internet, this advertising incident caused huge losses to Dolce & Gabbana at the end of 2019. Cross-cultural communication is not like ordinary communication and exchange in the life cycle. The key is that the objects of communication have different cultural backgrounds, and such differences in cultural backgrounds will lead to differences in communication methods, processes, and results. Therefore, a series of problems such as misunderstanding, suspicion, confusion and even hostility often appear in the process of cross-cultural communication. A successful cross-cultural communicator should not only have sufficient knowledge and skills in interpersonal communication but more importantly, have a sufficient understanding of the psychology of people in different cultural backgrounds (Peng & Wang, 2009).

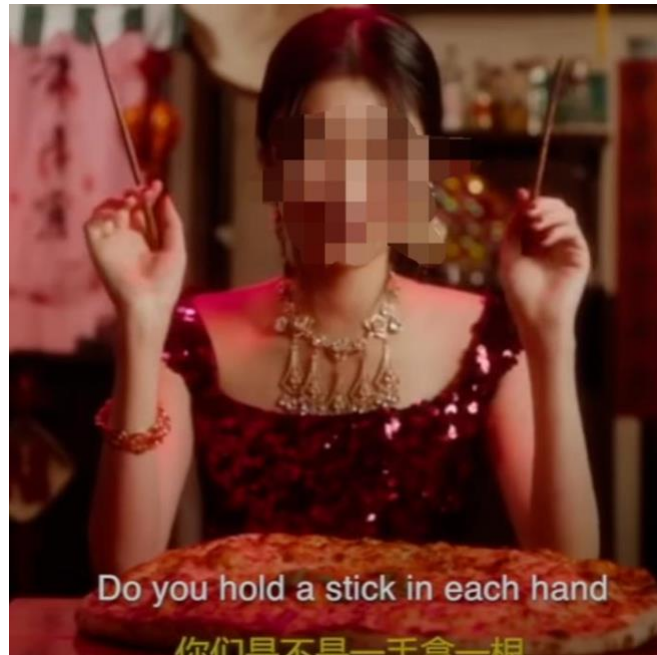


Figure 2.2 Dolce & Gabbana (2019). A scene from the Dolce & Gabbana Shanghai show announcement video

The book *Cross-cultural Psychology* written by Peng and Wang (2009), psychology professors at Tsinghua University in China, summarizes the eight main factors that affect the quality and process of cross-cultural communication: “Territory; speech accommodation; Length of communication; Communication involvement mode; Contact frequency; Mutual intimacy of communication; Communicate differences in status and power between the two parties; Communicate the quantity comparison between the two sides” (Peng & Wang, 2009, p.7). Two factors related to this thesis are territory and speech accommodation. The region of cross-cultural communication determines the advantages and disadvantages of both parties to some extent. Communicators who have mastered the factor ‘Advantage of Home Court’ often have great advantages in determining the time, method, length, and even topics of communication. Just like various sports, factors often have an impact on the result of the game. The group's sense of identity and support will play the greatest role in the home benefit, and the corresponding home

responsibility will increase with it. The subconscious sense of territorial control can be explained in chemical terms: both humans and animals have an innate sense of territorial superiority (Peng & Wang, 2009). This is also why territory affects cross-cultural communication. Using their own culture as a design element is like a home battle: designers can naturally understand the most representative cultural elements. Cross-cultural design, like away games, requires a more nuanced approach to detail and understanding of cross-cultural highlights.

Naturally, native speakers often have a linguistic advantage in communication. This advantage is most keenly felt when people speak two or more languages. As the same language is the carrier of culture, people naturally accept the culture based on different language carriers in the process of language learning. Design with culture as the carrier is also a tool for dialogue between designers and users, although design is not a negotiation, not a face-to-face conversation. The related psychological factors are the similarity principle, social exchange principle, and attribution principle (Peng & Wang, 2009). These three principles of psychology cover people's psychological tendencies and strengths in social communication and are discussed in the following paragraphs.

According to Byrne (1971), the similarity principle in psychology means that people subconsciously classify similar things into a category. For example, visually, things with similar shapes are automatically classified into a category and people tend to naturally believe that the functions of this category are similar. When people communicate with other people using familiar language, visual patterns, elements, and other non-verbal behaviors, the other person will naturally feel more friendly or attracted, which is a natural state of trust in familiar things.

The social exchange principle is that people weigh the potential benefits and risks of social relationships. When the risk outweighs the reward, they terminate or abandon the

relationship. In fact, in the process of cross-cultural communication, culture is used to build trust. Once trust is established, if the benefit of communication fails to meet the expectation or even is lower than the risk to be borne, then cultural communication will fail (Kelley & Thibaut, 1978). When the designer takes cultural design as the purpose, but the final product is not appropriate to a certain target culture, but just a gimmicky design, so then it will only bring disappointment to consumers. Nor does it serve the purpose of integrating culture into design.

The attribution principle (Kelley, 1967) refers to the tendency to underestimate the influence of a particular environment that leads to a particular behavior or performance of an individual and to attribute the behavior or performance to an individual's intrinsic predisposition. For example, when people see a person yelling in the street, they will naturally think that there is something wrong with the person who is yelling, and they will psychologically attribute the "fault" to this person because in the human mind, there should be no such rude shouting in public. But at the same time, no one knows what the cause is, ignoring the impact of the environment and the real cause. In other words, this kind of psychology should be avoided in cultural design, and a certain culture should not be treated with prejudice. These three principles of cultural communication will directly affect cross-cultural communication and also affect the cultural identity of others.

2.1.4 Relevance of Culture and Economy

Ancient humans traded shells as money. This seems to be the earliest form of money trading. People used rare and valuable items as a standard of value. The reason for forming this standard is given and influenced by culture itself. At the same time, this is why modern money acts as a medium of exchange, a store of value, and a unit of account. Money is created through a

cultural process and given value beyond itself by culture, which is the most typical example of culture influencing the economy under social and cultural rules (Henrich, 2005). All economies are influenced by local social relations, culture, and morals. In a market economy, we rely on universal money: money used to buy almost any good or service. This dependence on universal money creates the pursuit of universal money (Bowles, 1998). In addition to the most direct function of the universal currency itself, it also has cultural and moral aspects besides its function as a medium of exchange: for example, people spend money to learn something, but they cannot directly buy the degree with money, because it will lose the meaning of the degree itself. At the same time, money loses its cultural value, just as a purchased diploma is still condemned and "incorrect" in general social morality (Welsch, 2020).

Culture influences the form of existence of the economy, and the consumer economy also influences this culture to some extent, like the economic benefits of Christmas mentioned in 2.1.3, and the culture of Christmas spread to the world through economic globalization. Although China's Christian population is only 3% (Klara & Dubravcikova, 2023), Christmas is also very popular in China, where Confucianism, Taoism, and Buddhism are more prevalent. Many shopping malls, bars, and other consumer places have Christmas-related decorations, and although it is not like the traditional Christian country customs of Christmas with a family reunion, people still celebrate the holiday in different ways. There is even a different Christmas culture in China, such as giving apples to each other on Christmas Eve. Christmas Eve is translated as a peaceful night, pronounced in Mandarin: as Ping An Ye. Since apple is pronounced in Mandarin: as Ping Guo, the first syllable of the two words is similar, so people think giving apples is a symbol of blessing others' peace. Although Christmas in China was originally a gimmick introduced by businesses to promote consumption, it gradually gained a

different cultural significance with the influence of culture. Through consumption, people create cultural meaning, build social relationships, and create identities. Every culture distinguishes between the appropriateness of consumption, that is, people distinguish between what is appropriate to consume and what is not, provide social avenues for consuming culturally acceptable goods, and limit consumption of what is deemed inappropriate (Henrich, 2005).

In conclusion, the essence of the economy is given by culture, and culture influences the direction of the economy. At the same time, the economy can create new cultures. For designers, the analysis and understanding of consumer products will also reflect regional culture. The product reflects the consumption habits of different consumer groups and is the result of the influence of the group culture behind it. Understanding the economy can help designers better understand culture, and then apply culture to design.

2.1.5 Brief Introduction to Chinese Design Development History and Culture

According to writings by Gao (2011), the birth of representative products of Chinese design can be traced back to the primitive era, as discussed below.

The Neolithic "Yang Shao" culture-painted pottery was unearthed in Shanxi Province in 1955. A piece of "human face fish porcelain"(figure 2.3) represents "Yang Shao culture." The fish pattern of human faces is a usual pattern of witchcraft in Yang Shao culture. This porcelain was used to bring spirits and pray for dead children. The human face is a newborn baby, and the fin-shaped decoration on the top of the head means baby hair. The small fish on the outside of the ears is also a reflection of fertility witchcraft, implying that the baby can hear the wizard's call as soon as it is born. The spire on the top of the human face and the pattern on the bottom refer to

the female external genitalia, symbolizing that the baby has been delivered. The two big fish between the two groups have fish totem worship, prayers for reproduction, and so on. According to archaeological findings, the infant mortality rate in Yang Shao culture was high, and the psychological desire of the clan tribes for the birth of babies can also confirm the fish pattern on the human face.

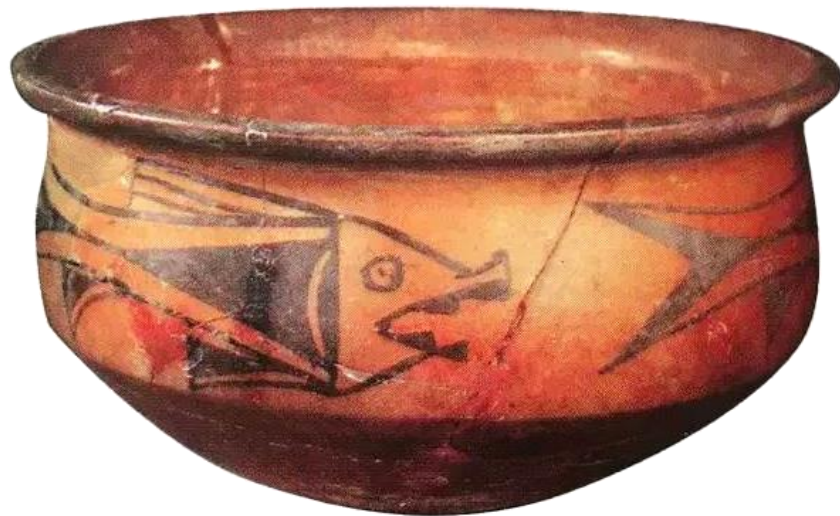


Figure 2.3 Fang, L (2023). human face fish porcelain [Photograph]

From thousands of years ago, people's use of objects in life has been endowed with cultural connotations, which again shows that behavior drives the birth of culture and can give birth to new behaviors.

During the Shang Dynasty and Zhou Dynasty, human society began to step into the slave society. The most representative cultural product of this era is bronze ware. This period is also

known as the Bronze Age. Like the Stone Age, the age was named after the production materials. The appearance of bronze ware was a revolution in the design and craftsmanship of ancient China. It is of scientific significance and complex cultural content, representing the rigorous order and dogma of the time (Gao, 2011). According to the changes, bronze wares were transformed from daily articles for people to sacrificial pieces, ceremonial articles, and everyday use for people. This change brought about changes in shape design and traditional patterns. When we see the physical bronze ware again, we will be amazed by the historical background and the outstanding firing skills of the bronze ware. The cultural products of the Bronze Age are due to the characteristics of the age.



Figure 2.4 Wikipedia (n.d.). ancient Chinese ritual bronze zun vessel Four Goat Fang Zun

Back to the historical background of modern China, China is now in the context of globalization. Still, because of the particularity of the social form, Chinese culture is a unique

product in the modern context. People hope that some national cultures can be reflected in the integration of cultures, a kind of confidence generated under the background of rapid economic development. The development history of China's modern and contemporary history is impressive and touching. The complex and rapid growth has made people eager to achieve results and make an impact in various fields under globalization. The integration of culture is no exception. The Chinese culture has been constantly mentioned and applied in the product industry in recent years, which has both positive and negative effects. Many brands from other countries are interested in China's mighty purchasing power and market, but unfortunately, many products only use simple designs to cater to this market.

In the Han Dynasty, the first peak period of the development of ancient Chinese design history (Zhu, 2008), materials and product functions were vibrant. Lacquerware began to replace bronze ware as the principal articles of daily use. It was not only the type and technology of the products that developed into a peak at that time but also the flow production of lacquerware, which appeared in the market at that time in the form of set combinations (Gao,2011). Nevertheless, bronzes were not eliminated from the product design industry for many years of the technological development of bronze ware. Old materials through design ushered in a rebirth: small bronze items, lamps, and lanterns, bronze mirror life, whether in the modeling design or practical, got further improvement and development. The new products were a combination of early functionality and aesthetics (Li, 2011).

A variety of product designs in the Han Dynasty got unprecedented development, which is also closely related to the prosperity of the Han economy. The Han Dynasty had enormous population growth, a high degree of urbanization, and a high degree of commercial and political centralization. At the same time, iron tools were also used as the main production tools in

construction and agriculture. This also reflects the need for a socio-economic basis for design. In other words, design is more likely to appear when people have a rich life and a booming economy. The same is true of modern design. People will consider design requirements beyond essential functions only after economic conditions are met.

The Tang Dynasty was a period of diversity and integration in the history of ancient Chinese design (Gao, 2011). In the Tang Dynasty, overseas trade began to flourish. In the second half of the 8th century, the sea route from Guangzhou entered the Indian Ocean through the Strait of Malacca, reached India and Ceylon, and then joined the Persian Gulf, Aden, and the Red Sea. By connecting the seaway to the West with the seaway to Silla and Japan, overseas traffic in the Tang Dynasty could reach much of the Old World before the discovery of the New World. The porcelain of the Tang Dynasty further expanded not only celadon and white porcelain in the production and artistic development and has a strong design language and creative expression. Porcelain was originally a traditional cultural symbol of China. Through communication with many other countries, the culture of porcelain has influenced many countries in Asia and even the world. In Japan and Korea, porcelain culture also became a part of their traditional culture due to the influence of Tang Dynasty porcelain. Because of trade with the world, the absorption of foreign cultures, and the mutual effect of various ethnic lifestyles, many new artistic symbols had been produced. The development of traditional patterns was a typical representative of the Tang Dynasty, and many new ways were born in combination with the cultural practices of the Western world.

Just as Professor Gao Feng (2011) said in his book about some rules obtained by discussing the history of design: a lower material life is an essential thrust for the development of the design. People could not make sacrificial bronze wares during shallow material life. Even in

the present society, modern China lags the world in the direction of design because the economic foundation could not support design development for a long time. Secondly, design and culture influence and promote each other. Culture is the sum of the unique civilization phenomena of a social group, and design is the creation of material forms and belongs to material cultural phenomena (Li, 2011). The products born in Chinese traditional culture have a deep cultural imprint on modern times. Modern design also lacks vitality without culture. The influence of culture may not be a direct visual expression but the story behind it and the way to solve the problem. The word of a course is the result of culture. However, design, science, and technology are inseparable. Nowadays, with the development of science and technology, design has many ways to express itself. 3D printing, adobe, CAD, AI, and so on embodies science and technology. Design through these techniques can bring new and different design art experiences, also very similar to the concept of ancient design (Rindfleisch, O'Hern & Sachdev, 2017). Secondly, design and aesthetic ideas develop synchronously; Designers play an essential role in promoting design; Design development is inseparable from the development and utilization of raw materials.

Separately, contemporary aesthetics will directly affect the form of mainstream design products. Regarding fashion products, design in the years 2020 to 2023 is due to the retro fashion style, and many product design languages are from the 1980s and 1990s (Bryon, 2023). Moreover, the futurism of that time has been in many designs this year. Moreover, this trend aesthetic also profoundly influences graphic design and interior design. The development of aesthetic concepts is synchronous and very important for innovation. As an indispensable part of the design process, the designer plays a vital role in promoting product control and aesthetic appreciation.

In many cases, people may not know what they want, so the designer plays the responder role. The answer is open and can be instructive. Take Apple's design, for example. When many epoch-making products of Apple appear, people may not know more uses of the products. In this process, consumers and designers are thinking and creating new scenarios and possibilities for the benefit of products together. The evolution of the iPad from its debut to today is the result of a "discussion" between designers and consumers.

It is more evident that the design is inseparable from the development and utilization of raw materials. Developing and utilizing new materials can improve product development efficiency and service life and discover more design languages and the possibility of using natural materials in the process. As mentioned in this section, the products of different dynasties in Chinese history were influenced by production methods and materials. From the Stone Age to the emergence of ceramics, from the use of bronze to the application of iron, have shown that raw materials and production methods, science, and technology will directly affect the development of products. In today's rapid development, because the mining of raw materials is much easier than hundreds of years ago, the large demand for raw materials makes people pay attention to how to use raw materials in a more environmentally friendly way, and through the exploration of new raw materials. Both directions bring new challenges to modern technology, which has been developed in the use and extraction of raw materials. The corresponding product design process will also consider how to not waste raw materials and improve sustainability. This is also the impact of modern raw materials on products (Birat, 2020) .

This section provides an overview of the ancient history of Chinese industry, as well as the relationship between modern technology and raw materials. The interaction between raw materials and technology is expounded. Considering the design according to the characteristics

of raw materials and technical production characteristics in different regions will also help to improve the further understanding of product design.

2.2 About Footwear

Having a pair of perfect, comfortable shoes will add happiness to everyday life, but in today's highly developed industrialized environment, it is difficult for people to spend time and energy to customize a unique pair of their own "perfect" shoes. Any product is difficult to achieve full balance, so people always need to sacrifice one part of the design to meet the requirements of another part. This is why people often have more than one pair of shoes, and functionality allows the shoes to have more branches and application scenarios. Fashion gives value to shoes beyond their functions, just as the correlation between culture and economy mentioned in 2.1.4 - fashion culture and footwear consumer goods' economy interact. The development of the industrial economy has made industrial technology progress, and the technology industry will subtly affect the fashion and function of shoes in the change of the production mode of shoes.

2.2.1 A Brief of Footwear Design History

The foot can bear the weight of the whole-body load and has support, expansion, distortion, bounce, shock absorption, and friction functions (Earls, 2021). In the beginning, shoes were not very comprehensive in terms of functions. However, with the development of science and technology, people began to use shoes to provide performance for sports, which made the functional development of shoes more and more diversified. Meanwhile, the fashion culture of

shoes also makes the appearance design of shoes more and more diversified. The book *Chinese and Worldwide Footwear Culture 中外鞋履文化* by Zhang, Wu & Tian (2018) states:

By the turn of the 19th century, the industrial revolutions in the United States and France had dramatically changed the social order, putting the middle class in charge of the state and resetting the standards of taste and etiquette. Old aristocratic styles, such as ornate shoelaces, colored leather, and gilded embroidery, fell out of fashion. (p.120)

In the 19th century, shoe design and technology developed rapidly. By the end of the 19th century and the beginning of the 20th century, shoe production, sales, and culture began to approach today's shoe market. The appearance of a variety of shoes has triggered a lot of people's discussion on fashion and functionality, but also indirectly let the raw materials, structure, and technology of shoe design be improved and developed to different degrees.

Footwear in the 19th century was roughly divided into five periods of popularity:

Neoclassical and Imperial (1789-1825)

Romantic (1825-1859)

Neo-Rococo (1850-1879)

Bustle Era (1870-1890),

S-shaped (1890-1914) (Zhang, Wu & Tian, 2018).



Figure 2.5 The Met Museum (n.d.), 14 shoes from 1795-1815. [Photograph].

The discovery of the ancient cities of Herculaneum and Pompeii in Italy in the mid-18th century brought attention to ancient culture. In terms of artistic style, elegant and delicate Rococo culture began to shift to the "simple and noble" classical culture, that is, classicism. The French Revolution overthrew the old feudal aristocracy's dress. While the new regime promoted simple men's wear, women's wear also became popular in the direction of ancient Greece (Zhang, Wu & Tian, 2018).

In the neoclassical period, people began to pay more attention to the functionality of shoes because the French Revolution profoundly influenced them; people began to think about what they needed rather than the simple splendor of the old society. In recent times, high heels have been gradually replaced by flat shoes. At the same time, because the sole is light and the shoes are used frequently, the life of the shoes is considerably shortened. As a result, women then had the habit of buying many pairs of shoes at once. Because of the development of the Industrial Revolution, in addition to men, women also wanted to invest in a wide range of social labor, so shoes such as flat shoes, sandals, and boots became the best choice for workers.

After the fall of Napoleon's empire, Europe was mired in a long war, and power returned to the old aristocracy. This led to a greater emphasis on spiritual emotions, forming a distinctive romantic style. Romanticism opposes pure rationality and abstraction and attaches importance to strong emotional expression (Kindersley, 2012), making men's clothes more neutral. Women's clothes had many shadows from the old aristocratic period. Cavalry and guard boots were popular during this period, and in the late 1820s, low heels and high tops were introduced for both men and women. This period imperceptibly brought shoe culture closer to fashion, and at the same time, people began to express their positions and opinions on society through fashion.

The design of men's shoes has laid the foundation since the period of the Bustle Era (1870-1890). Many men's leather boots still refer to this period. In the period of s-shape, a movement trend appeared in Art that denied the traditional style of modeling, namely the so-called "Art Nouveau." From this period, symmetrical free-flowing curves became popular, intending to break traditions, become free from historical styles, and create a new art form. From the end of the 19th century to the beginning of the 20th century, the footwear industry developed rapidly, and American assembly line technology made finished shoes begin to appear on the stage of history (Zhang, Wu & Tian, 2018).

The 19th century was a century of significant changes in the world fashion trend. Although the status of French fashion was not threatened, the American fashion trend at that time was almost 100 percent of the same quality as Paris. However, the status of the traditional shoemaker was challenged. The industrialization of the United States pushed the original traditional handwork to the assembly line. The modern (after 1980) sports shoe was born in the final decades of the nineteenth century. Britain's social, industrial, and commercial changes

prompted widespread enthusiasm for various games and athletic activities. Sports created physical and social needs, which were met by the emerging industrial footwear industry.

Shoemakers sought to cater to the demands of sportsmen and sportswomen; shoemakers drew on how footwear would be used within the sporting practice and exploited modern manufacturing and commercial processes. From 1914 to the end of the 20th century, human natural science, human form, historical concepts, design, and creation experienced new changes, and the speed of development was unmatched in the previous historical period. In the 20th century, two global wars and continuous local wars destroyed civilization and wealth created by human beings to varying degrees. Because of the coexistence of contradiction and unity of the society, clothing shows unprecedented diversity and polarity.

Based on historical factors and focusing on footwear culture, the culture's development process is in constant change, and the root of this change is the change of the properties of footwear itself; footwear has both practicability and sociality; and the main factors of the source of footwear change are environmental factors and functional factors. The article *Global Shoe Waste: The Environmental Impact of Footwear* by Tess DiNapoli (2024) states "Environmental factors are external factors that have mandatory and restrictive influences on footwear, including natural and social environments" (p.5).

The natural environment is relatively stable in its influences on change in footwear, generally, with the region and climate as the main factors, and these factors are relatively minor changes. If the natural environment changes, such as floods, earthquakes, tsunamis, and other disasters, these factors will also affect the change of shoes. The social environment is constantly changing because people's thoughts change due to different political positions, while humanity constantly changes and updates the environment. With the development of technology and

economy, one of the social factors that cannot be ignored is that ecology will be related to technology and economy, and the application of materials will also change. The shoemaking process, production capacity, and technology will continue to improve and change (Zhang, et al., 2018).

Functional factors make the shoe design more appropriate to the social environment because different shoe application scenarios will lead to very typical functional factors.

2.2.1.2 Brief Introductions of Classic Shoes

As mentioned in 2.2.1, the 19th century ushered in great changes in footwear design and fashion trends due to the development of the industrial landscape. The concept of modern footwear design began to manifest in the mid-19th century (Turner, 2019). From the mid-19th century to the time of this thesis in 2024, many of the most representative and transformative shoes in footwear design have appeared. The powerful branch of sports shoes, or sports shoes themselves, is the beginning of modern footwear design and occupies an important position in the history of footwear design. Perhaps in 2024, many classic shoes are not sneakers in people's eyes, but most of these shoes were designed for sports purposes or with special functions in the design and release of the initial footwear. Of course, there are many classic shoes born for fashion. Today in 2024, due to the high development of science and technology, some of the former sports shoes have changed their initial use scenarios, but many classic shoes are still constantly mentioned in the fashion field and redesigned to make the original design take on a new look. These far-reaching influences continue to influence modern designers.

Oxford

Oxford shoes are a pair of classics that cannot be bypassed in the field of men's shoes in the fashion industry, and the Derby shoes that evolved from them have also become classic. The shoes that the modern fashion industry will mention when it comes to men's shoes are the styles that many brands will redefine, and design based on the original shoes in the product planning process. The origin of the Oxford shoe is still debated, but it is known that the shoe began to appear in 1825, and the word "Oxford shoe" first appeared in writing around 1846. Oxfords are elegant and functional shoes. An interesting fact is that from the beginning of the 20th century, with the influence of the women's rights movement and the change of women's roles in society, women began to take Oxford shoes as the representative style of women in the new era. They are comfortable, convenient, and elegant, not only for life use, but people also wear Oxford shoes for sports. By the end of the 19th century, many different shoes were created based on Oxford shoes because of their applicability to multiple scenes (Shawcross, 2014). As of 2024, different types of Oxfords are still being designed, which shows that Oxfords are still very popular.

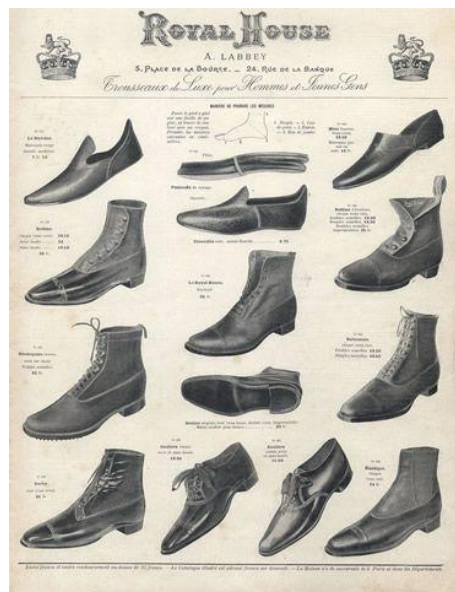


Figure 2.6 HP prints (n.d.), Royal House (Department Store) 1898 Men's Shoes [Poster]

Lawn Tennis Shoe

Lawn tennis, a sport that emerged in the 1860s, was popular in middle-class and upper-class societies at the end of the 19th century, and the highly social nature of lawn tennis was highly popular among middle-class families with lawns in country houses. At the same time, recreational sports are not very competitive, which allows men and women to participate together. In an era of strict gender segregation, lawn tennis allowed both males and females to socialize. This series of characteristics allowed lawn tennis to quickly gain a foothold in the 19th-century sports market (Turner, 2019). The emergence of lawn tennis was also accompanied by the demand for lawn tennis equipment, including lawn shoes that needed to have the characteristics of light and flexible, and a guaranteed grip that at the same time cannot destroy the grass itself. Traditional moccasin soles are easily slip on the grass with rich water content, so the application of vulcanized rubber and canvas that just appeared at that time made Lawn Tennis Shoes appear on the retail shelf, resulting in the application of new materials and the perfect combination of flexibility and grip (Turner, 2019). In the late Victorian era, people still maintained a strict focus on beauty, so tennis shoes still fit the design aesthetic of the time, and many lawn tennis fashion styles were also popular. Lawn tennis shoes from the modern point of view are not the perfect sports shoes, but the elegant lines still retain the aesthetics of the year of introduction, and this pair of shoes has become a synonym for classic and elegant.

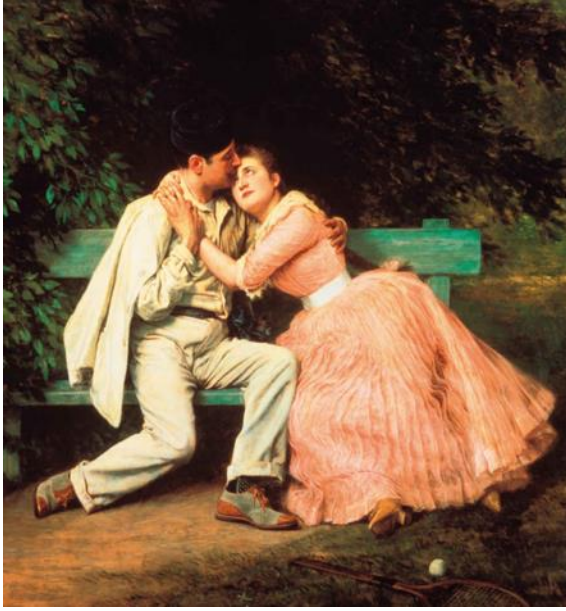


Figure 2.7 Beers, J. V. (1890), *A Love Match* [Oil Paint]



Figure 2.8 Gere, C.M. (1900), *The Tennis Party* [Oil Paint]

Chunk Taylor-All Star

Converse started as a traditional rubber industry company, and like other similar companies, it was a raw material company that processed rubber. To keep the industry unaffected by the seasons, Converse produces a wide range of products, including footwear. Converse began to enter the basketball market in 1917 because basketball as an emerging sport began to become popular on the East Coast at that time. Basketball was a sport that did not have a larger field demand like baseball and football which began to become popular among American teenagers. In 1922, basketball player Charles Hollis Taylor proposed new requirements and designs for Converse's basketball shoes, and the more flexible and lightweight requirements led to the creation of Chuck Taylor's initial design version. The iconic star logo at the ankle, as well as light and comfortable wear, once made this pair of shoes have a good market performance. However, due to the limitations of product technology and the continuous update of other basketball shoes at the same period, this pair of shoes gradually faded from the basketball court. With the advent of the Chuck Taylor-All Star low-top version, the shoes began to become legendary. Young people on the street and seaside began to wear these shoes in many arenas, which made Converse's Marketing Department puzzled about the sudden popularity of this shoe. The low top, which is more convenient to put on and take off, made Converse's comfort play a huge role. Another turning point was the release of Chuck Taylor in different colors in 1971, and people began to express their own personalities with colors, such as representative color matching on university campuses to let college students find fun (Smith, 2020). Since then, Converse Chuck Taylor – All-Star 1970 has become a classic legendary shoe.



Figure 2.9 The Converse Archive (n.d.), Converse Non-Skid All Stars, 1923. [Photograph]

Military Boots

After the First World War, military boots became a symbol of wild, unruly males wearing military boots to show off their brutal charm. French designer Coco Chanel was the first to introduce such boots to women's clothing stores. She used her upper-class influence to implant her favorite riding suit into haute couture, shattering the aesthetic stereotype of women's long skirts. At the same time, it also pushed the Chanel fashion brand to a new peak. Since then, fashion has become a visual stimulation and an artistic medium for people to reflect on social problems (Zhang, Wu & Tian, 2018).



Figure 2.10 Tumblr (n.d.), Fashionable riding suits, 1937 [Photograph]

<https://districtofchic.tumblr.com/post/28555569136/vintage-retro-fashionable-riding-suits-1937>

Chelsea Boots

In the 1960s, the Beatles became popular around the world, and they became popular among young people. The Beatles' classic performance style also attracted countless fans. People began to dress like their idols, which led to the band members turning the "Beatles boots" into a classic. They were also known as Chelsea boots. Invented in 1837, the Chelsea boot has an elastic band around the toe, making it a perfect fit. Vulcanized rubber, which was popular at the time, was used to make it easy to put boots on and off. The Beatles' music culture has made Chelsea boots a fashion darling, and Chelsea boots have become one of the representative products of many iconic brands. This simple elegant style and its clean lines are different from the traditional Oxford shoes, so are seen as fancier. As a product of the same era, Chelsea boots are undeniably as classic as Oxford shoes (Anderson,2022).



Figure 2.11 The Rake (n.d.), Beatles band with Chelsea boots, 1963.[photograph]

<https://therake.com/stories/the-kaleidoscopic-escalation-of-the-beatle-boot>

Martens

The Martens were invented during World War II and were modified by Klaus Martens, a German doctor during World War II. Later, the well-known brand Dr. Martens became popular among workers because of its wear-resistant material and comfortable wearing experience. For the first time, Dr. Martens was worn from a fashion point of view, breaking the non-functional boundaries of footwear. In the 1960s, many street gangs in the UK liked to wear these shoes, because they did not need very delicate care and were rain-resistant and slippery, and the quality was very good (Zhang, Wu & Tian, 2018). The Martens also became a street symbol in Britain in the social context of the time. With the development of these boots, Doc Martens has become a symbol of many youths' culture, and more and more classic Martin shoes have appeared in people's vision. In 1973, the yellow boots of Timberland pushed Marten boots to another height. Today, Martens is still one of the most popular shoes for not only manual workers who love their functionality, but more fashion styles are influenced by Dr. Martens.



Figure 2.12 Dr. Martens (n.d.), Announcement poster picture of Dr. Martens. [Photograph]

Nike Air Jordan 1 Retro

In 1984, Nike signed Michael Jordan with the help of Sonny Vaccaro, a decision that was one of the most important for Nike. The Nike Air Jordan 1 Retro is bound to go down in the history of footwear design. Nike often refers to The Nike Air Jordan 1 as "The one that started it all". Peter Moore is the designer of the Air Jordan 1, which was created in 1984 and encapsulates Jordan's boundary-breaking talent, innovation, expression, and style. On November 17, 1984, this pair of shoes officially landed in the NBA, and in February 1985, a pair of black and red Air Jordans 1 attracted the attention of the league. This pair of basketball shoes because of the unique color violation of the league's "uniform" rules was fined by the league, and Nike used the "fine" to make this "ban" storm into a marketing advertisement, and basketball fans across the United States began to be obsessed with the Air Jordan 1 (Wertheim, 2021). This pair of classic lines of sports shoes through the basketball culture is popular around the world and even birthed the "sneakerhead" culture (sneaker collection culture). Just like Michael Jordan, these shoes broke tradition and created legend once again. "Sneakerhead" Culture is not just a niche hobby in today's life, but it has even influenced the sneaker economy to occupy a large share of the consumer goods market.

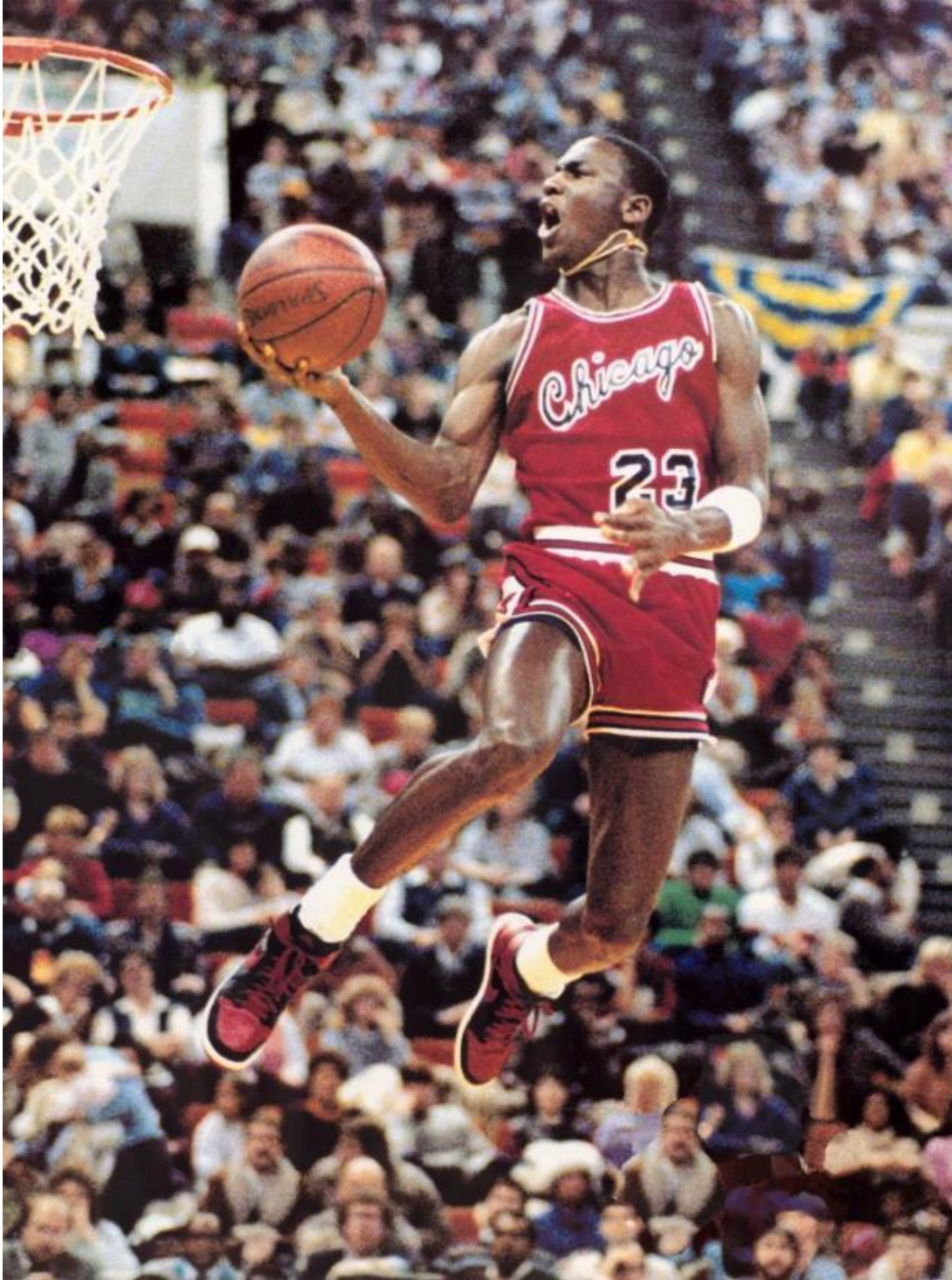


Figure 2.13 SneakerNews (2021), Michael Jordan laying up in Jordan 1 Retro “banded”.

[photograph].

Christian Louboutin’s red-sole heels

Christian Louboutin's red-sole heels are probably one of the most iconic high heels of the late 20th century to the present day. This is not just a pair of high heels, but a high heel with a unique element of designer Christian Louboutin. Christian Louboutin launched his first collection of red-soled shoes in 1992. The collection was an instant hit, and Louboutin's red-soled heels soon became synonymous with luxury and high fashion. This classic element, the "red sole," has been present throughout his designs. High heels are not a scientific product, because they are not ergonomic, and long-term wear will even have a bad effect on people's muscles and joints, but as a synonym for "sexy" because of their unique design language and smooth curves, they have been sought after by fashionable people. Christian Louboutin's most representative pair of high heels, the "So Kate Pump" is the most classic pair. This pair of shoes is named after the model Kate Moss. Once released, these shoes have become the "Dream heels" in the eyes of many heels consumers. And Christian Louboutin once again left a classic for footwear design (Tse, 2023).



Figure 2.14 Clonlineshop (n.d.). Christian Louboutin “So Kate Pump”. [Photograph].

<https://clonlineshop.com/#>.

Kanye West's Yeezy collection

With the spread of music pop culture, Kanye West (Ye) is known around the world as a music artist, and his Yeezy series footwear has also started to create a new wave of footwear design, giving birth to a new fashion Style named "Yeezy Style". In 2009, Kanye and Nike collaborated on their first pair of shoes, the Air Yeezy. This pair of shoes is the first pair of Yeezy in the real sense, although the design at this time is not very prominent, and even a lot of different shoes can be seen. It was not until 2012 with Air Yeezy 2 that Kanye West's Yeezy began to enter the public eye, and the shoes were influenced by sneakerhead culture and sold for 20,000 US dollars average retailer price. The shoes also officially let Kanye West confirm his confidence in the Yeezy collection. In 2015, Kanye and Adidas cooperated to launch Yeezy Boots 350, The Yeezy era officially opened, and fans around the world were crazy for this pair of shoes at the same time; Nike and Virgil Abloh cooperated to launch the "Ten" series. The two collaborations between these two sneaker brands pushed sneakerhead culture to a global climax (Stonebrook, 2023). In 2019, Kanye West posted a photo of all Yeezy samples and himself on social media. Yeezy style is the real game changer in footwear design from 2017 to 2023. It is not difficult to see that many shoe designs after Yeezy have been more or less Yeezy-influenced.



Figure 2.15 Toppin, J. (2019). Kanye West with Yeezy Samples. [Photograph].

<https://www.instagram.com/jameltoppinphoto/>.

This thesis cannot restate all the classics in the history of footwear design. Too many wonderful shoe designs enrich the industry, while footwear, as a necessity for people's lives, contains too many cultural branches. From the history of several classic shoes, it can be summarized that culture is an important factor affecting footwear design. Successful footwear design on the one hand is created by the influence of culture, but on the other side can breed a new culture. People can find that the story behind the successful shoes must have a lot of cultural connotations, and rich culture brings inspiration to the design. The cultural economy is the result of successful footwear design and continues to influence the development and progress of

footwear culture. The development of the fashion industry and culture inevitably drives footwear design, and the emergence of new technology also brings innovation to footwear design again and again. Function is the foundation of shoes, but it is also an important issue that needs to be solved at the beginning of footwear design.

2.2.3 The Human Foot

Before understanding the basic function of shoes, the part that must be mentioned is the human foot - the important part of the human body that allows shoes to be created. The structure of the human foot is very complex, and its complex bone structure, neural network, and muscle fascia give it the ability to help humans balance, move, and interact with the outside world. No cell, tissue, or organ is a single function. The human foot is no exception; any simple movement involves a lot of muscle structures and nerves. A simple understanding of some foot structures and foot movement behavior will help designers better understand the function of shoes, such as some shoes that need special functions: sprint cleats, football shoes, weightlifting shoes, and so on. People can see that many sports brands have many kinds of sub-lines, which are built specifically for some sports to design more professional equipment. When designers need to design shoes for these sports, they inevitably need to understand the principles of these sports, muscles, and sports performance. Again, this thesis cannot provide all the details about the relevant science, as it is not a professional biomechanics and sports medicine thesis. The content involved is to provide some directions that can be referred to, as well as to provide what direction the designers might need to consider when thinking about professional sports footwear.

2.2.3.1 A Brief of Foot Anatomy

Foot bone

Each person's foot has 26 bones (Figure 2.16), which are divided into three areas according to the function of the bones -- Tarsus, Metatarsus, and Phalanges. The main role of Tarsus is to physically distribute the weight of the body to the sole surface of the foot, absorb force, and then accurately balance the center of gravity of the body through the feeling of force. The metatarsal bones are five elongated bones located between the tarsal and phalanx bones whose primary function is to distribute the body's weight efficiently and safely. Phalanges are essential for proper toe bending. As a result, they are important in a variety of activities, from walking to jumping (Ficke & Byerly, 2023).

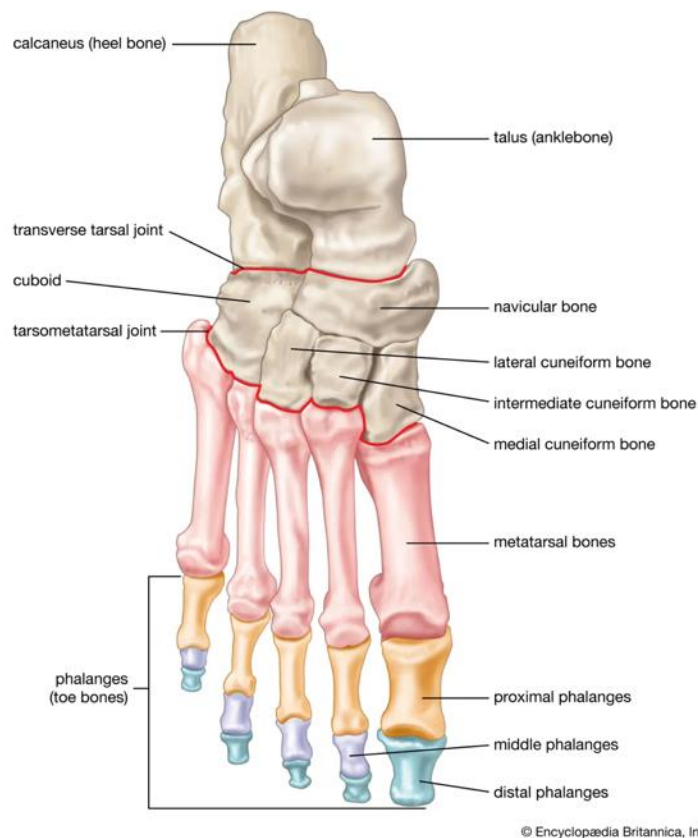


Figure 2.16 Encyclopædia Britannica Inc.(n.d.), Anatomy of foot bone.

2.2.3.1.2 Arch of the foot

Arches (Figure 2.17) in general help distribute body weight proportionally to the weight-bearing area. At the same time, they act as a spring plate during movement to reduce the burden of power consumption during movement. Finally, the presence of the arch protects the plantar blood vessels and nerves.

The foot has three arches: two longitudinal (medial and lateral) arches and one anterior transverse arch. Due to some innate heredity or acquired influence of wearing shoes, some arch problems may occur, and arch problems will cause uneven pressure distribution of related muscles, indirectly or directly affecting muscle motor performance (Ficke & Byerly, 2023). In the process of designing shoes, the degree of softness and hardness of the arch support material and the support of the material itself will be considered, to improve the impact of shoes on the performance of the arch movement.

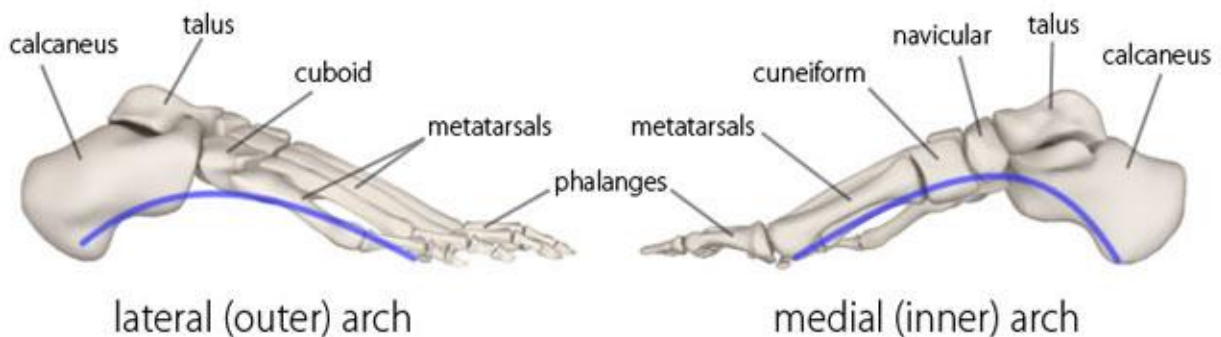


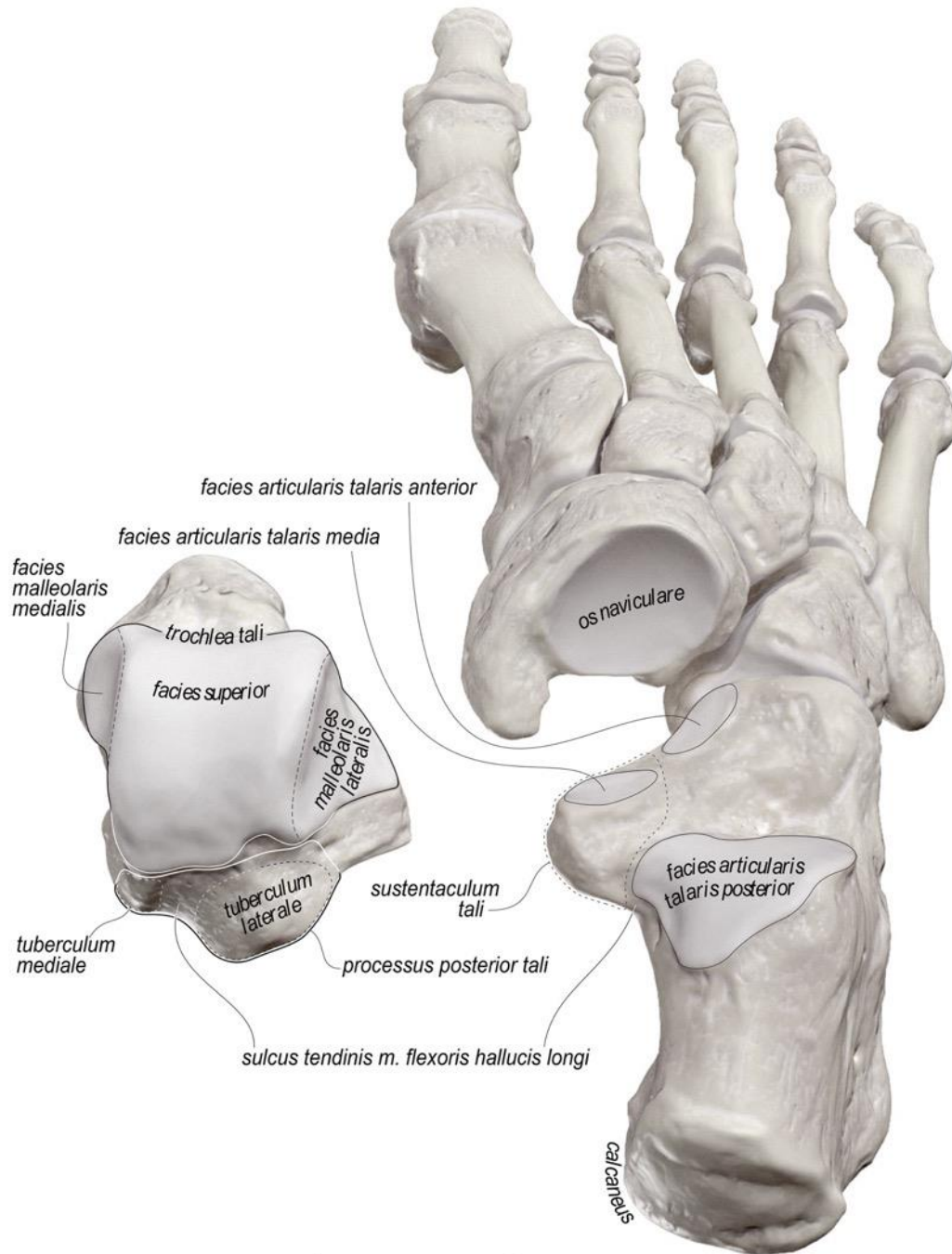
Figure 2.17 Theislander, (n.d.). Foot Arch, [Anatomy Picture].

<https://theislander.online/2016/09/health-wellness/the-medial-longitudinal-arch-of-the-foot/>

2.2.3.1.3 Joints of Foot

Joints (Figure 2.18) are the links that allow different bones to interact with each other, and the structure of joints is necessary to provide the flexible movement of bones. Between the bones of the foot, some joints enable foot dynamics. Each foot has 33 joints, made up of two or more bones, that can move, provide mechanical support, and absorb force (Speller,2023)

The ankle joint consists of the talus of the foot and the tibia and fibula of the leg, which mainly realizes the dorsi flexion and plantar flexion of the foot. There are medial (deltoid) and lateral ligaments that stabilize the ankle joint. The ankle is often used when walking or running, especially during sports. Therefore, it is the most injured joint in the foot. Therefore, when it comes to the movement of direction change, designers need to pay attention to the ankle protection design, and how to strike a balance between protection and flexibility. The intertarsal joints are the joints of the tarsal bones in the foot. The main movements involving these joints are inversion, eversion, pronation, and supination. They allow the foot to adapt and maintain contact with the ground on irregular surfaces. Other joints also connect the muscles and fascia of the foot to make the foot more stable and flexible during movement.



ANATOMY STANDARD

Figure 2.18 Anatomy Standard, (n.d.). Foot Joints. [3D model].

<https://www.anatomystandard.com/docs/about.html>

2.2.3.1.4 Muscles of Foot

The foot muscles are categorized based on their location into two main groups: the dorsal and plantar groups (Speller, 2023). The dorsal group is primarily involved in extending the toes. The dorsal group is further divided into extensor digitorum brevis and extensor hallucis brevis. The muscle extensor digitorum brevis works in concert with the extensor digitorum longus to extend the toes, especially during the rocking phase of gait, and lift them off the ground. The primary function of the extensor hallucis brevis is to extend the big toe. It acts alongside the extensor hallucis longus muscle, which extends the big toe and aids in the dorsiflexion of the foot at the ankle. These dorsal muscles are innervated by the deep peroneal (fibular) nerve and play crucial roles in foot movement and stability, particularly during activities such as walking, running, and climbing, by helping to lift the toes off the ground (Speller, 2023)

The muscles of the plantar foot can be divided into four layers; these muscles act collectively to stabilize the arches of the foot and individually to control the movement of the digits. They are innervated by the medial or lateral plantar nerves which are branches of the tibial nerve. All information summarized in this section is in Table 2.1 below.

Table 2.1**Muscle of the Plantar Aspect**

First Muscle Layer of the plantar Aspect			
Muscle	Function	Innervation	Corresponding Tendon
Abductor hallucis	Abducts and flexes great toe at metatarsophalangeal joint	Innervated by the medial plantar branch of the tibial nerve	The tendon inserting on the medial side of the base of the proximal phalanx of the great toe
Flexor digitorum brevis	Flexes lateral four toes at proximal interphalangeal joint	Innervated by the medial plantar branch of the tibial nerve	Flexor digitorum brevis tendons on the lateral four toes
Abductor digiti minimi	Abducts little toe at the metatarsophalangeal joint	Innervated by the lateral plantar branch of tibial nerve	The tendon inserting on the lateral side of base of proximal phalanx of little toe
Second Muscle Layer of the plantar Aspect			
Muscle	Function	Innervation	Corresponding Tendon
Quadratus plantae	Assists flexor digitorum longus tendon in flexing toes II–V	Innervated by the lateral plantar branch of tibial nerve	Flexor digitorum longus tendons
Lumbricals	Flexes metatarsophalangeal joint and extend interphalangeal joints	First lumbrical is innervated by the medial plantar nerve from the tibial nerve; second, third, and fourth lumbricals are innervated by the lateral plantar nerve from the tibial nerve	Flexor digitorum longus tendons

Fourth Muscle Layer of the plantar Aspect

Muscle	Function	Innervation
Dorsal interossei	Abducts toes II–IV at metatarsophalangeal joints; resists extension of metatarsophalangeal joints and flexion of interphalangeal joints	Innervated by the lateral plantar branch of tibial nerve; first and second dorsal interossei also innervated by deep fibular nerve
Plantar interossei	Adducts great toe at metatarsophalangeal joint	Innervated by the lateral plantar branch of tibial nerve

Third Muscle Layer of the plantar Aspect

Muscle	Function	Innervation	Corresponding Tendon
Flexor hallucis brevis	Flexes metatarsophalangeal joint of the great toe	Innervated by the lateral plantar branch of tibial nerve	The tendon originating from plantar surface of cuboid and lateral cuneiform; tendon of tibialis posterior muscle
Adductor hallucis	Adducts great toe at metatarsophalangeal joint	Innervated by the lateral plantar branch of tibial nerve	Fibularis longus tendon
Flexor digiti minimi brevis	Flexes little toe at metatarsophalangeal joint	Innervated by the lateral plantar branch of tibial nerve	Fibularis longus tendon

Note. From “The Science of Footwear (Human Factors and Ergonomics)” by Goonetilleke, R.S. (2012), CRC Press, Page 10-11.

2.2.3.2 Foot Measures

Foot measurement is to help the designer understand the shape of the foot (Figure 2.20), but also to provide the basis for the designer in the process of designing a shoe lasts, lasts is an important tool for determining the internal space of a pair of shoes and the general style of the shoe (Figure 2.19). Usually, people make shoes over the shoe lasts. Therefore, some professional terms in Figures 2.20 and 2.21 can help designers understand the shoe last's measurements better. The thesis content of this part will not cover all measurement methods and international shoe lasts' data. This part mainly introduces the necessary step of foot measurement. For the design of professional sports shoes, the data of relevant athletes is required as the basis for the shoe last. With the progress of science and technology, many measurement methods have gradually tended to use foot digital technology, 3D scanner technology, and gravity sensing technology to provide more accurate data based on traditional 2D mapping, helping designers better understand the model and shape of the foot. At the same time, due to the complex shape of human feet and the importance of shoe and foot fit, the key to improving the comfort of shoes is to understand foot measurement.

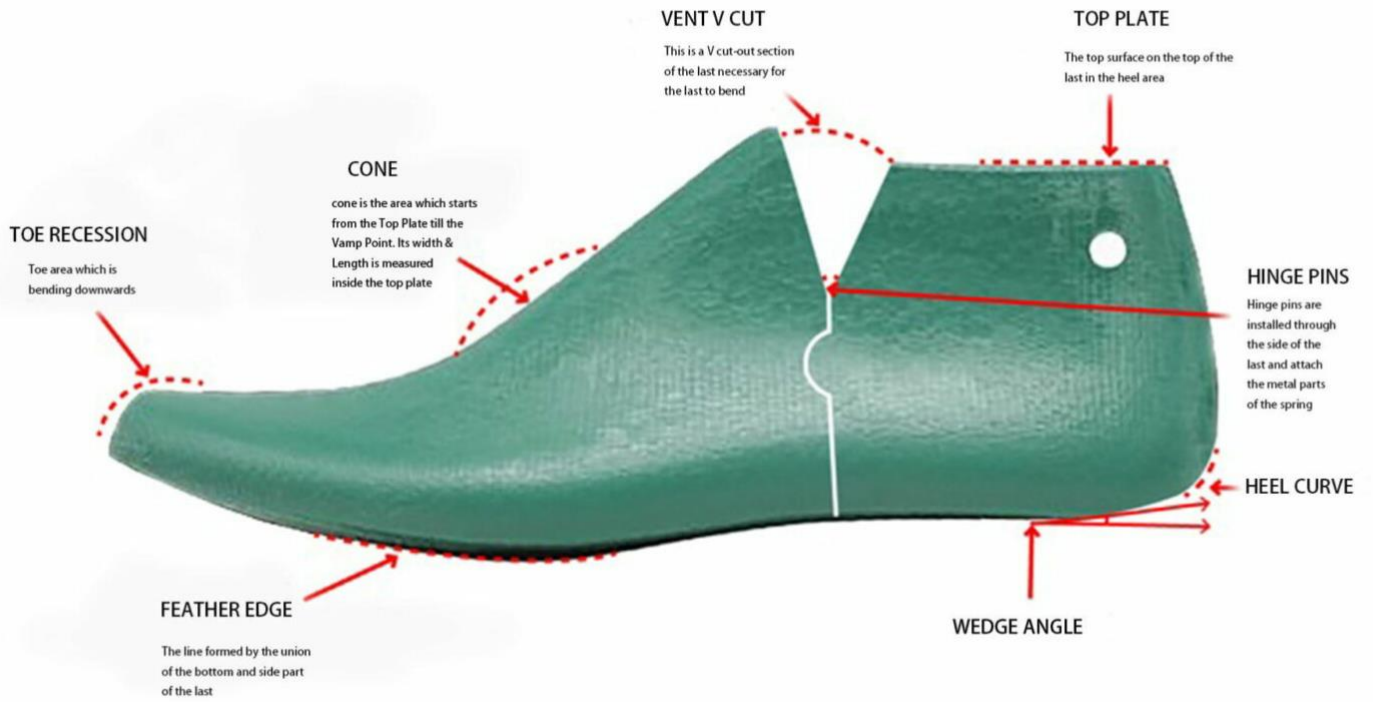


Figure 2.19 MESCOT (n.d.), The Shoemaking Tool: Shoe Last.

<https://www.mescotshoes.com/what-is-a-shoe-last-2-minutes-explanation/>.

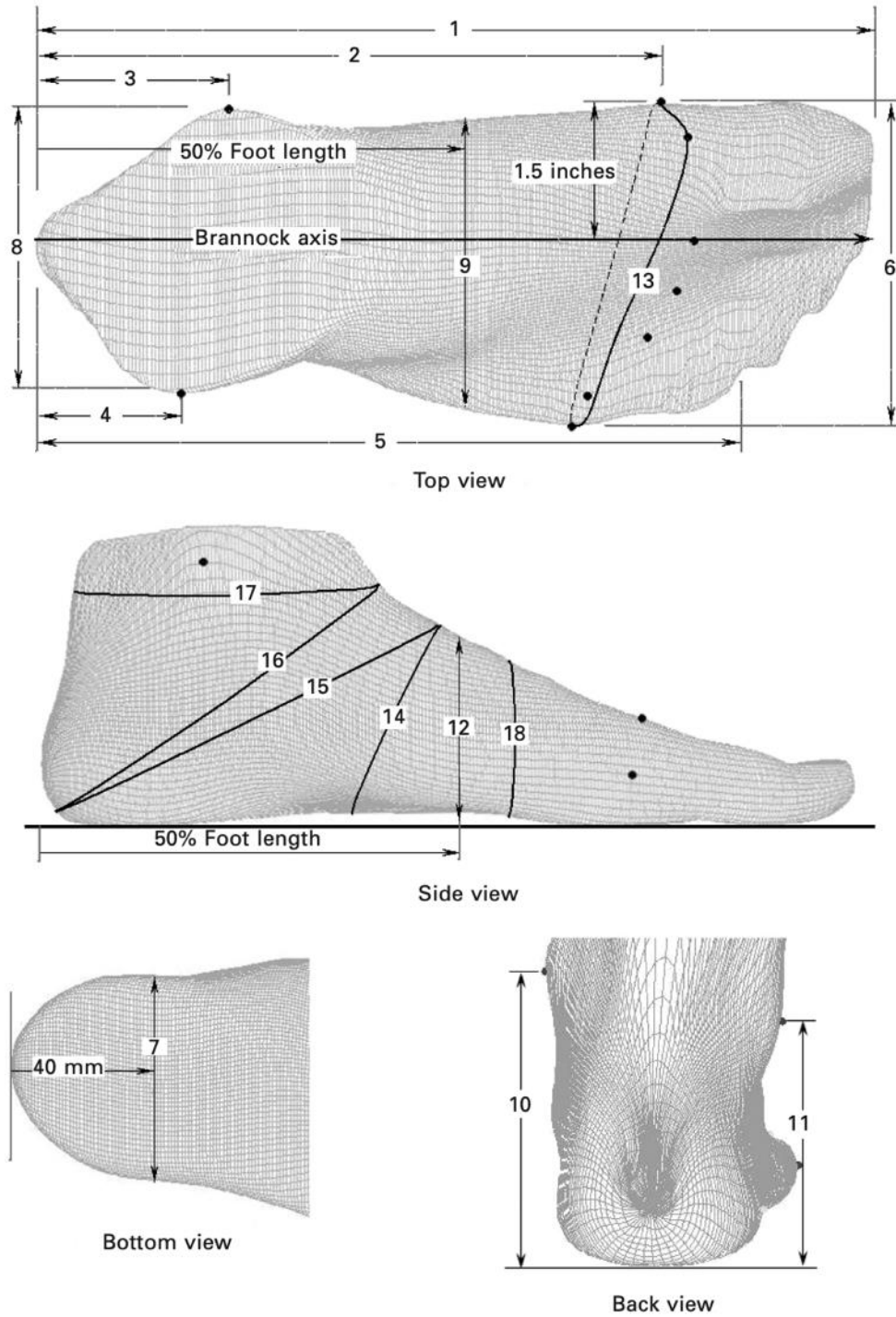


Figure 2.20 Luximon, A. (2013), Diagram about Measurement of the foot, Retrieved from “Handbook of footwear design and manufacture”. Page 75. [Diagram]

5 lengths	<ol style="list-style-type: none"> 1. Foot length: The distance along the Brannock axis (X-direction) from pternion to the tip of the longest toe. 2. Arch length: The distance along the Brannock axis from pternion to the most medially prominent point on the 1st metatarsal head. 3. Heel to medial malleolus: Length from pternion to the most medially protruding point of the Medial Malleolus, measured along the Brannock axis. 4. Heel to lateral malleolus: Length from pternion to the most laterally protruding point of the Lateral Malleolus measured along the Brannock axis. 5. Heel to 5th toe: The distance along the Brannock axis from pternion to the anterior 5th toe tip.
4 widths	<ol style="list-style-type: none"> 6. Foot width: Maximum horizontal breadth (Y-direction), across the foot perpendicular to the Brannock axis in the region in front of the most laterally prominent point on the 5th metatarsal head. 7. Heel width: Breadth of the heel 40 mm forward of the pternion. 8. Bimalleolar width: Distance between the most medially protruding point on the medial malleolus and the most laterally protruding point on the lateral malleolus measured along a line perpendicular to the Brannock axis. 9. Mid-foot width: Maximum horizontal breadth, across the foot perpendicular to the Brannock axis at 50% of foot length from the pternion.
3 heights	<ol style="list-style-type: none"> 10. Medial malleolus height: Vertical (Z-direction) distance from the floor to the most prominent point on the medial malleolus. 11. Lateral malleolus height: Vertical (Z-direction) distance from the floor to the most prominent point on the lateral malleolus. 12. Height at 50% foot length: Maximum height of the vertical cross-section at 50% of foot length from the pternion.
6 girths	<ol style="list-style-type: none"> 13. Ball girth: Circumference of foot, measured with a tape touching the medial margin of the head of the 1st metatarsal bone, top of the 1st metatarsal bone and the lateral margin of the head of the 5th metatarsal bone. 14. Instep girth: Smallest girth over middle cuneiform prominence. 15. Long heel girth: Girth from instep point around back heel point. 16. Short heel girth: Minimum girth around back heel point and dorsal foot surface. 17. Ankle girth: Horizontal girth at the foot and leg intersection 18. Waist girth: Circumference at the approximate center of the metatarsal, measured in a vertical plane, perpendicular to the Brannock axis.

Figure 2.21 Luximon, A. (2013), Tablet to explain the numbers in Figure 2.20, Retrieved from

“Handbook of footwear design and manufacture”. Page 76 [Tablet]

2.2.3.3 Shoe Last

Last (Figure 2.19) is an important tool to determine the internal space of a pair of shoes and the general style of the shoe. The main role of the last is to serve as the interior model of the shoe, helping to maintain the shape of the shoe, while providing a fixed working platform during the shoe-making process. Each type of last is designed with a specific shape and size to suit different types and styles of shoes, ensuring the correct shape and structure of the shoe during the manufacturing process, and affecting the comfort and appearance of the shoe when worn. The shape of the shoe last is very similar but not exactly the same, because the human foot needs space when wearing shoes, and the volume of the shoe last of the same size is greater than the human foot from this point of view. The first part of designing a pair of shoes is to design or choose a suitable last. The last design has very detailed theoretical data that cannot be fully presented in this section. For more detailed data, please refer to *Handbook of Footwear Design and Manufacture* edited by A. Luximon (2013) chapters 9-11.

2.3 Broad Definition and Understanding of Fashion

The first sense that people receive information is vision, and fashion, as a product of vision, naturally becomes the medium of information transmission. Because fashion conveys information and meaning through appearance and clothing, fashion and clothing can be regarded as a non-verbal form of communication. People express their identity, gender, social status, and other information by choosing specific fashion styles and wearing specific clothes. With the development of society, the tolerance of fashion is constantly improving, and fashion is not only exclusive to the rich and famous. Because fashion can be expressed by anyone, fashion can be used to challenge and push the boundaries of class, gender, sexual orientation, and social identity (Barnard, 2002) . What is fashion? Fashion, like culture, cannot be explained from a single perspective. The definition of fashion is not the same in different contexts. Fashion can be understood as a popular way of dressing, an art form, a group entertainment, and consumer behavior. Fashion can also be seen as a way of expressing the psychology of individuals and groups, as a non-verbal means of communication. In addition, fashion can also be seen as a projection of body and self-identity, as well as a defense mechanism against age and death (Barnard, 2020). Roland Barthes and Richard Howard (1990) see fashion as a structured system of signs, more about the language of clothes than the clothes themselves. Gilles Lipovetsky (2002) describes fashion as a central mechanism of modernity, reflecting individualism and ephemeral aesthetics. Elizabeth Wilson (2020) considers fashion as an art form as well as a manifestation of social, economic, and political changes. Anne Hollander (1993) regards fashion as a visual art that reflects historical and cultural dynamics through the lens of personal style and societal trends.

If fashion is discussed separately, people link fashion with art. Indeed, art and fashion influence each other in objective history. Is fashion art? Can the products of fashion industrialization be called art in themselves? Looking back at the works of some fashion designers involved in the design of the brand, those classic collections of customized clothing full of stories and themes seem to overlap with artistic expression in many ways. These haute couture works are not replicable, there are expressive themes and even some content contains a lot of realistic themes. A complete design series is like a work of art, not only the creation of visual art but also the discussion of realistic problems or artistic problems (Barnard, 2020) .

There seems to be no expression of this artistic meaning for the "ready-to-wear" design product itself, but the ready-to-wear design, as part of the fashion industry, also affects the promotion of the fashion industry culture, although it has separated from the scope of art (Barnard, 2020) .

Fashion, like culture, is a community. Considering fashion as a kind of culture, just as the culture mentioned in thesis 2.1 is a representative of a certain lifestyle of a group, fashion is a culture followed by a group at a specific time. A particular fashion differs from a particular taste in that it implies some degree of compulsion on the part of the group, rather than individuals choosing from many possibilities (Sapir, 1931). In the context of modern globalization, fashion through the transmission of information and marketing is no longer a minority of people, unlike hundreds of years ago fashion was exclusive to aristocrats and celebrities. Because the platform of fashion display began to flatten, the platform of fashion display in daily life became no longer limited, and the fashion of cities like New York, Paris, Shanghai, and Tokyo seemed to affect all aspects of people's lives. The spread and development of fashion has made fashion a typical modern lifestyle, and the reason is that fashion can express the spirit of The Times and show it in a visible form - fashion can be a carrier of the abstract problems of The Times (Vinken, 2004).

According to the understanding of the content of these articles, the definition of fashion can be summarized into the following aspects:

2.3.1 Style and Clothing

This is the most basic attribute of fashion, and it is also the purpose and source of fashion creation in the first place. Clothing and accessories are important expressions of fashion, which represent the style of people in a certain period or context, and how the social environment is expressed through fashion. The changes in Chinese women's dress from the Tang Dynasty (Figure 2.22 left). to the Qing Dynasty were remarkable (Figure 2.22 right). The Tang Dynasty had frequent and open exchanges with the world because of its strong national strength. People's clothing is relatively freer and more open, so, in this context, people are more willing to show their body advantages. With the change of the times when the Qing Dynasty closed the country, the collar design became more and more conservative. The change of clothing and style is a direct expression of the current environment.



Figure 2.22 Zhou, F. (Tang dynasty). Ladies Wearing Flowers in Their Hair [Chinese traditional paint] (Left). Unknown, Ladies wearing traditional costumes of the Qing dynasty [Wang, X. uploaded photograph] (Right).

2.3.2 Cultural Expression

Just like the cases mentioned in 2.2.2, each shoe design is supported by culture, and culture and shoe design influence and develop each other. In contrast, culture has a variety of influences on fashion, and fashion, as an expression of culture, allows individuals and groups to express their identity, beliefs, and upbringing through their choice of clothing and accessories. It can indicate the identity, status, or adherence to a particular cultural tradition of a member of a particular group (Barnard, 2002; Hollander, 1993).

2.3.3 Art

Fashion is also regarded as an art form, and the reason why fashion is regarded as an art is that it is not only concerned with the practicality of clothing, but also involves creative design, aesthetic expression, and cultural communication (Taylor, 2019). Through their work, fashion designers show personalities, emotions, and stories, just like any other art form. The book *Galliano Spectacular Fashion* records most of John Galliano's classic design dresses and shows from 1984 to 2015. The design expression of these couture clothes is very similar to the expression of the artist's artwork. With his unique, luxurious, and dramatic design style, John Galliano mixes historical, cultural, and dreamy influences to create stunning visual effects and deep emotional experiences. Galliano's work shows how fashion design can go beyond the function of everyday wear to become a means of expressing personal identity, cultural

background, and artistic creativity. His designs (Figure 2.23) are not only clothes but also works of art, with deep meaning and emotional power, which makes his fashion shows often regarded as a kind of performance art (Taylor, 2019)



Figure 2.23 Maison Margiela (2024). A model wearing Maison Margiela Spring 2024 Couture Collection. [Photograph].

2.3.4 Industry and Commerce

The fashion economy is still an important part of the global consumer industry today. The fashion economy can reflect the current economic environment and status quo, and the content covered by the fashion economy is more complex and detailed. Fashion is a global industry from the design of clothing and accessories, manufacturing, distribution, marketing, and retail supply chain details while covering all parts of couture, ready-to-wear, and fast fashion; each part caters to different market segments and consumer needs, requiring huge management operating systems to achieve the global status of the fashion economy (Thomas, 2008).

2.3.5 Trend-Driven

With the support of the fashion economy, the fashion industry has formed the current fashion model through continuous marketing and creation - continuous innovation is the core driving force of fashion. Innovation touches every part of fashion. Fashion captures trends using culture - innovating through the cultural labels of film, art, music, and social issues. The innovation formed after these cultural elements, which are originally social trends, are utilized by fashion further enhances the influence of fashion trends. The pursuit of innovation is associated with the innovation of other industries behind the fashion industry. The application of innovative materials and new technologies can often quickly react in the fashion industry. These phenomena are important reasons for the trend-driven nature of fashion (Brannon, 2010).

2.3.6 Symbolism and Communication

In Malcolm Barnard's book *Fashion as Communication*, it is mentioned that fashion is a non-verbal means of communication, and clothing and accessories can convey information about one's status, occupation, race, religion, etc. Furthermore, it is a visual language that helps

individuals communicate their identity without words. Looking back at the history of some fashion changes, each era seems to have some representative fashion symbols, "rock style", "boot-cut jeans", "Yeezy," "high-street," "Supreme," and so on. All of these labels seem to be associated with a particular period. This is why fashion can be used as Symbolism and Communication (Barnard,2002).

2.4 Fashion Impact

Fashion from the industrial age into the post-industrial era, from a centralized single authority, has become more fragmented and diversified, with the advent of the information age dispersed fashion authority more. In the post-industrial 20th century, fashion was no longer bound by class and more and more began to truly go to the masses (Crane, 2000). Today, social media platforms give fashion a voice to more people. Whether it is luxury fashion, industrial fashion, or street fashion, more fashion is chosen by consumers, and the fashion industry is influenced by social network culture. At the same time, fashion also influences people's lives through social media (Dorado, 2011). For brands and designers, jumping on social media has many benefits. In addition to being a free tool for public relations, social media connects potential buyers with marketers. Emerging designers and high-end brands are using social media as one of their marketing strategies. Big brands and designers in the industry use social media to create hype before the official launch of fashion shows and events (Ahmad, et al., 2015). Social media marketing requires fashion company posts to have more visual effects or dramatic content, and such a series of marketing will spawn some designs that exist for visual effects. Just like the big red boots of MSCHF in 2023 (Figure 2.24 left) and the post of the AVAVAV fashion show in 2022 (Figure 2.24 right), in addition to the designers of the brand, more social media icons

appear, and all kinds of creative and even some incredible and illogical fashion appear. Although some of the fashion elements are not common sense, these posts are successful both in terms of social media spread and topic popularity (Ahmad, et al., 2015).



Figure 2.24 MSCHF (2023), A model wearing 2024 MSCHF big red boots. [Photograph] (Left). AVAVAV (2022), Models falling on the stage in AVAVAV Spring-Summer Show. [Photograph] (Right)

Fashion trends are ephemeral, but they affect not only what people wear, but also how they live. The lawn tennis shoe mentioned in 2.2.2 of this thesis is a good example: Lawn tennis became popular at the beginning, and people made lawn tennis shoes because they did not have suitable shoes. The birth of such shoes led to the application of new materials and the emergence of a new outfit style, which derived an elegant sports fashion style. In turn, these fashion elements make more and more people join the sport, thus changing the way people live.

Fashion trends play an important role in cultural identity and communication. Individuals and groups can use fashion as a way to express their traditions, beliefs, and values (Crane, 2000).

For example, more and more Chinese fashion designers like Ziggy Chen, Yueqi Qi, and UMA Wang are interpreting East Asian aesthetics with their designs. Conversely, the global spread of certain fashion trends may dilute or blur cultural identities (Kaiser & Green, 2021). For example, American pop and hip-hop culture has more or less influenced fashion trends since its birth, from 2013 to 2017, hip-hop rappers ASAP ROCKY, Aubrey Drake Graham, Kanye West, Travis Scott, and fashion designer Virgil Abloh, who was deeply influenced by hip hop culture, brought the culture to the world's climax. It's not that the effect is negative; it's just that cultural influence on a phenomenal scale like this can dilute some unique cultural identities, allowing cultures to converge as they develop. Nowadays, many young generations tend to ignore the charm of their own national culture while pursuing pop culture.

2.5 Brief Introduction of Fashion and Footwear

People have never stopped discussing the definition of fashion, but the influence of fashion on footwear design culture from both broad and narrow points of view is far-reaching. Shoes have always been a secondary product from the perspective of fashion design, but with the gradual improvement of footwear's influence on modern fashion, people's attention to footwear design is increasing, and footwear products not only produce some subculture branches but also become particularly important in fashion modeling (Kawamura, 2016). More and more footwear design concepts born for fashion modeling have appeared in some fashion shows (Figure 2.25). Secondly, the influence of fashion on footwear design will be directly reflected in the use of fabrics, the application of new technologies, the application of popular elements, the choice of colors, and so on.

As the intersection of fashion and industry as part of footwear products, balancing fashion and function needs to be discussed all the time. Therefore, how to add cultural expression into footwear design through fashion is also an important topic to be discussed in this thesis.



Figure 2.25 Botter (2023), A photograph of Botter 2023 fashion show new shoe concept.

[Photograph]

2.6 Brief Discussion of Footwear Function

Sports are the most directly related to function culture. With the development of different modern sports and the connection of globalization, some traditional sports or minority sports in many countries and regions have become more standardized and specialized based on modern

sports science (Greenhalgh & Greenwell, 2013). Unlike popular sports, minority sports do not have a large base of participants and audiences, and often the commercial value is not very good. As a result, there are not enough professional shoes for many sports, and many athletes will choose shoes from other sports. To a certain extent, unprofessional shoes will increase the risk of the sport (Sterzing, 2016). In the face of this situation, how to design more professional shoes will be a valuable issue to discuss. Business potential and sports science cannot be ignored. In the future, there will still be many sports entering people's vision and life through globalization, and sports equipment will be an indispensable part of a new sport. Footwear design will also face the need to solve the functional requirements of different sports shoe design, as well as some more professional complex problems. Therefore, the design of professional shoes is based on function, athlete protection, sports performance, and the understanding of sports mode, all of which are then translated into the design of shoes.

Traditional functional shoes can be divided into four parts: upper, insert, midsole, and outsole (Ames, 2023). These four parts constitute the basic function of the shoe. With the development of technology, there are also many integrated shoes (the shoes produced by one whole piece such as 3D printed shoes), Because the materials of various parts of traditional shoes will affect many aspects of shoes, such as sports performance and sports function, those shoes formed in one body are temporarily limited to the concept design of shoes, fashion design and some shoe designs that do not pay much attention to function. There are still limitations for the one-piece shoes that are applied to sports, so the function part is still discussed as a traditional shoe component based on function. How function reflects the related culture will be discussed in the form of case studies.

2.7 Shoe Last Making Process

The function of shoe last and the basic understanding of shoe last were discussed in chapter 2.2.3.3. In the process of designing a pair of shoes, the first part is to choose a pair of suitable shoe lasts or design a pair of suitable shoe lasts. Since this thesis mainly discusses the relationship between culture and footwear design, how to design shoe lasts will not be discussed in depth. But what designers need to know is the basics about the last and how it affects the function and shape of the shoe. *Footwear Pattern Making and Last Design* by Wade Motawi and *The Science of Footwear (Human Factors) and Ergonomics* by Ravindra S. Goonetilleke provided more information and details about shoe lasts. When people perform a certain kind of sport for a long time, the size of their feet will be affected by the sports environment, and the shoe last designed based on functionality should refer to the shape of the feet of specific sports groups. The last manufacturing method (Figure 2.26) used for making shoe lasts can solve this problem.

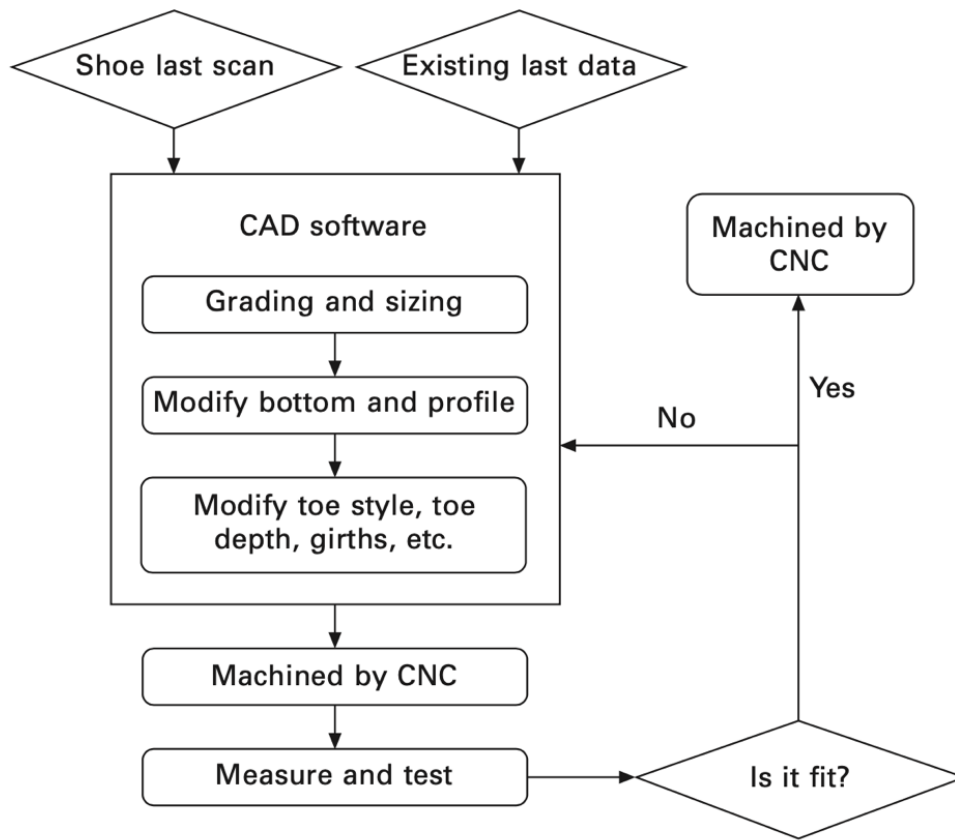


Figure 2.26 Luximon, A. (2013), Manufacturing Process of Shoe Lasts Making, *Handbook of footwear design and manufacture*. Page 194

Figure 2.26 shows the shoe lasts making process, starting with the Scanning of existing shoe lasts or organizing data according to existing measurement data (please refer to Chapter 2.2.3.3 and associated figures for the detailed list of shoe lasts) to help build CAD models (CAD models are computer data models. Commonly used software for last design is Rhino, Alias, and Fusion 360). Then designers can refer to the figure for the remaining steps. The CNC technology mentioned in it states to read the CAD model analysis and then manipulate the drill, cutter, and other tools to carve the material and get the solid model. For individual designers, 3D printing is a more economical and convenient choice. Additionally, 3D scanner works by capturing the

three-dimensional shape and details of physical objects, and Structured Light Scanning technology is commonly used in industrial manufacturing. In simple terms, the information collected by the emitted light beam is converted by the sensor into the computer, so that a three-dimensional model of the scanned object can be obtained in the computer, and this technology can capture some irregular objects in detail (Furht,2008. p.222). In addition, there are many types of scanners used in different industries.

CHAPTER 3 Case Study

3.1 Introduction

This chapter will analyze how to combine culture with shoe design through concrete element extraction through the case study, in which function and fashion cases will be the focus. The use of technology will only provide a brief introduction to the technical direction and will not analyze the detailed problems of each technology in depth. This chapter is divided into three parts: function, fashion, and technology. Through the understanding and extraction of cultural elements and subdivision into these three parts, designers should be able to complete the goal of combining culture and shoe design.

3.1.1 Upper

A pair of traditional shoes visually seems to consist of only two parts - the upper and the sole. These two parts include many branches, such as tongue, shoelace, toe, midsole, outsole, etc., leaving aside the details. The two parts that guide the overall structure of the shoe are the upper and the sole. As for the largest part of shoes, the upper plays the role of wrapping and supporting the foot (Sun, et al., 2020). The choice of materials determines the permeability, strength, water resistance, heat retention, flexibility, support, and aesthetics of the upper. The parts included in the upper are shown in Figure 3.1 It should be noted that the design of appropriate parts according to the characteristics and strength of some materials can help athletes improve sports performance and reduce the risk of sports injuries.

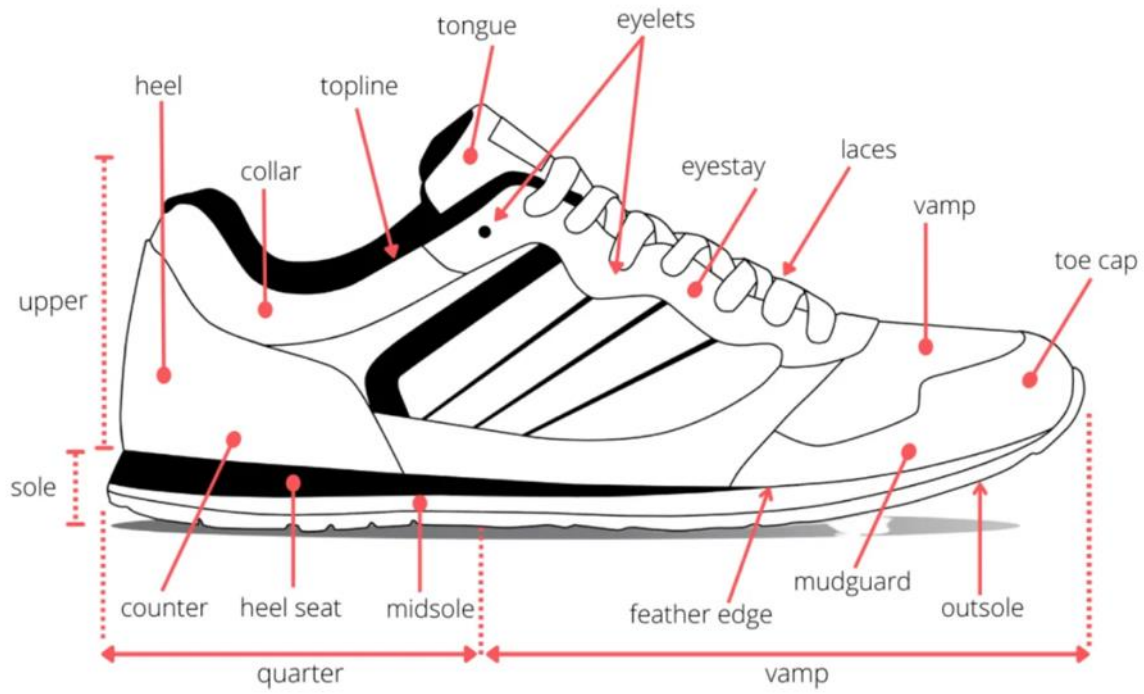


Figure 3.1 Ehm, C (2023). Anatomy of a Sneaker. [Diagram].



Figure 3.2 The Shoe Surgeon (2021). Anatomy of Nike Air Force 1. [Photograph].

3.1.2 Insole

The Insole belongs to the part of the shoe sole and usually refers to a piece of gasket inside the shoe. Some insoles are removable, and some are not. The insole adds cushioning inside the shoe, which can improve the comfort of the shoe (Sun, et al.,2020). At the same time, the insole also provides certain support for the arch of the foot (the role of the foot arch was mentioned in 2.2.3.1.2). That's why the insole is so important. Because of this importance, many professional athletes have their own custom insole created. Additionally, everyone's arch and foot shape is different, so it is difficult for industrial shoes to customize the insole for each pair of shoes, which also gave birth to the related industry of insole personal customization. If designing shoes for a certain sports group, the design of the insole can also consider whether this sports group has special functional needs, which will affect the design of the insole.

3.1.3 Midsole

The most direct role of the midsole is to absorb the impact force (Sun, et al.,2020). The role of the midsole is usually related to the material. Like for long-distance running, hiking, and other sports that need long-distance moving, the midsole is relatively soft. Sports like lifting, cross-fit, and other sports that require a more stable sole and ankle support need a harder midsole. The softness and elasticity of the material determine whether the midsole can meet the needs of the target function. Some designs include a small insert in the midsole as shown in the red part of Figure 3.3. This material will often be a relatively high strength, relatively light material with elasticity at the same time. This is designed to improve the athlete's ability to run and jump during exercise, which will give the athlete a sense of propulsion during exercise as

well as improve the torsion resistance of the shoe. The torsion resistance refers to the ability of the shoe to resist the deformation and torsion of the shoe's central axis during the movement.

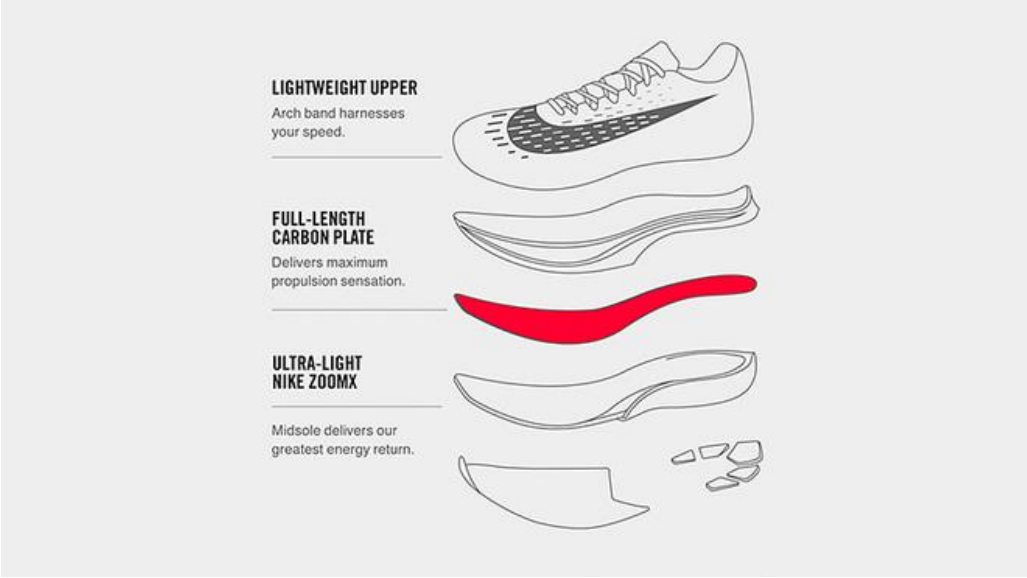


Figure 3.3 Nike (n.d.), Anatomy of Nike Zoom X Vaporfly Next%. [Diagram]



Figure 3.4 Speedland (n.d.), Anatomy of SPEEDLAND SL: PDX [Photograph]

3.1.4 Outsole

The outsole is the outermost part of the shoe that touches the ground directly. Its main role is to provide the shoe with the necessary grip and protection to prevent damage to the shoe by different surfaces (Sun, et al., 2020).

3.1.5 Basketball Shoe Case Study

Because basketball movement is complex and combines a variety of compound actions like running, jumping, sprinting, lateral displacement, shooting, etc., it has high requirements for the compound function of basketball shoes. This section will analyze some basketball shoes with characteristic movements, and then summarize the functional characteristics of different parts of sports shoes to support the establishment of guidelines. The sports function culture is added to the footwear design through the image element of function. The analysis was conducted according to the test methods of the footwear evaluation website <https://runrepeat.com> and the test specialist Dimitrije Curcic and combined with the characteristics of basketball players themselves.



Figure 3.5 Curcic, D. (2023), Shoe Breathability Test. [Photograph]

The shoe breathability test (Figure 3.5) puts smoke into the shoe and compares it with a standard control group. The standard control group was rated as 4 out of 5. The tested shoes were then scored according to the effect compare.



Figure 3.6 Curcic, D. (2023), Tongue Padding Thickness Test. [Photograph]



Figure 3.7 Curcic, D. (2023), Heel Stack Test (Average thickness of shoe heel part) [Photograph]



Figure 3.8 Curcic, D. (2023), Forefoot Stack Test (Average thickness of forefoot part).

[Photograph]



Figure 3.9 Curcic, D. (2023), Sole Softness Test. [Photograph]

The softness test uses a professional hardness tester to measure (Figure 3.9), divided into multiple measurements to take the average. The Shore hardness system is used, and the detailed knowledge about this system will not be explained in this paper. The higher the value this system measures, the softer it is, and the unit is HA.



Figure 3.10 Curcic, D. (2023). Stiffer Test. [Photograph]

The stiffer test involves stiffing the front foot of the shoe to a table and bending it to 90 degrees. A pressure gauge is used to gauge the stiffer force exerted by the shoe (Figure 3.10)

After the introduction of the measurement method, this section is divided into two groups according to the characteristics of 6 NBA professional basketball players. Players in the first category are LeBron James, Giannis Antetokounmpo, Zion Williams. Players in the second category are Stephen Curry, Damian Lillard, and Trae Young. The first type of player has the following common characteristics: power athletes, with high explosive power, dunk ability, strong defensive intensity, and strong physical quality. Simply put, this type of player has a strong strength level but also has a strong muscle-starting ability. During the game, they often need to fight with strength, jump higher, and move faster. The second type of players are smaller than the first type of players and are better at flexible dribbling, three-point shooting, dribbling penetration, cross-over dribbling, stealing, passing, etc. This type of player has the characteristics of flexibility and speed, so the game will need them to connect the team and feel the distance

between the players on the court, and there is a very strong sense of space. The physical intensity will be lower than the first type of players.

The following table is an analysis and discussion of the main basketball shoes players wore in the 2022-2023 season, a total of six pairs. Some of the data was measured by *Runrepeate.com* for these six pairs (this section does not contain all the data, but more details can be found at <https://runrepeat.com>).

Table 3.1

Analyze and Discussion of main basketball shoe that selected players wore in the 2022-2023 season.

	Nike Lebron 20, Lebron James	Nike Zion 2 , Zion Willams	Nike Zoom Freak 4, Giannis Antetokounmpo	Under Armour Curry Flow 10, Stephen Curry	Adidas Trae Young 3, Trae Young	Adidas Dame 8, Damian Lillard
Breathability	2 out of 5	3 out of 5	3 out of 5	5 out of 5	3 out of 5	2 out of 5
Tongue padding	6.3 mm	9.1 mm	8.4 mm	7.1 mm	3.7 mm	6.3 mm
Heel Stack (thickness)	27 mm	27.1 mm	32.7 mm	30.4 mm	29.6 mm	30.5 mm
Forefoot Stack	22.6 mm	19.1 mm	24.4 mm	24.5 mm	20.7 mm	20.1 mm
Midsole softness	25.5 HA	27.5 HA	27HA	24.6 HA	22.5 HA	20.3 HA
Weight	14.67 oz (416 g)	15.20 oz (431 g)	12.28 oz (348 g)	12.63 oz (358 g)	14.99 oz (425 g)	14.89 oz (422 g)
Stiffness	46 N	67.2 N	54N	35.5 N	40.8 N	41.9 N

Note. All the data from “<https://runrepeat.com>” by Curcic, D (2023).

Here are the height and weight of the players, according to the NBA's official website: LeBron James is 6 '9 "(2.06m) and weighs 250lbs(113kg). Giannis Antetokounmpo is 6' 11" (2.11m) and weighs 243lbs(110kg). Zion Williams is 6 '6 "(1.98m), weighing 243lbs (110kg). Stephen Curry is 6 '2 "(1.88m) and weighs 185lbs(84kg). Trae Young is 6' 1" (1.85) and weighs 164lbs(74kg). Damian Lillard is 6 '2 "(1.88m) and weighs 195lbs(88kg).

Midsole Softness

According to the connection between Runrepeate.com data and NBA's official body data, the two obvious differences in shoe selection were Midsole softness and Stiffness. First, the midsole softness of the first type of player is softer than that of the second type of player. The first type of player involves more longitudinal jumps in their sports, and the softer midsole improves the foot force absorption of players weighing more than 230 lbs. and reduces the pressure of the knee in the horizontal jumping and falling motion. The reason why the second type of player will choose the relatively hard midsole is that this type of player needs a very strong sense of space, in other words, the distance between the players, the feedback of the field, the instant change of the direction of movement, and so on. The harder the midsole, the better the physical feedback, allowing these players to react immediately. Compared with another type of shoe - tennis shoes, according to the data obtained by Runrepeate.com tennis shoes to measure the midsole softness, the average midsole softness of tennis shoes reaches 29HA. The tennis court is much harder than the basketball court, and the direct reason why athletes need a softer midsole is that they need the midsole to provide better force absorption and reduce the risk of joint injury.

Stiffness

Stiffness refers to the stiffness in a shoe. Stiffness can be understood in terms of the measurement logic. The larger the stiffness measured by the method, the stronger the longitudinal stiffness of the shoe. The stiffness in the shoes of the players in the first type is larger than the shoes of players in the second type. This is because the longitudinal torque resistance can improve the efficiency of the player's movement, help improve performance and running efficiency, and enhance the energy return to the athlete. Of course, it does not mean that a larger stiffness measurement is better, but should be in a suitable range, because the first type

of players need more stiffness strength to help jump and speed up in short bursts. Also, their body weight is larger than the second type of players, so they are more dependent on their performance and efficiency in running and jumping. For the second type of player, it is not that there is no need for shoe longitudinal stiffness to improve efficiency, but because too much torque resistance for athletes who are not so large in weight, to a certain extent, limits flexibility if the sole cannot bend, so then the running or other motions cannot be completed well.

Anti-rollover Design

According to Figures 3.11, 3.12, 3.13, and 3.14, Nike LeBron 20, Nike Zion 2, and Nike Zoom Freak 4 all have a prominent design parallel to the proximal phalanx joint of the foot. This design, called the Anti-rollover Design, is designed to reduce the risk of spring ankle injuries during the game. In contrast, the other three pairs of shoes do not have a significant anti-rollover design, but the front of the sole is widened to a certain extent. This anti-rollover design is a kind of protection for athletes with relatively large weights, and the process of constantly changing the direction of movement will put a lot of pressure on the ankle and the outside of the foot, and the shoe will have a certain risk of rollover in this case. Widening the sole or adding a small amount of anti-rollover design can reduce the risk of rollover, protect the player, and reduce the risk of injury. A similar design can be seen in some power-lifting shoes (Figures 3.15 and 3.16). Heel stability is very important for powerlifters when doing squats, so these squat shoes are almost completely flat on the back, using a harder material to maximize the anti-rollover design. The reason why basketball players do not use hard materials as anti-rollover systems is because basketball players need flexibility. This is also why Under Armour Curry flow 10 (Figure 3.17), Adidas Trae Young 3 (Figure 3.19), and Dame 8's anti-rollover design (Figure 3.18) are not very prominent. Because guard players need more flexible movement in different motions, part of the

anti-rollover design is canceled. That's why designers use a widening sole with a sleeker edge design to improve flexibility and guarantee some anti-rollover capability.



Figure 3.11 Brkicks (2023, November 27), LeBron James wearing Nike LeBron 20 [Photograph]



Figure 3.12 Nike (n.d.). Outside part of Nike Zoom Freak 4. [Photograph]



Figure 3.13 Nike (n.d.). Inside part of Nike Zoom Freak 4. [Photograph]



Figure 3.14 Nike (n.d.), Nike Zion 2. [Photograph]



Figure 3.15 Reebok (n.d.), Reebok Legacy Lifter III Shoes White Black. [Photograph]



Figure 3.16 Nike (n.d.), Nike Romaleos 4 SE. [Photograph]



Figure 3.17 Under Armour (n.d.), Curry flow 10. [Photograph]



Figure 3.18 Adidas (n.d.), Dame 8. [Photograph]



Figure 3.19 Adidas (n.d.), Trae Young 3. [Photograph]

Shoe bottom pattern and grip performance

The dense pattern can improve the wear resistance of the sole and good grip performance, and the direction of the pattern cannot be single. At the same time, the shoe pattern density can be adjusted according to the athlete's habit, such as some athletes will often use the heel force, so increasing the density of this part of the pattern can make the sole more durable. As observed in the soles in Figures 3.20, 3.21, 3.22, 3.23, 3.24, and 3.25, these pairs of shoes have good grip performance, and basketball players need soles with good anti-slip performance to reduce the risk of slipping during acceleration.



Figure 3.20 Nike (n.d.). Bottom view of Nike LeBron 20. [Photograph]



Figure 3.21 Nike (n.d.). Bottom view of Nike Zoom Freak 4. [Photograph]



Figure 3.22 Nike (n.d.), Bottom of Nike Zion 2. [Photograph]



Figure 3.23 Under Armour (n.d.), Bottom view of Curry flow 10. [Photograph]



Figure 3.24 Adidas (n.d.), Bottom view of Dame 8. [Photograph]



Figure 3.25 Adidas (n.d.), Bottom view of Trae Young 3. [Photograph]

And the shoe bottom pattern can change according to the requirements of the environment. For example, the bottoms of sprinting cleats and marathon sneakers are very different (Figures 3.27 and 3.26). Usually, the sprint field material is rubber, and the marathon runner must pass through a variety of fields. Nails can provide grip on rubber fields, but they are less effective on concrete. At the same time, marathon runners' shoes should not have too strong a grip performance, because increasing friction will also increase the athlete's physical consumption.



Figure 3.26 Nike (n.d.), Bottom view of Nike ZoomX Vaporfly Next% 2. [Photograph]



Figure 3.27 Amazon (n.d.), Bottom of sprinting cleats. [Photograph]

3.1.8 Design for Sports Features

Many shoes have some special functions that are specially made for some sports, and according to these examples, it can be found that the functional design of the shoe can be adjusted according to the existing problems. For example, in curling shoes, each shoe outsole material is not the same, as shown in Figure 3.28, curling shoes one is a rubber shoe outsole, and the other is a plastic shoe outsole. The plastic outsole allows the athlete to glide on the ice, while the rubber outsole allows the athlete to push forward by pushing against the ice and controls the glide to brake on the other hand.



Figure 3.28 Patrick, n. (2006), Bottom of curling shoes. [Photograph]



Figure 3.29 Olympic (2020), A photo of a curler pushing a curling rock with a plastic outsole on the front foot and a rubber outsole on the back foot. [Photograph]

Figure 3.30 shows climbing shoes. Climbing shoes are shoes that completely fit the curve of the foot, and the upper material is usually made of flexible materials, which can completely fit the foot type. The soles have very good anti-slip properties, and the toe box is pointed. This is to make the athletes have better toe strength (Figure 3.32) . The entire sole of the climbing shoe has a good anti-slip effect in any direction and is made of a single piece of rubber, which improves the safety performance of the athletes during the climbing process. Therefore, in summary, as long as we have a good understanding of the characteristics of sports and the way of exerting force, we can design a reasonable function according to these characteristics and ways, which is to combine culture and footwear design through function.



Figure 3.30 Black Dimond (n.d.), Black Diamond Shadow Climbing Shoe. [Photograph]



Figure 3.31 Scarpa (n.d.), A person wearing Scarpa climbing shoe. [Photograph]



Figure 3.32 Scarpa (n.d.), A person wearing Scarpa climbing shoe. [Photograph]

3.2 Fashion

Section 2.3 of this thesis has some discussion about fashion culture and the influence of fashion on footwear. This section explains how fashion extracts visual elements from some cultures and then carries out design and creation through the case study. The conclusions and methods of these case studies will also be applied to the guidelines in Chapter 4 of this thesis. In section 2.3, fashion is mentioned as a part of culture and a collection of culture. Fashion inspiration can often come from many aspects of human culture, such as the unique aesthetic value system of regional culture, film cultural symbols, fashion symbols in historical contexts, the beauty of natural and non-living creatures, cultural elements of religious connotations, the expression of different languages and cultures, the influence of music on popular culture,

architectural aesthetics, the exploration of emerging technological materials, and so on. Because there are not too many restrictions, exploration is often the main theme of fashion. The fashion of shoe design is often built on the balance of function, and some of the innovations in shoe design in the fashion shows only have less functionality. Therefore, in chapter 4, this thesis will determine the percentage of function and fashion according to the purpose of design, and search for inspiration and design within a controllable range.

3.2.1 Case study of regional culture aesthetics and fashion

The culture in which designers grow up is often the most direct source of inspiration. On the other hand, even without the growth environment of a certain regional culture, designers can still make designs that conform to local aesthetics according to some aesthetic studies. At the same time, the design made through the extraction of regional cultural elements can often bring surprises to people. Different regions often have different cultural aesthetics, and this aesthetic value can be directly expressed in the design. If designers can have a good understanding of the important elements of different cultural aesthetics, then it is very helpful for some cultural design. This section will analyze some designs with obvious regional cultural symbols and understand the characteristics of regional aesthetics from these cases.



Figure 3.33 Uma Wang (n.d.), Uma Wang 20SS Women show (Left). [Photograph]. Uma Wang 2023 lookbook (Right). [Photograph]



Figure 3.34 Ziggy Chen (2023), Ziggy Chen webpage look book (Left & Right). [Photograph]

As shown in the figures, these are the works of Uma Wang (Figure 3.33) and Ziggy Chen (Figure 3.34), two world-renowned fashion designers. The aesthetics of their works have a strong aesthetic expression of Chinese culture. We can compare the styles of these ancient Chinese paintings for discussion, as shown in Figures 3.35, and 3.36. As shown in the picture, the design of this skirt has the characteristics of traditional Chinese clothing, and the arrangement and color of the clothing pattern also contain the influence of traditional Chinese painting. The cut and shape of the two designers' clothes are also part of the interpretation of Chinese aesthetics——Soft and smooth cut, cross-opening collar, and spacious cuffs.



Figure 3.35 Zhang, X. (Song Dynasty), “Court Ladies Preparing Newly Woven Silk”. [Chinese traditional paint]



Figure 3.36 The Dunhuang frescoes. (Tang Dynasty), “A Buddha sitting on the Lotus Terrace” (Left). [Wall paint]. Guan, X. (Tang Dynasty),” A Monk sitting under the tree” (Right). [Chinese traditional paint].

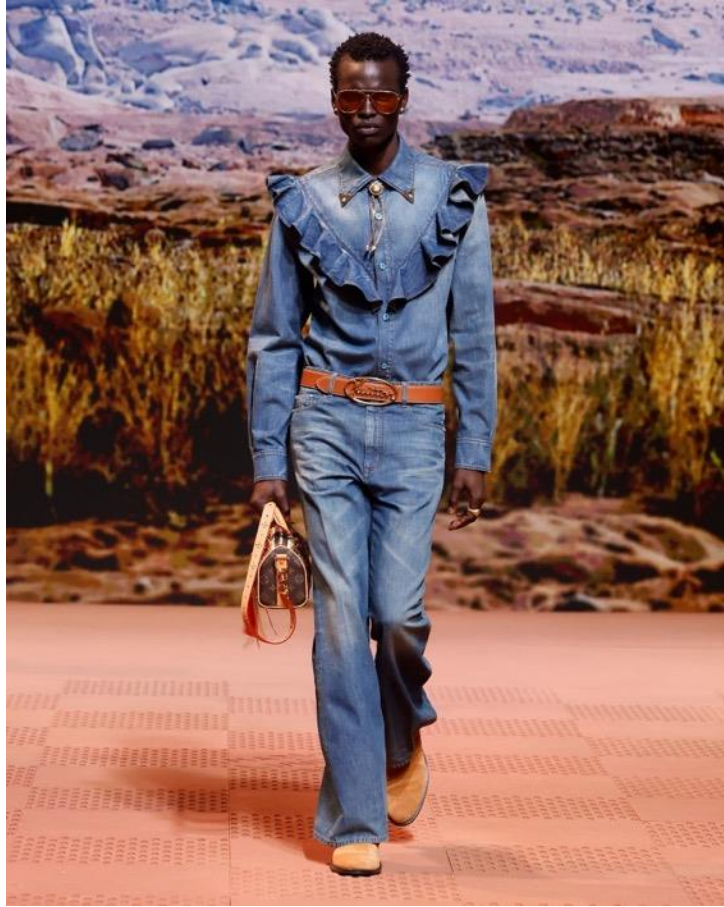


Figure 3.37 Louis Vuitton (2024), A model in Louis Vuitton's men's spring/summer 2024 show.

[Photograph].

As shown in Figure 3.37, the aesthetic style of Louis Vuitton's men's spring/summer 2024 collection is a series of designs based on the cowboy culture of American Western culture. As shown in Figure 3.38, the pants are embroidered in a classic pattern of the Western cowboy, and the cut of the clothes retains and amplifies the characteristics of cowboy clothing. The cowboy costume culture is also a very special and representative product of American regional history and culture (figure 3.39). This series of designs is also a good reference and expression of the cowboy culture in the western United States.



Figure 3.38 Vogue (2024), A picture collected of 5 outfits of Louis Vuitton's men's spring/summer 2024 show. [illustration picture].



Figure 3.39 Salecinask (n.d.), An old photo of cowboys. [Photograph].

The Yves Saint Laurent Autumn/Winter 1969 collection is a display of Moroccan aesthetic culture. Yves Saint Laurent's design had been deeply influenced by Moroccan aesthetic culture. The clothes in Figure 3.40 are inspired by the traditional Moroccan dress Moroccan Djellaba. As shown in Figure 3.41, Yves Saint Laurent's designs from 1969 to 1989 all had strong Moroccan colors. Whether it was cut or silhouette, Moroccan culture had a deep influence on Yves Saint Laurent's early designs. Figure 3.42 shows the rich color aesthetics of the traditional Moroccan fabric market, which also brings the rich colors of Morocco to the design of Yves Saint Laurent. Figure 3.43 shows more designs of Yves Saint Laurent inspired by Moroccan aesthetic culture.



Figure 3.40 Yves Saint Laurent (1969). Two models wearing Yves Saint Laurent Autumn/Winter haute couture. [Photograph].



Figure 3.41 Mytindy (2021, August 4). A lady wearing Djellaba with a camel. [Photograph]



Figure 3.42 Ekinci, E. (2016, July 6). The fabric market of Morocco. [Photograph]

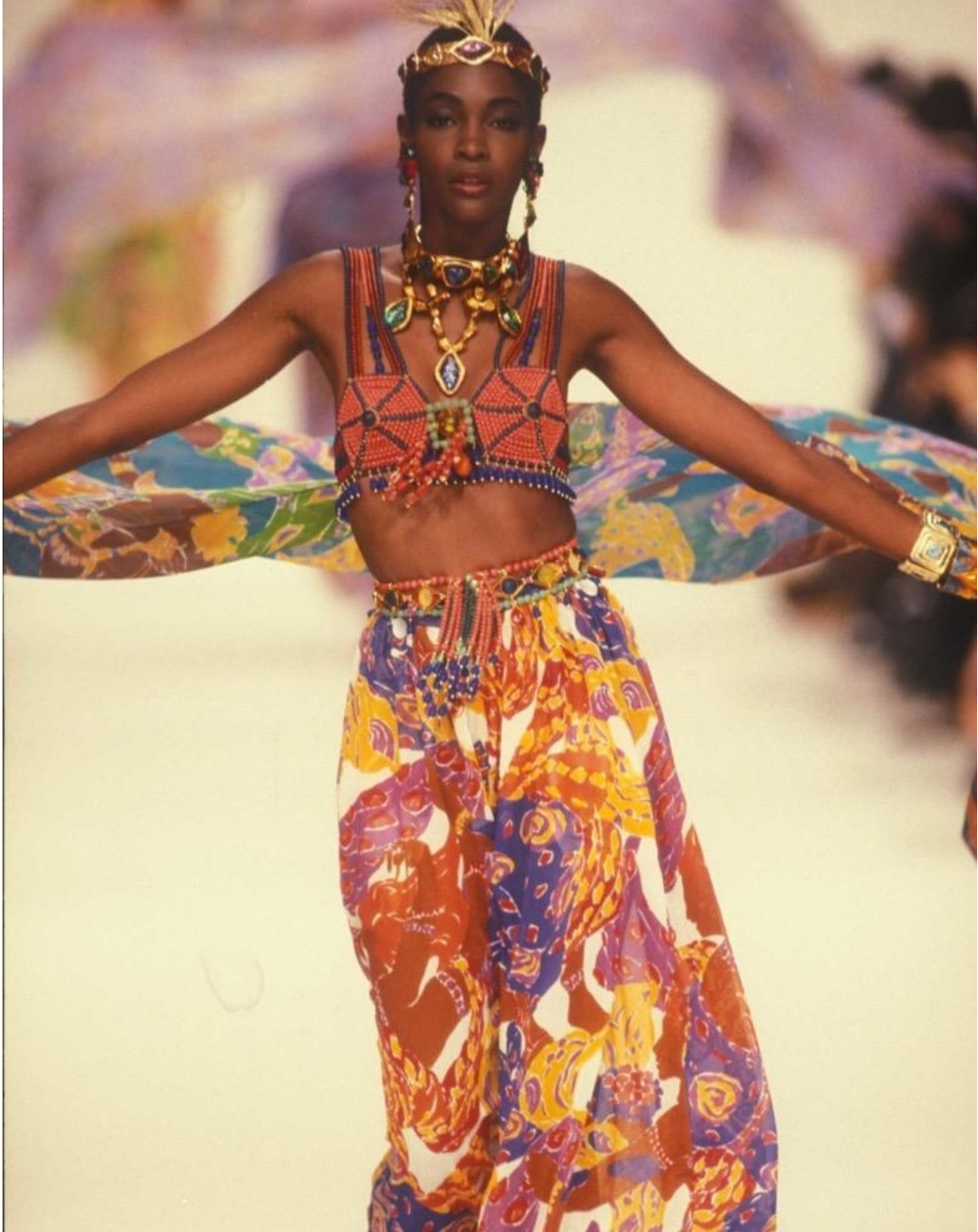


Figure 3.43 Museeyslparis (n.d.), A model in 1966 Yves Saint Laurent Show. [Photograph]

The theme of Christian Dior's Spring/Summer 2019 Haute Couture collection is circus culture, a classic symbol of 18th-century European culture (Figure 3.44). The modern circus

performance continues the costume characteristics of the time, forming the iconic costume style of the circus. The design of this collection applies many vintage circuses' costume elements (Figure 3.45), as well as some classic elements of circus culture. The setting of the show is more like an immersive circus show (Figure 3.46). As shown in Figure 3.44, clothes and accessories are inspired by the characteristics and colors of circus costumes.



Figure 3.44 LVMH (2019), A picture of models in Christian Dior's Spring/Summer 2019 Haute Couture show. [Photograph]. LVMH



Figure 3.45 Barnum & Bailey. (1899). Circus performers on stage of The Barnum & Bailey Show. [Photograph].



Figure 3.46 Figure 3.44 LVMH (2019), A picture of Christian Dior's Spring/Summer 2019 Haute Couture show. [Photograph]. LVMH

3.2.2 Case Study of Movie Culture and Fashion

Film art is a collection of aesthetics, literature, music, and photography. Many films with unique artistic styles have also deeply influenced fashion aesthetics. This section looks for some examples of movies' influence on fashion, proving that the inspiration of fashion can be deeply influenced by movies.

Thierry Mugler's Fall/Winter Ready to Wear 1990-91 jacket, shown in Figure 3.47, was inspired by the film *Alien*, and in tribute to the art of H.R. Giger (artist and art director of the *Alien* series). This jacket is also known as the Giger jacket. The jacket has several prominent pipe-like structures that reference the alien form in the film (Figure 3.48), and the overall cut of the jacket is heavily influenced by the space suit. Figure 3.49 shows Alexander McQueen once designed the Alien Shoes inspired by the movie. Both the shape and the details are a direct interpretation of H.R. Giger's aesthetics.



Figure 3.47 Simon, D. (1990). A model wearing Défilé Thierry Mugler 1990 Jacket.

[Photograph].

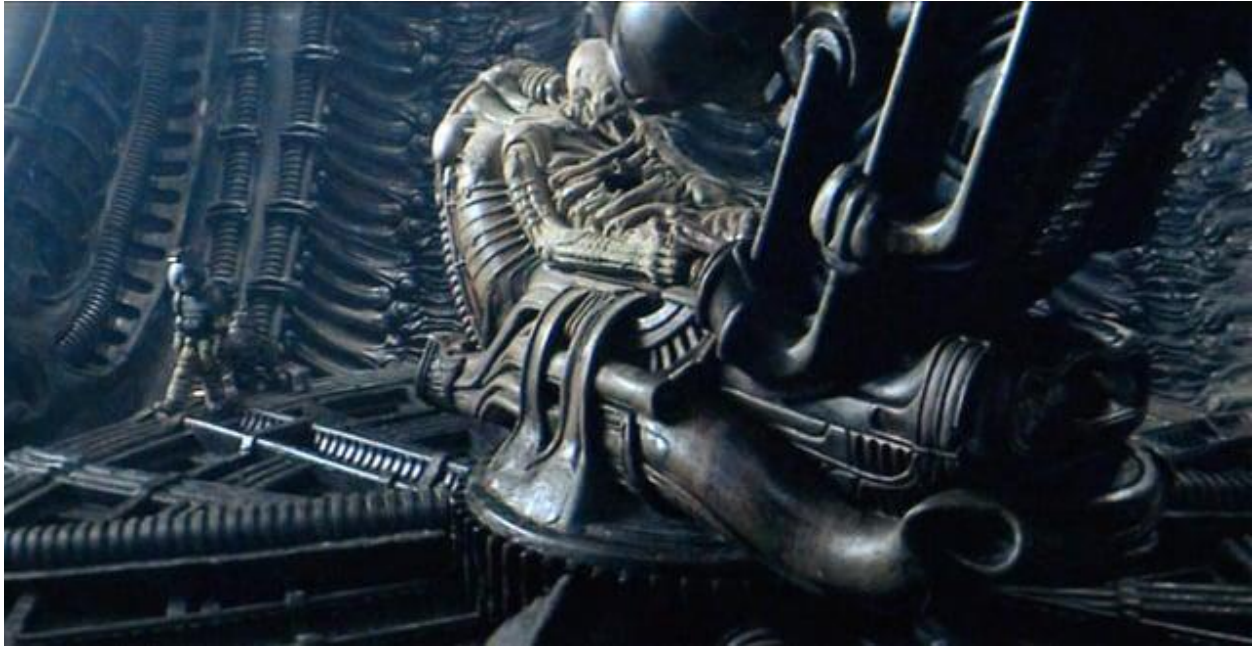


Figure 3.48 Scott, R. (1979). A scene from the movie *Alien* 1979. [Movie scene].



Figure 3.49 Alexander McQueen (2009). Alexander McQueen Alien Heel. [Photograph].

The shape of leather clothes, shoes, sunglasses, metal, etc. in *The Matrix* (Figure 3.50) is the most classic element of the millennium (Y2K), and the influence of the Matrix on fashion continues today. Christian Dior also released the 1999 autumn and winter ready-to-wear series inspired by *The Matrix*, as shown in Figures 3.51 and 3.52, designer John Galliano used a large number of leather clothes, boots, sunglasses, and other elements deeply influenced by the film. The cut and silhouette of the clothes are the shadow of the characters' clothes in the movie.



Figure 3.50 Wachowski, L. (1999), A scene from *The Matrix 1999*. [Movie Scene]



Figure 3.51 Persson, B. (1999), A picture of John Galliano with models after Christian Dior's 1999 show. [Photograph]. Vogue.



Figure 3.52 Persson, B. (1999), A model walking in Christian Dior's 1999 show. [Photograph].

Vogue

Dune (Figure 3.53) made apocalyptic fashion popular from 2021 to 2023, and DEMOBAZA (Figure 3.54), a fashion brand that collaborated with *Dune*, brought apocalyptic fashion to the fashion stage. The overall design style of Rick Owens' spring/summer 2022 collection (Figure 3.55 Left), spring/summer 2023 collection (Figure 3.55 Right), and Hamcus (Figure 3.56) are heavily influenced by the apocalyptic style. This style has entered people's daily life and become a fashion, and the film *Dune* has more or less influenced it.



Figure 3.53 Villeneuve, D. (2021), A scene from *Dune 2021*. [Movie scene]



Figure 3.54 DEMOBAZA (2021), A picture from Demobaza lookbook. [Photograph]



Figure 3.55 Rick Owens (2022), A photo from Rick Owens 2022 Spring/Summer lookbook (Left). [Photograph]. Rick Owens (2023), A photo from Rick Owens 2023 Spring/Summer lookbook (Right). [Photograph].



Figure 3.56 Humcus (2021), A photo from Humcus 2021 lookbook. [Photograph].

Back to the Future is a very classic American science fiction film, and its influence is also far-reaching. *Back to the Future* includes a lot of 1980s fashions (Figure 3.57). Although it is a film about the future, it is also a film that expresses the ideas and culture of Americans in the 1980s. In terms of fashion, perhaps the most far-reaching impact is Nike and *Back to the Future* cooperation Air Mag (Figure 3.58). This pair of shoes is people's imagination of the future shoe concept, and its function of automatically tying shoes makes people feel bright. And Nike has thus really begun to develop the path to self-lacing shoes. First released in 2011 and again in 2016, the unique shape and design make this shoe influential. In the same year, Nike also released the Nike Hyper Adapt 1.0(Figure 3.59), and self-lacing shoes went from the movie to reality.



Figure 3.57 Zemeckis, R. (1985), A scene from *Back to the Future* 1985. [Movie scene]



Figure 3.58 Nike (n.d.), Nike Air Mag 2016. [Photograph].



Figure 3.59 Nike (n.d.), Nike Hyper Adapt 1.0. [Photograph].

Reviewing the influence of movie and regional culture aesthetics on fashion, it can be concluded that designers can adopt a wide range of elements with clear aesthetic symbols and systems, and clothing styles are a direct source of inspiration. Additionally, like features, specific styles, colors, and clothing textures can be analyzed and extracted from those aesthetic systems.

3.2.3 Nature and Fashion

The creation of designs inspired by natural creatures quickly reminds people of the very famous Iris Van Herpen in 2021-2023, and the works at the Iris Van Herpen Spring-Summer 2021 Haute Couture show are a good interpretation of fashion's extraction of natural elements. As shown in Figure 3.60, this skirt is designed with the inspiration of the Marine creature feather star (3.61). The fancy dress edge is very similar to the feather star, and some unique colors of Marine creatures are also applied in the colors. Figure 3.62 shows Iris Van Herpen's other dresses are also heavily influenced by other natural objects. Iris Van Herpen is very good at seizing the morphological characteristics, colors, and elements of marine creatures to apply to fashion design, and as a designer, she can also use these natural creatures and non-living nature things as inspiration to add to the design of shoes.



Figure 3.60 Vogue (n.d.), Two Looks from Iris Van Herpen. [Photograph].



Figure 3.61 MBARI (2020), Feather star. [Video Scene].



Figure 3.62 Vogue (n.d.), Three looks from Iris Van Herpen. [Photograph].

Figure 3.63 Nike Air Max 97 "Shanghai" is designed with water waves as inspiration. The designer comes from Shanghai, because Shanghai is a city near the sea, and the water wave allows the designer to connect the design quickly. At the same time, it also uses the elements of mountains of traditional Chinese paintings (Figure 3.64), so that the design of this shoe not only expresses Chinese culture but also has very distinct nature and urban characteristics. This also makes this shoe one of the most successful Nike redesigned shoes of 2019.



Figure 3.63 Nike (2019), Nike Air Max 97 “Shanghai”. [Photograph].

It has to be mentioned that the Alexander McQueen 2001 collection is inspired by natural elements. As shown in Figure 3.64, many dresses on Alexander McQueen’s Spring/Summer 2001 couture women's show were inspired by nature. Among them, this Erin O 'Conner dress (Figure 3.65) was made of Razor Clam shells, which directly showed the beauty of natural creatures. This combination of fashion and nature is very successful. The unique elements of nature, organisms, or non-organisms are beautifully represented. The texture of the materials, the shape of the clothes, and the aesthetics of the whole collection all show the combination of nature and fashion.



Figure 3.64 Vogue (2000), Alexander McQueen’s Spring/Summer 2001 couture women's show.

[Photograph]

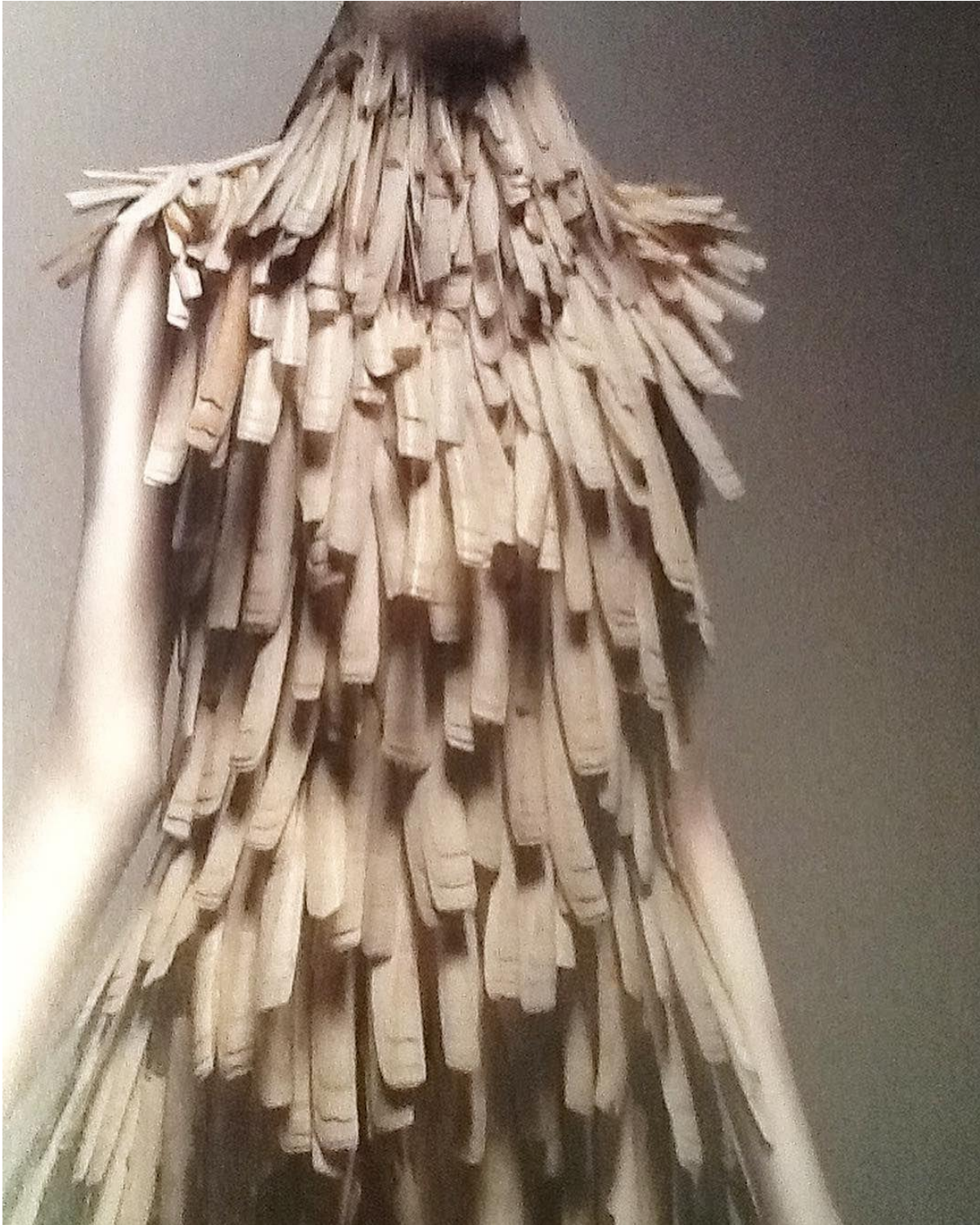


Figure 3.65 Vogue (2000), Alexander McQueen's Spring/Summer 2001 Clam Shell Dress.

[Photograph]

In conclusion, the extraction of natural aesthetic elements is not as direct as that of culture and film aesthetics. Because of the rich variety of natural elements, the choice of appropriate natural elements is the key to determining natural aesthetics. If designers need a more direct approach and understand how to extract natural elements as inspiration for their designs, the thesis *An Approach to Incorporate Generative Artificial Intelligence as a Means to Include Biomimicry within Industrial Design* by Gabby Lascari (2022) has a good explanation and method.

3.2.4 Religion and Fashion

Religion is also a very rich cultural element. Many religions contain lots of aesthetic symbols because of their long history and wide range of cultural influence. It should be noted that religion should not be offended when using religious elements as design elements. It should also be noted that not all religious elements are suitable for use in the design. This section will list some visual projects influenced by religion and discuss the visual elements that religion can provide to design.

Music artist Kanye West's 2021 "Donda" concert has a lot of religious elements, although the fashion connection doesn't seem to be that strong. But as one of the most trend influencers of 2019, Kanye West's concerts are still a mix of art and fashion. The church that appeared in the concert, as shown in Figure 3.66, is the theme that runs through the whole--memorializing his mother, marriage (Figure 3.67), and life with family. Those representations of all of this showed Kanye's Christian faith.



Figure 3.66 Yeezy team (2021), Kanye West standing in front of the church. [Photograph].



Figure 3.67 Yeezy team (2021), Kanye West and Kim Kardashian. [Photograph].

The Crown of Thorns (Figure 3.68) by music artist Kendrick Lamar and Tiffany in 2022 is a typical Christian element, a classic element of Jesus' crucifixion. It is also a product of being influenced by religion. From 2020 to 2022, people lost a lot of life experiences because of COVID-19, and some people didn't even survive from that time. Kendrick sings N95 (A song describing the suffering of people in the context of COVID-19) with the Crown of Thorns, and the effect is that he's praying, like praying for the suffering of people (Figure 3.69).



Figure 3.68 Mcdermott, K. (2022), Kendrick Lamar wearing Crown of (Tiffany & Co.) Thorns.

[Photograph]. Vogue.



Figure 3.69 Mcdermott, K. (2022), Kendrick Lamar singing on the stage with Crown of (Tiffany

& Co.) Thorns. [Photograph]. Vogue.

Dolce & Gabbana's spring/summer 2019 couture collection is inspired by Greek mythology, where Figures 3.70 and 3.71 show the goddess and the angel Cupid are deeply influenced by Greek mythology.



Figure 3.70 Dolce & Gabbana (2019), A model wearing Dolce & Gabbana's spring/summer 2019 couture collection. [Photograph].



Figure 3.71 Dolce & Gabbana (2019), Dolce & Gabbana's spring/summer 2019 couture collection. [Photograph].

In addition to the above-mentioned examples, some designs are inspired by church-style glass paintings and church costumes, using patterns, colors, and some handicrafts as design elements. For example, the dress design of Dolce & Gabbana Autumn/Winter 2013 women's wear is shown in Figure 3.72 and a dress from Christian Lacroix's autumn/winter 2009 couture (Figure 3.73).



Figure 3.72 Talon, K. (2017, November), Models wearing Dolce & Gabbana Autumn/Winter 2013 women's wear. [Photograph].



Figure 3.73 Singer, S. (2009, July), Christian Lacroix's bride--stunning in pale aquamarine zibeline. [Photograph]. Vogue

3.2.5 Technology and Fashion

Design often needs to explore the application of technology, and new technology can bring different visual effects to the design. Technology can also make design more possible. This section will give some examples of how technology can inspire fashion.

Greek researcher and visual artist Ioannis Michaloudis designed this Air bag (Figure 3.74) for the fashion brand Coperni in 2024, using a silica aerogel produced by NASA. This is a very light material. The whole Bag adopts the classic shape of a Coperni Swipe Bag, but the weight is only 35 grams. Such similar use and bold attempts to explore new materials further increase the possibilities of design and aesthetics. In 2022, Coperni designers "sprayed on" a dress for the model in the spring and summer women's fashion show (Figure 3.75), by spraying material directly on the model's body and waiting for solidification to form a dress that completely fits the model's body.



Figure 3.74 Coperni (2024), Coperni 2024 Air bag. [Photograph]. Coperni Instagram.



Figure 3.75 Coperni (2022), Coperni designers "sprayed on" a dress for the model in the spring and summer women's fashion show. [Photograph]. Coperni Instagram.



Figure 3.76 Bateman, K. (2016 October 3), A model wearing a pure white dress. [Photograph].

At the end of Alexander McQueen's spring/summer 1999 show, Shalom Harlow appeared in the middle of a circular platform, wearing a plain white dress (Figure 3.76). On either side of the platform, two Fiat-made robotic arms sprayed color at Shalom Harlow. The platform rotated with music, while the color eventually sprayed onto the dress, creating a very random but emotional pattern (Figure 3.77).



Figure 3.77 Bateman, K. (2016 October 3), The machine arms spraying color to the dress and model [Photograph].

The emergence of 3D printing has brought more possibilities to footwear manufacturing, and some shapes that are difficult to manufacture by traditional industrial means can be easily completed by 3D printing. Scry's shoes in Figure 3.78 are a good example of 3D printing applications. Many imaginative shapes can be 3D printed. Big red boots made by MSCHF

(Figure 3.79), which were widely discussed on the Internet in 2023, also use 3D printing technology.



Figure 3.78 Scry (2020), Scry 3D printed shoes. [Photograph]. Scry Lab.



Figure 3.79 MSCHF, A model wearing big red boots.

In conclusion, fashion inspiration can be combined with design through the perspective of human culture. This section only mentions a few of them. Any culture with an aesthetic system can be directly or indirectly applied to design aesthetics. In addition to those mentioned in this chapter, inspirations such as architectural aesthetics (Figure 3.80), aesthetics in historical context, ancient human aesthetics, etc., can be applied. Section 3.2 once again explains the connection between fashion and culture through these cases. And that link can be expressed through design utilizing dismantled cultural elements.



Figure 3.80 Clothing inspired by architecture.

CHAPTER 4 An Approach of Applying One Specific Culture to Footwear Design through Function and Fashion

This chapter will start by introducing the developed approach of this thesis--Footwear Design Box, and the Flow Chart detail developed from this method tool. Based on the Literature Review and Case Studies, this chapter summarizes how to apply one specific culture to footwear design through function and fashion. Chapter 2 discusses the importance of culture in footwear design and the relationship between culture, function, and fashion. The explanation of the guideline on this basis will show more specific ways to achieve the goal of the thesis.

4.1 Footwear Design Box

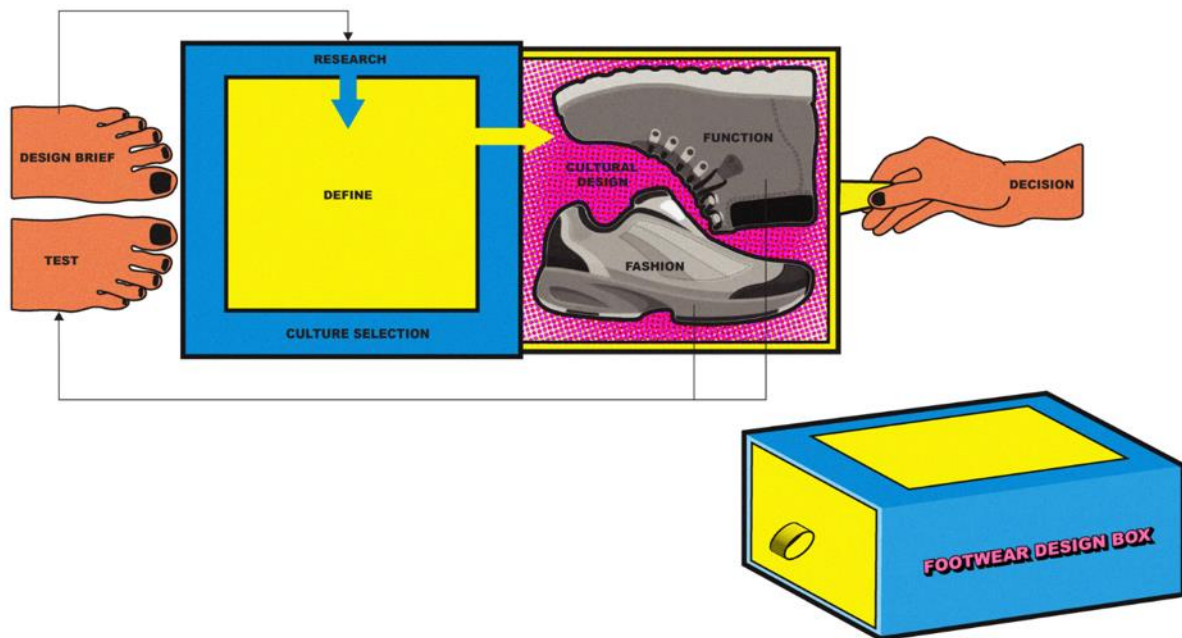


Figure 4.1 Footwear Design Box

This is the developed approach shown as a visual diagram (Figure 4.1). Starting from human feet, the diagram uses a shoebox to represent the design process. It uses two different shoes to represent fashion and function respectively, which are also the important themes of this

thesis. The purpose of this thesis is achieved through the selection and testing of fashion and function. The detailed steps follow the following sequence:

Step 1: Design Brief

Step 2: Research and Culture Selection

Step 3: Define Culture and Targets

Step 4: Cultural Design Through Fashion and Function

Step 5: Function and Fashion Test

Step 6: Refine and Decision Confirmation

Step 7: Final Product

For the two aspects of shoes that people are most concerned about fashion and function, there is often a conflict between the two. For example, very innovative shoes with fashion concept design as the main purpose are difficult to ensure comfort, while shoes with absolute functionality and sports as the main purpose need to make some sacrifices in fashion. Before designers design a pair of shoes that meet the Design Brief, they need to be clear about the purpose, and how to allocate the percentage of function and fashion is very important. The following sections will show detailed methods respectively. By dividing design goals into three categories, the general idea will follow the idea of the Footwear Design Box. After the design is completed, it is necessary to "test" the functional culture and fashion culture. This test is to analyze whether the design meets the design objectives, and then adjust or improve the final design according to the analysis results.

4.2 How to Apply One Specific Culture to Footwear Design through Function and Fashion

Flow Chart

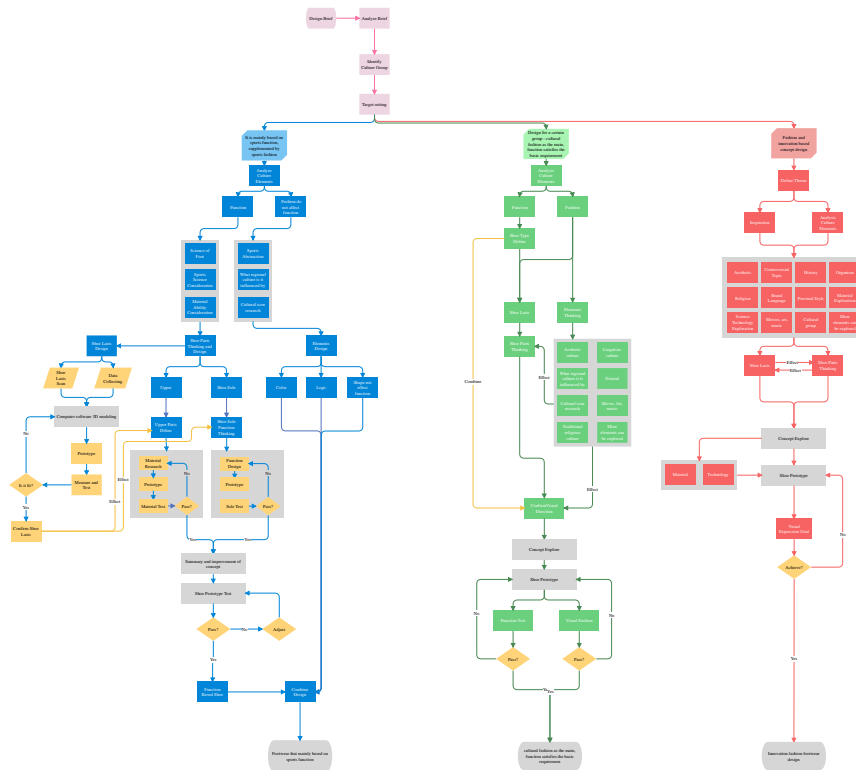


Figure 4.2 How to Apply One Specific Culture to Footwear Design through Function and Fashion Flow Chart

4.2.1 Design Brief

The first step in the methodology is to analyze the Design Brief (Figure 4.3). The Design Brief proposes the design challenge and outlines the needs as well as the criteria for the design project. This part of the process is very helpful in setting up the objectives later, as the needs of

the design brief are the most direct questions thrown at the designer. The designer needs to analyze and understand the problem to conduct further in-depth research. After analyzing the brief, it is necessary to identify the cultural group of the design target. The designer should summarize according to the content mentioned in brief: 1. Region to which the Group belongs. 2. Get a brief overview of the group's pop culture scene. This is a simple preparation before starting your research. After that, the designer should start setting up the goal for the design.

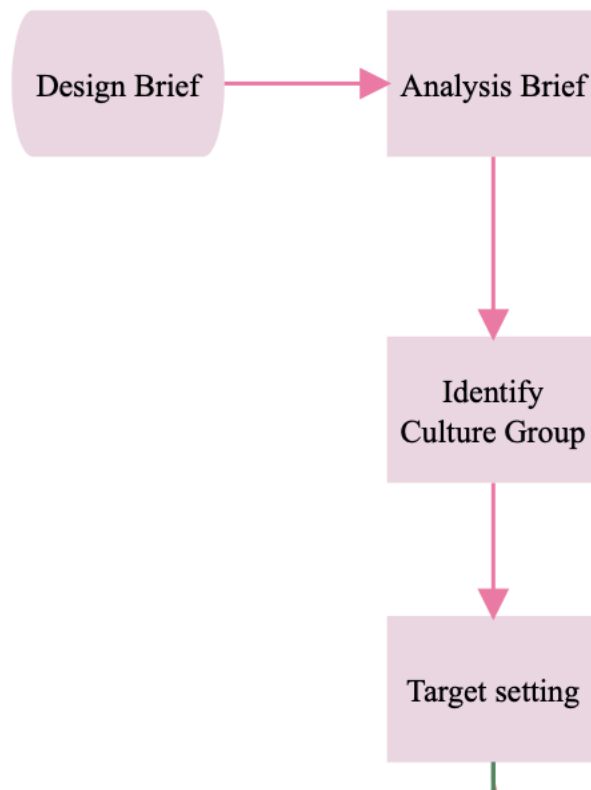


Figure 4.3 First step of flow chart

4.2.2 Goal Setting

Goal setting is the second step of the whole process. This thesis divides the whole footwear design into three goals, which can be selected and set according to the specific design brief. The reason for the goal setting is the balance between fashion and function discussed in section 2.2. If there is a clear goal, it is better to balance fashion and function.

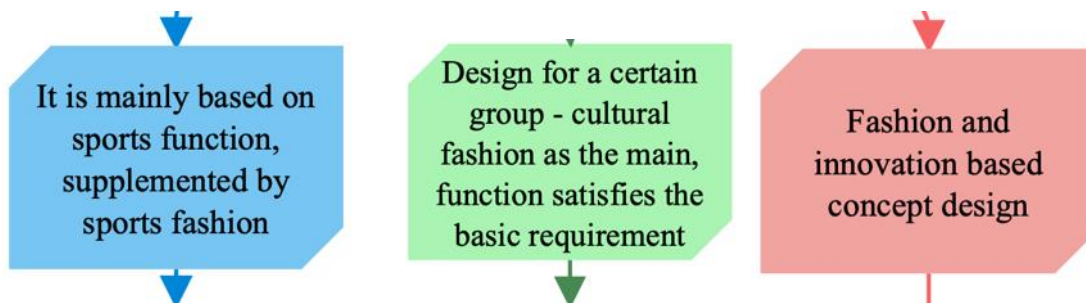


Figure 4.4 Three types of goal

The goal of the first type (Figure 4.4 Left): The design is based on sports functionality, supplemented by fashion elements. This type is one where most of the considerations are functional first. It is a design goal based on sports culture, and the sports culture here is the functional culture required by sports shoes. As mentioned in section 2.1 and section 3.1, functional requirements are also part of culture, and design by meeting functional requirements is also the realization of cultural design through functions. According to the above-mentioned content, this goal is strongly influenced by function, which means any fashion applied can't affect the function of the shoes.

The goal of the second type (Figure 4.4 Middle): The design for a certain group, the cultural fashion as the main target, function satisfies the basic requirement. For this purpose, function and fashion will interact, as mentioned in section 3.1.2, the shoe lasts will affect the shape of the shoe, and the shape of some shoes will also affect the comfort of wearing.

Therefore, this goal needs to meet the needs of basic shoes, but also consider the impact of adding fashion culture on shoes. In this case, the fashion research of a certain group will be more in-depth. The function and fashion should meet at middle range, which means, after satisfying basic function requirement the fashion can be applied to change the shape of shoes.

The goal of the third type (Figure 4.4 Right): The design considers fashion and innovation as the main purpose. Fashion is one of the important factors affecting footwear design. For this goal, more attention is paid to the concept and innovation of design. Therefore, this goal will discuss the footwear design approach from a fashion design perspective. As discussed in sections 2.3 and 2.3.1, fashion is an important part of culture. Therefore, it is very important to apply culture to footwear design with fashion as the carrier. Under this goal, fashion requirements and functional requirements will not be quantified in precise numerical terms. Because in the process of innovation design, the two still influence each other. But it's important to note that fashion needs to be given a higher priority as a consideration under this goal.

4.3 Flow Chart of First Type Goal (The design is based on sports functionality, supplemented by fashion elements)

The first type of goal is determined as the main goal (Figure 4.5). To meet the functional focus, the fashion of this part will be discussed in a secondary position, and the fashion elements that can be added will not affect the function. The reason why designers choose the first type of goal is usually to design a professional sports shoe such as shoes designed for basketball players, or professional tennis shoes designed for tennis players.

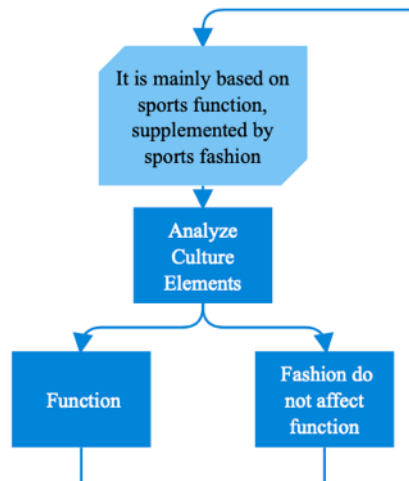


Figure 4.5 The second step of the first type of goal

4.3.1 Research Prepare

Before designers start to think about the specific design of shoes, they need to do three parts of research preparation (Figure 4.6):

1. Science of Foot
2. Sports science consideration
3. Material ability consideration

There is some discussion of foot science in section 2.2.3, but it is not very specific. If the shoe is designed for a certain sports group, it is necessary to collect the foot type data of this type of sports group to help design the shoe last in the next step. Concerning sports science, it is possible to analyze the motion of athletes in specific sports during exercise, such as running, jumping, stability, acceleration, load bearing, and so on. Then the designer should follow the way the functional requirements are met as mentioned in chapter 3. They should link the function of

the shoe to the motion of the athlete and think about professional function. According to the possible characteristics of the shoe, then the designer should do the appropriate material research.

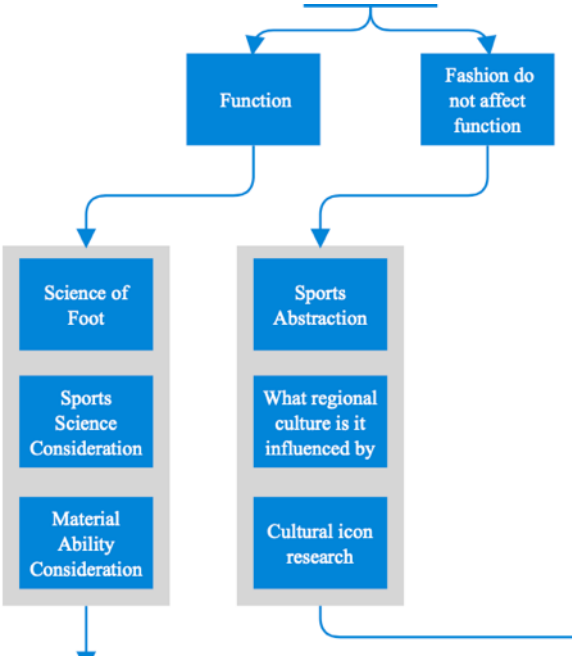


Figure 4.6 The third step of the first type of goal

4.3.2 Shoe Parts Thinking and Design

Once research is completed, the designer can start thinking about the shoe's components. Because it is based on function, it is divided into the shoe 's last design, upper design, and sole design according to the characteristics of the shoe (Figure 4.7).

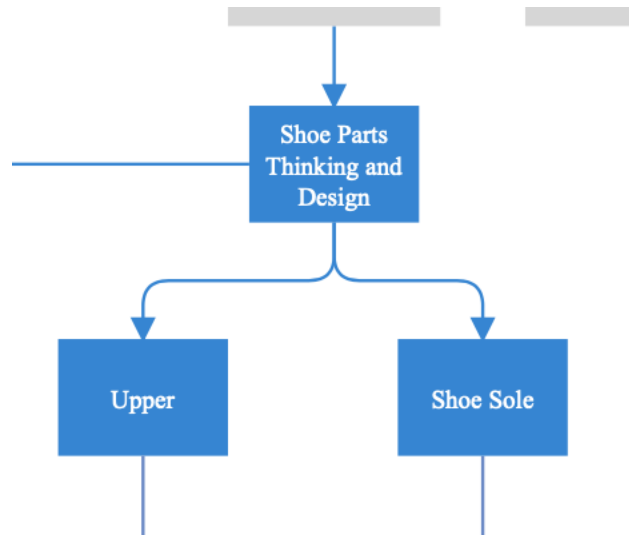


Figure 4.7 Shoe parts thinking and design.

4.3.3 Shoe Lasts Design

The last design process is based on the industrial design process mentioned in 3.1.1(Figure 3.1). As Figure 4.8 shows, the first step is based on the data collected or on the existing last of a particular sport. The designer then needs to put the scanned last into the computer for 3D model modification, or directly through the collected data for computer modeling. (The key data of the foot is mentioned in section 2.2.3.2 and can be measured and collected according to that standard). After the design of the computer model is completed, the shoe lasts can be printed using CNC or 3D printing technology. If the designer is more accustomed to other technology, it can also be used in this part. The goal of this step is to make the computer model into an accurate solid prototype. Then they should test the data to see if it meets the requirements; if not, the designer needs to adjust it in the computer and repeat the steps. The shoe lasts can be determined if the requirements are met.

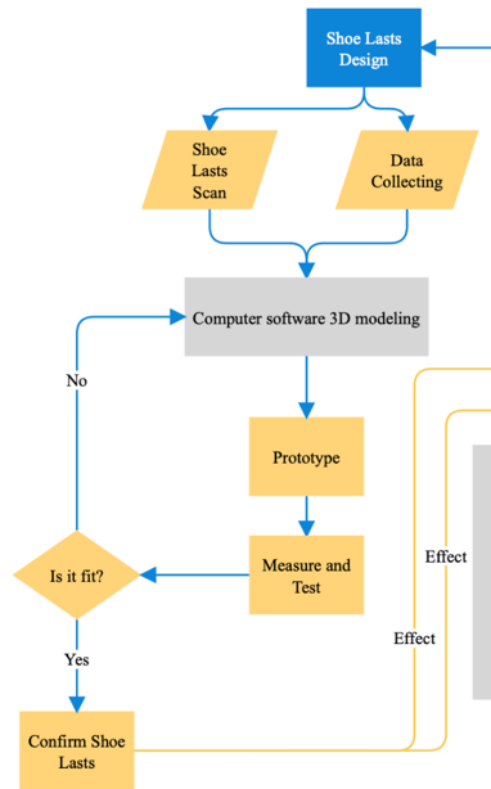


Figure 4.8 Shoe Last making and design.

4.3.4 Shoe Upper and Shoe Sole

After the last is determined, the design of the upper and sole can be considered according to the prior research. The functions of the sole and upper are summarized in 3.1.3 and 3.1.7. Section 3.1.7 summarizes the consideration process of sole function according to the case study of basketball shoes and player types. Designers can make designs based on the analysis of athletes in research. The main consideration of the upper is flexibility, support ability,

protectability, and breathability. All these properties need to be combined with material analysis.

The most commonly used method for upper design (Reed, 2017):

Step 1: Taping the identified shoe lasts.

Step 2: Apply a design to the shoe lasts.

Step 3: Transfer the 3D tape pattern into a 2D pattern.

Step 4: Adding technical information to pattern shape.

Because of the restrictions on the use of this guideline, this thesis can't mention the specific method of making shoe lasts in detail here. For more detailed steps, please refer to *Footwear Pattern Making and Last Design* by Wade Motawi (2020).

After the prototype is completed, the designer should test the prototype, and determine whether it meets the requirements according to the design brief. If it does not meet the requirements, they must repeat the steps, and improve the design. If the brief is satisfied, the upper part and sole part are combined and further tested, and finally, the function-based shoe prototype is obtained. The whole process is shown in Figure 4.9.

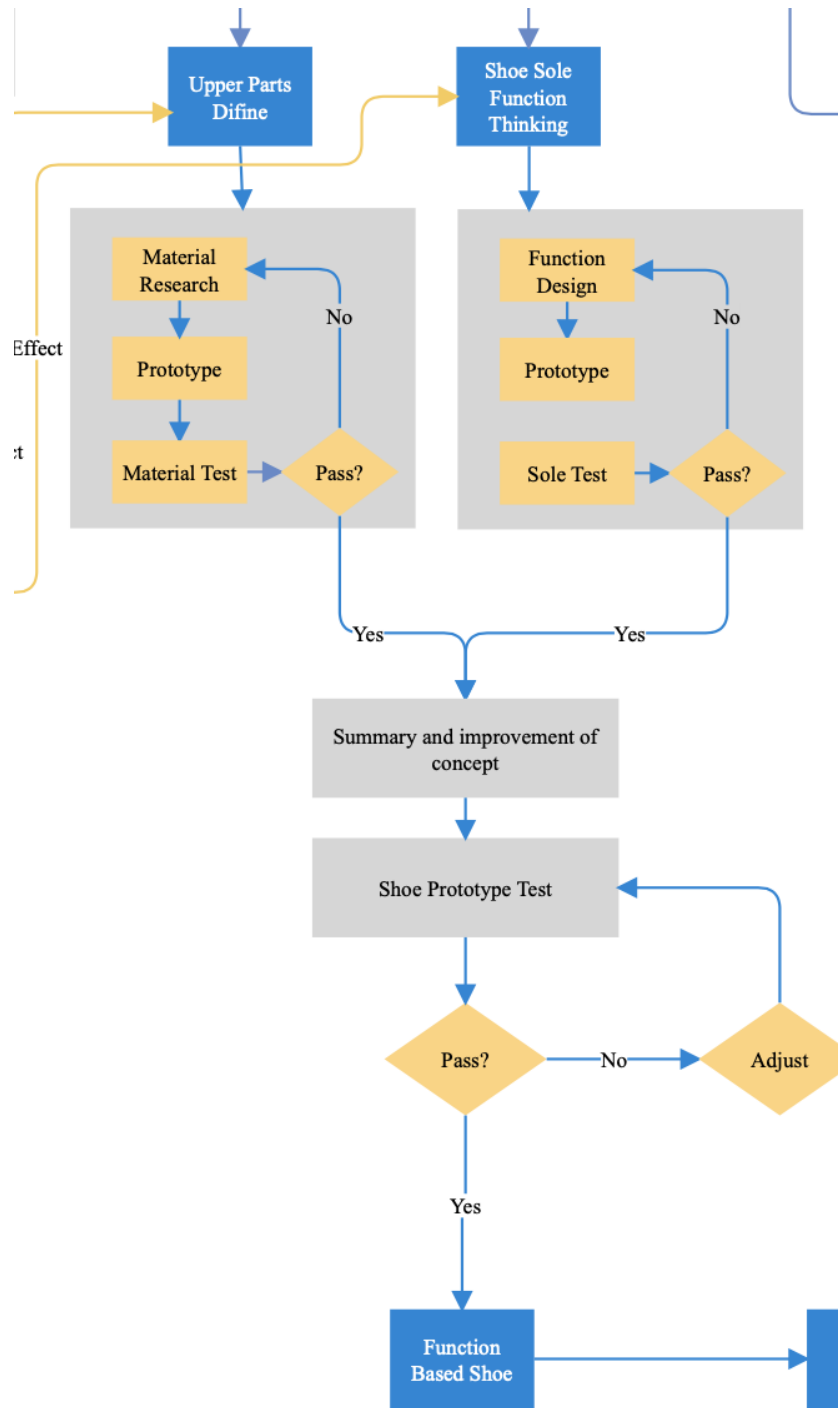


Figure 4.9 Design Upper parts and Shoe Sole steps

4.3.5 Fashion Elements Apply

After the functional design of the shoe is completed, fashion can be added. Again, because it is a function-based design, the fashion under this goal cannot affect any necessary function. Under this limitation, designers can use color matching, logo detail design, and some modeling design that does not affect the function. The design inspiration of this part can be abstracted from the sports motion, the regional culture that the movement is most influenced by, and the cultural icon as inspiration (Figure 4.10).

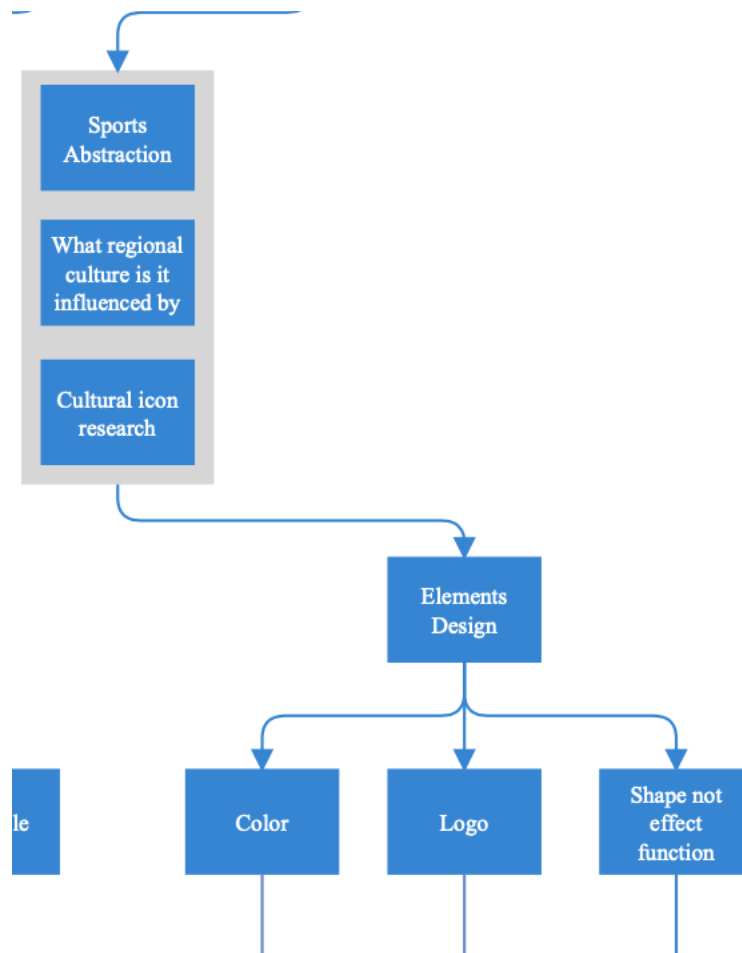


Figure 4.10 Apply fashion steps.

4.3.6 Combine Function and Fashion

The completion of the addition of fashion elements is to combine fashion and function, and finally achieve the goal of footwear design with function as the main aspect, and fashion as a supplement (Figure 4.11).

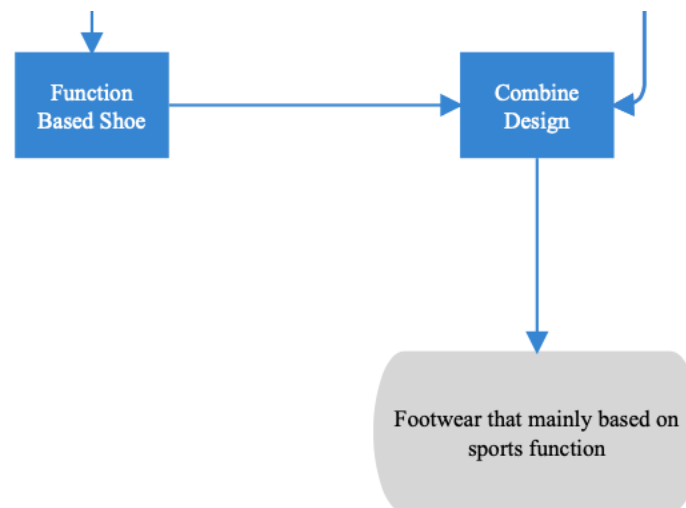


Figure 4.11 Combine design and finish.

4.4 Flow Chart of Second Type Goal (The design for a certain group, the cultural fashion as the main, function satisfies the basic requirement)

In this example, the second type of goal is determined as the main goal, based on satisfying the basic functional design. It mainly focuses on the cultural fashion design of a certain group (Figure 4.12). This goal is different from the first goal: as long as the general functional requirements are met, the designer can focus on more fashion design. The functions of this section will not be discussed in as much detail as the first type of goal, but the general direction can be referenced.

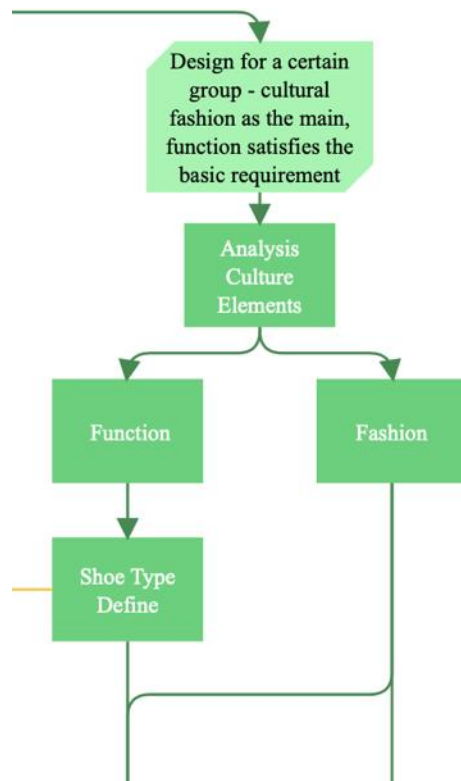


Figure 4.12 The second step of the second type of goal

4.4.1 Research Prepare

This research preparation will be different from the first type. There is less need for a detailed understanding of exercise science, but the same basic foot science and materials research is still needed. The fashion effect can be considered in the material research. Under this goal, designers need to focus on little bit more cultural fashion applied to shoe design, but still need to satisfy the basic function of footwear requirements. The key is to prepare for some aesthetic research on fashion, which requires detailed aesthetic research on the cultural group after it is determined.

4.4.2 Shoe Type Define

Because there is no need to think too much about function, it is possible to identify about 1-3 shoe types by studying specific group aesthetics in research. This section simply sets a direction and does not mean that adjustments cannot be made in subsequent steps.

4.4.3 Elements Thinking and Aesthetic Determined

According to the contents of case study section 3.2 and section 2.3, the research and extraction of group aesthetic elements can be carried out in these directions: the unique aesthetic value system of regional culture, film cultural symbols, fashion symbols in historical contexts, the beauty of natural and non-living creatures, cultural elements of religious connotations, the expression of different languages and cultures, the influence of music on popular culture, architectural aesthetics, the exploration of emerging technological materials, and so on (Figure 4.13). However, it should be noted that it is recommended not to choose more than three of these elements in this thesis guideline, because it is difficult to digest complex cultural content in one single design work. When the aesthetic elements are extracted, it is important to determine the visual direction, because in this goal, the visual direction may determine whether the final goal will be achieved or not. As explained in section 4.4, this type of goal ultimately relies on 40%-50% fashion expression. This is why visual direction is so important.

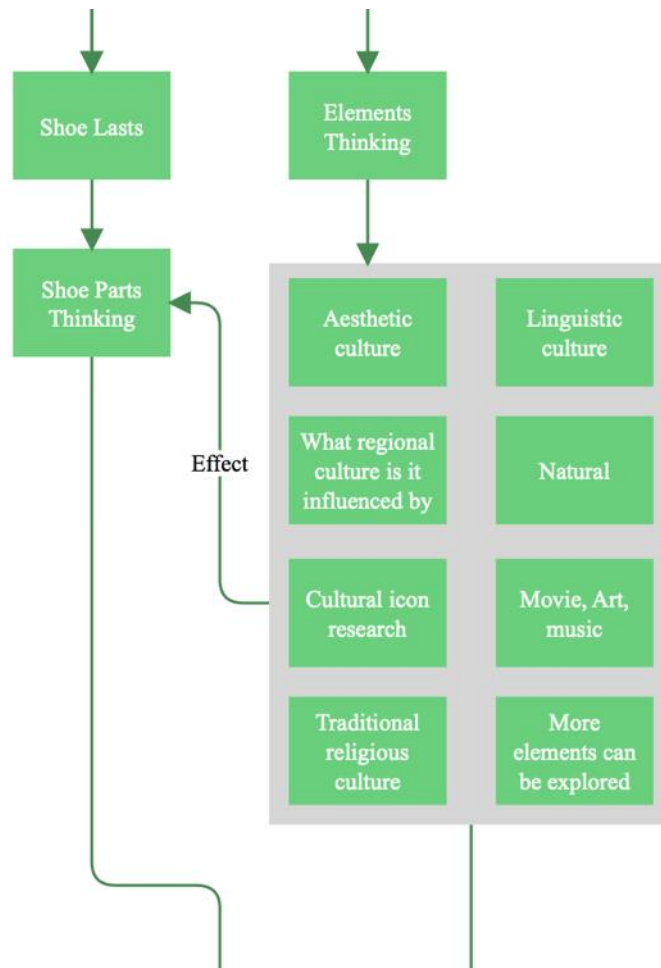


Figure 4.13 Elements of thinking and shoe parts thinking

4.4.4 Design and Prototype

According to the determined visual direction and shoe type, the next step is concept exploration (Figure 4.14). In this step, the designer should sketch the collected aesthetic elements, visual direction, and shoe type, and constantly extract from many sketches to select the final concept. Then they run prototyping after completing the concept, and then test the prototype. Problems are constantly found and solved in the test to achieve "The design for a certain group, the cultural fashion as the main, function satisfies the basic requirement."

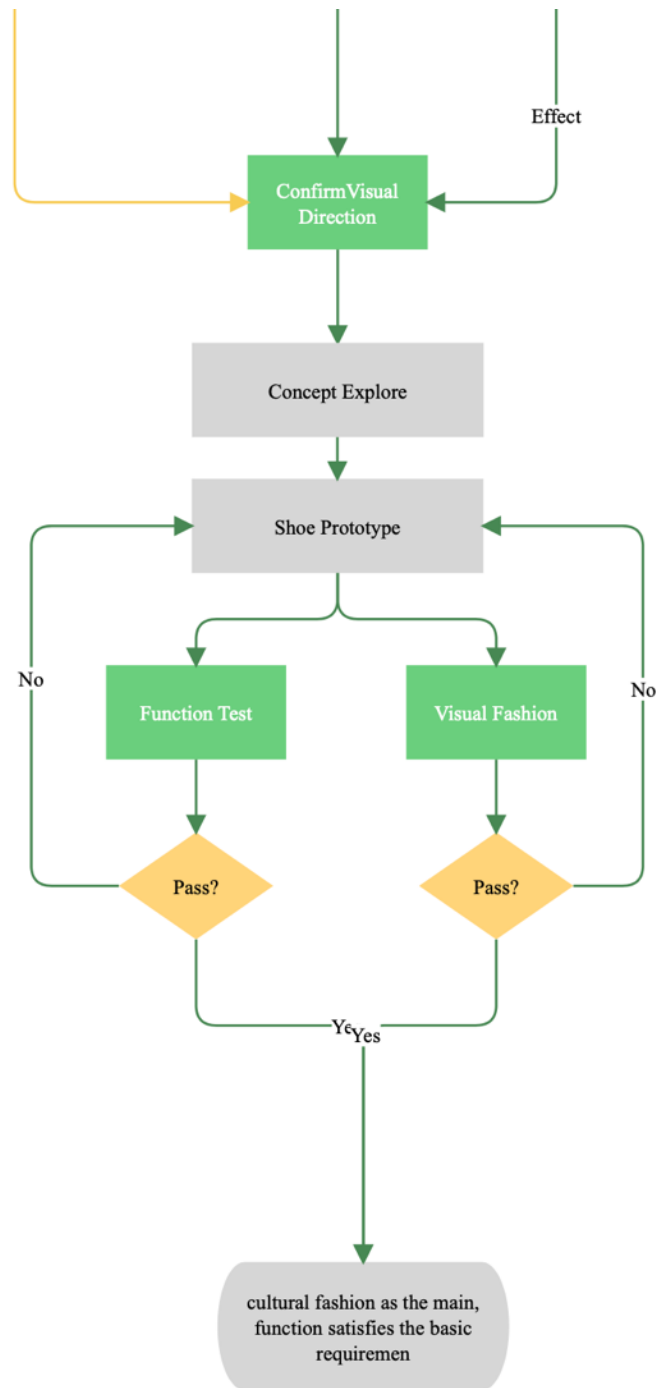


Figure 4.14 Last steps of second type of goal.

4.5 Flow Chart of Third Type Goal (The design considers fashion and innovation as the main)

Under this goal, the designer chooses to ensure the basic wearable function as the premise, but more importantly is to meet the fashion vision (Figure 4.15). It is even said that some functional comfort is sometimes sacrificed to meet the fashion vision. The restrictions under this goal are much less than those under the first two goals because it is mentioned in section 2.3 that the tolerance of fashion is very high, so the design can be interpreted according to any inspiration under this goal. In other words, concept design is the main end of this goal.

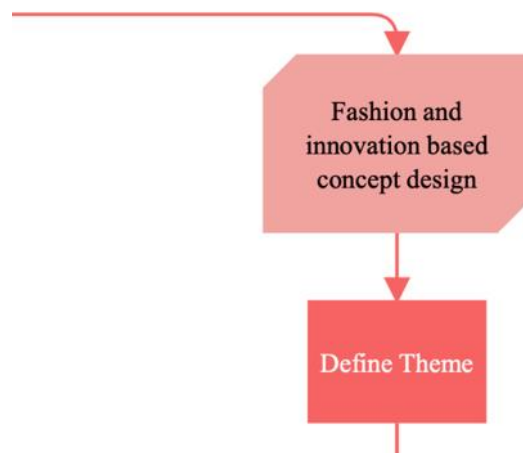


Figure 4.15 Second step of third type goal

4.5.1 Define Theme

As Figure 4.15 shows, a defined theme is also to determine the direction of the whole design, to have a general direction for the whole theme according to the content of the design brief, and then to connect it with the design brief through some directions mentioned in (Figure 4.16) as inspiration. There are many cases of fashion inspiration in the previous chapter,

specifically section 3.2, and these cases also prove that these inspiration directions and visual directions are feasible. Designers are not limited to these areas but need to revisit the design brief to determine the desired visual theme before the design.

4.5.2 Inspiration and Analysis Culture Elements

The first thing to understand is that in this type of goal, fashion visual expression and innovation design are the most important parts, and the functional impact depends on the design brief and theme. That's why this goal is more of a discussion of aesthetic cultural influences. Based on this explanation, after determining the theme, these elements need to be selected as cultural elements and inspiration direction: Regional cultural aesthetics, controversial topics, historical aesthetics, natural biology aesthetics, religious aesthetics, brand language, artist or designer personal style, materials aesthetics, science and technology exploration, film aesthetics, art, music, etc. It should be noted that the choice of direction is the same as the second type of goal: no more than three. At the same time, it is not necessary to choose from these listed ranges, and anything with a cultural aesthetic system can be selected as a design element.

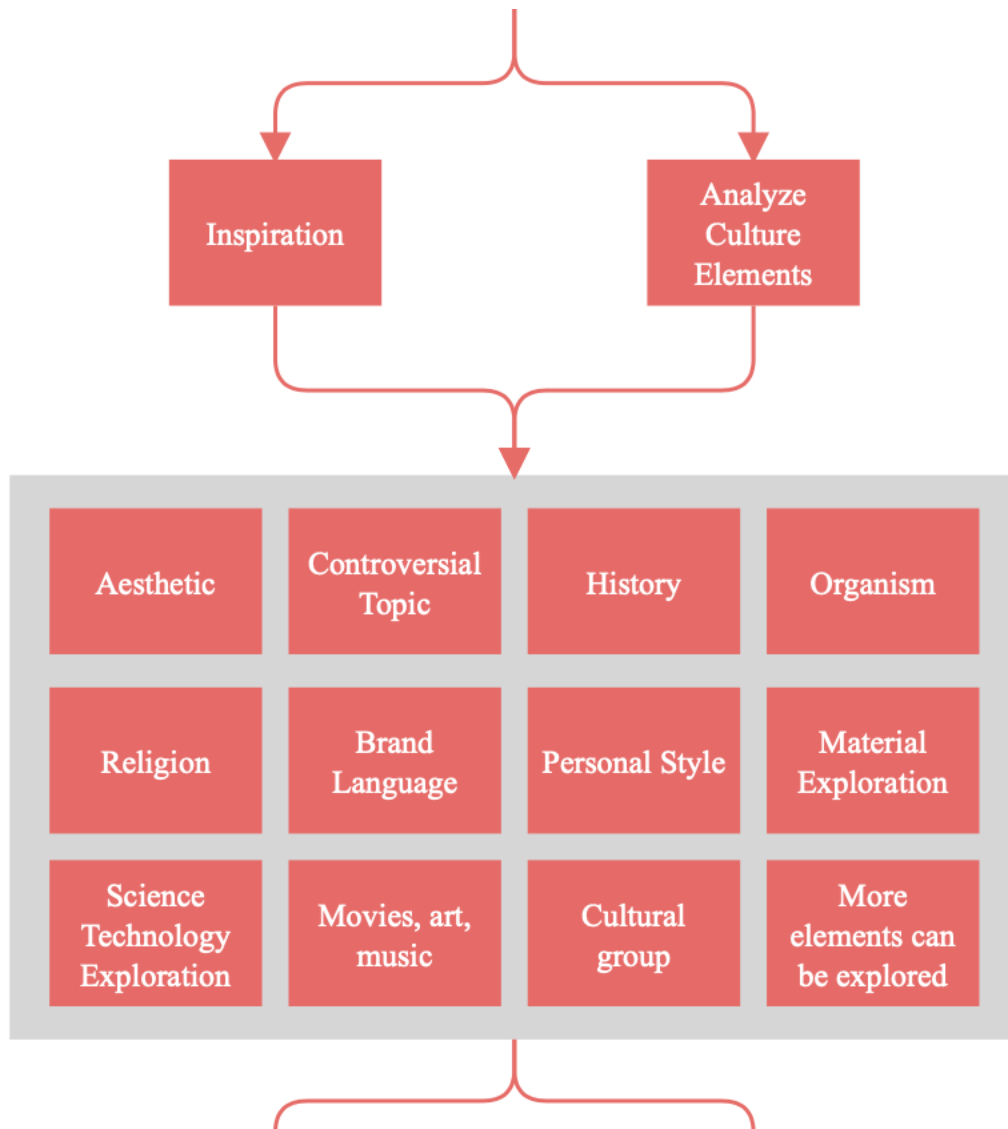


Figure 4.16 Analyze culture elements.

4.5.3 Shoe Lasts and Shoe Parts Thinking

After the selection of cultural elements, the composition of the shoe and the design of the last can be initially considered, because it is mentioned in section 3.1.2 that the last will affect the shape of the shoe. Therefore, based on the goal of fashion design, the shape of the shoe last is also influenced by the aesthetic of cultural elements (Figure 4.17).

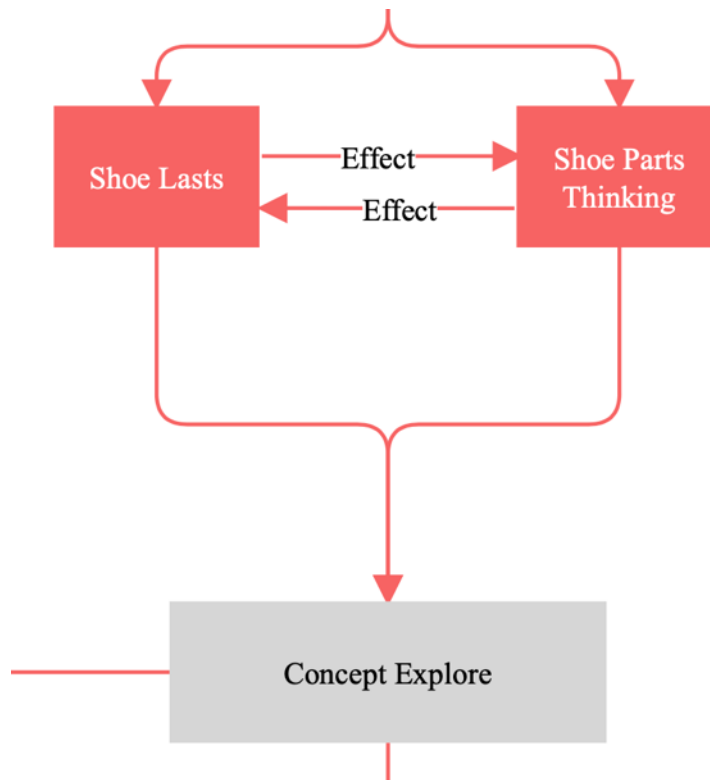


Figure 4.17 Concept exploration

4.5.4 Design and Prototype

This step will summarize the previous steps, start the design, and explore the concept with the sketch. At the same time, designers should consider the possible impact of the required materials and technologies on the final design of the shoe. Then they prototype the final selected concept, and finally test whether it meets the design brief and visual expression goals. If the goal is not met, it needs to be adjusted repeatedly until the goal of "the design considers fashion and innovation as the main" is achieved (Figure 4.18).

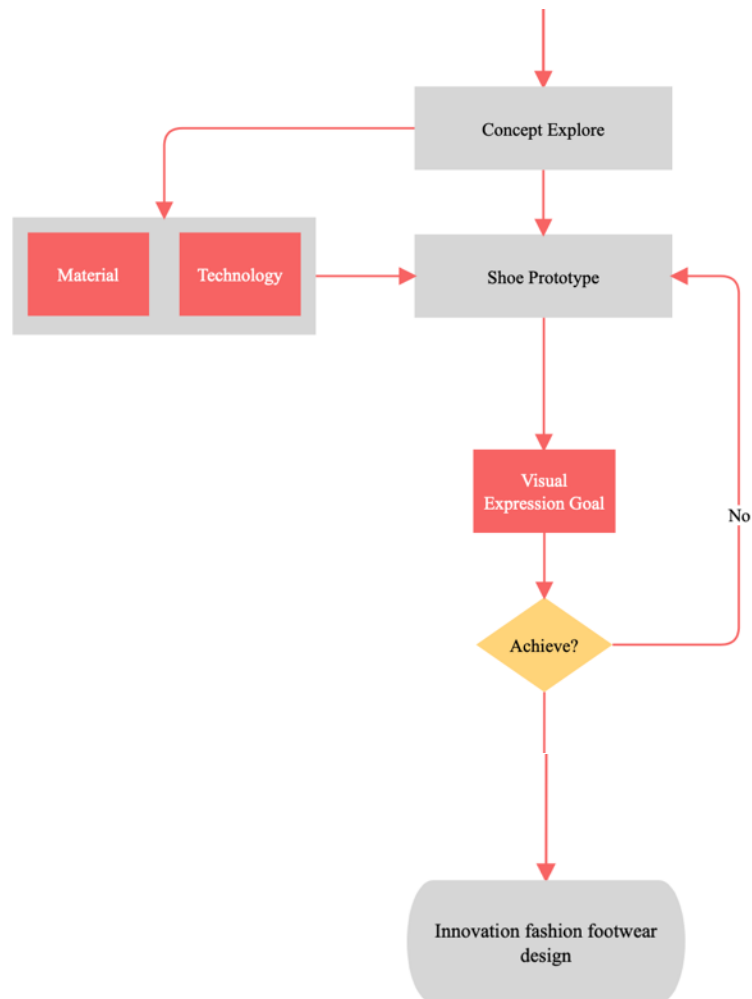


Figure 4.18 Finishing steps of third type goal

4.6 Tool Summary

According to the content of the flow chart and footwear design box, the tool is summarized below, divided into three goals by color, and then each step under each goal is detailed.

Design Brief Understanding	Complete the understanding of the brief, analyze the brief, find out the user group, and design needs.
Identify Culture Group	What is the user group?
	What is the footwear user requirement
	Which region does this group come from
Goal Setting	The design is based on sports functionality, supplemented by fashion elements. (Strong function need for design)
	The design for a certain group, the cultural fashion as the main, function satisfies the basic requirement. (Culture aesthetic combine with function and fashion)
	The design considers fashion and innovation as the main.

Figure 4.19 First step of final tool

<p>Goal Type 1</p>	<p>Analyze Culture Elements</p>	<p>Strong Function Need:</p> <ol style="list-style-type: none"> 1. Analyze sports motions 2. Analyze this sport's footwear or similar sports foot wear 3. Analyze sports footwear function 4. Science of Foot 5. Material Consideration 	<p>What are the motions covered in this sport:(example:jump, squat, side step etc.)</p> <p>What's special about this sport?</p> <p>The average body type of a person in this sport according to different positions (height, weight, strength, endurance, etc.):</p> <p>The common age groups for this sport are:</p>
	<p>Fashion do not affect function:</p> <ol style="list-style-type: none"> 1. Group aesthetic 2. Cultural icon 3. Sports culture symbol 	<p>Shoe Parts Thinking</p> <ol style="list-style-type: none"> 1. Put function first 2. Combine athlete motions to consider function of each part: Upper function Insole function Outsole function Material function 	

Figure 4.20 First type of goal tool (1)

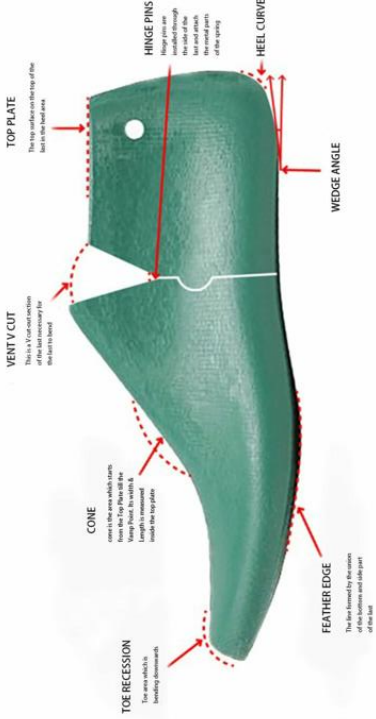
<p>Shoe Lasts Development</p> <ol style="list-style-type: none"> 1. Find proper lasts for this sport or find the average foot measurement data of this sports group 2. Scan the lasts that already exist or roughly model the lasts based on the data 3. Create model shoe lasts with computer software (work with professional lasts design team) 4. Prototype and Test 5. Repeat process until the lasts fit well 6. Shoe lasts confirmation 	
<p>Design upper and sole based shoe lasts</p>	<p>Upper:</p> <ol style="list-style-type: none"> 1. Material strength 2. Material Breathability 3. Material elasticity 4. Upper force support 5. Foot protection 6. Foot motion flexibility 7. Special requirements <p>Sole:</p> <ol style="list-style-type: none"> 1. Mid sole distribution of lines of force 2. Softness 3. Arc support 5. Out sole material and grip ability 6. Special requirements <p>Test Prototype</p>

Figure 4.21 First type of goal tool (2)

Summary and Improve concept	The designer combines the upper and sole, and then makes detailed adjustments to carry out functional testing for the function	
Test and Function based shoe confirmation	Test prototype until it satisfies the design brief and needs	
Apply fashion	Fashion elements can't affect function. Color, theme, shape, and logo do not affect function.	
Goal achievement	The footwear is mainly based on sports functionality	

Figure 4.22 First type of goal tool (3)

<p>Goal Type 2</p>	<p>Analyze Culture Elements</p> <p>Function Consideration:</p> <ol style="list-style-type: none"> 1. Confirm a shoe type 2. Analyze this type of shoes' characteristics 3. Analyze shoe parts <p>Fashion Consideration:</p> <ol style="list-style-type: none"> 1. Group aesthetic 2. Inspiration explore: <ul style="list-style-type: none"> Movie; Religion; Music, Art, Traditional clothing; Pattern; Crafts; Cultural icon; Symbolic aesthetic; explored more elements (pick no more than 3 elements)
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Figure 4.23 Second type of goal tool (1)

Shoe Parts Thinking	<p>1. Consider fashion influenced by culture</p> <p>2. Shoe lasts: mainly focus style (shape of toe-box, style)</p> <p>3. Upper function/ Fashion Material Fashion exploration Sole style and aesthetic</p>	<p>Shoe top type: low-top <input type="checkbox"/> mid-top <input type="checkbox"/> high-top <input type="checkbox"/></p> <p>Whether or not the shoe is an integrated upper:</p> <p>Whether the shoes need laces:</p> <p>Ankle support:</p> <p>Arch support:</p> <p>Upper Materials:</p> <p>Mid-sole material:</p> <p>Whether the shoes need out-sole:</p> <p>Out-sole Material:</p> <p>Additional considerations:</p>
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Figure 4.24 Second type of goal tool (2)

Confirm Visual Direction	Based on culture elements	Mood board making
Concept Explore	Sketch	
Shoe Prototype	Function test Fashion test Repeat until until satisfy the design brief and needs	
Goal achievement	The footwear for a certain group, the cultural fashion as the main, function satisfies the basic requirement.	

Figure 4.25 Second type of goal tool (3)

Goal Type 3		
Define Theme	According to the analysis of the design brief, research and determine the theme of the design	
Analysis Culture Elements and Inspiration	<ul style="list-style-type: none"> Aesthetic Controversial topic History Organism Religion Brand Language Personal style Material exploration Science technology exploration Movie, Art, Music (Pick no more than 3 elements) 	<p>After selecting the elements, investigate and analyze aesthetic elements one by one:</p> <ol style="list-style-type: none"> 1. Investigate the most classic ICONS of this group under this category 2. Find and record the aesthetic rules between these ICONS 3. Combine different elements respectively, compare the effect, and learn this kind of cultural aesthetics in the combination. 4. Conduct further research to find out some unique aesthetic signs. 5. Combine again and compare the effect. 6. Summarize

Figure 4.26 Third type of goal tool (1)

Shoe Parts Thinking	<ul style="list-style-type: none"> 1. Strongly influenced by fashion 2. Shoe lasts: mainly focus on style (shape of toe-box, style) 2. Upper function/ Fashion Material Fashion explore Sole style and aesthetic 	Mood board making
Confirm Visual Direction	Based on culture elements	
Concept Explore	<ul style="list-style-type: none"> Sketch Material effect Technology effect 	
Shoe Prototype	Adjust detail until the goal is achieved	
Goal achievement	The design considers fashion and innovation as the main aspect	

Figure 4.27 Third type of goal tool (2)

CHAPTER 5 Demonstration of the Design Approach

5.1 Design Brief

Based on my design tools (Figure 5.1), I created the following design brief: To design a pair of footwear with Chinese cultural and regional characteristics. The footwear is suitable for Sichuan young people aged 18-30 in China. Footwear has certain practicality and fashion. When I started analyzing this design brief, I started with three questions based on my tool:

What is the user group?

What is the footwear user requirement?

What region does this group come from?

According to this design brief, we know that the user group is a young urban person in Sichuan. First, the research on this group of people shows that Sichuan is a province with diverse ethnic cultures. In addition to cities like Chengdu, which are relatively close to modernization, there are also Tibetan cities like Ganzi and Aba. On the one hand, the young people of Sichuan are influenced by the city culture, on the other hand, the traditional ethnic culture is also a feature of Sichuan culture. This pair of shoes does not mention special functional requirements in the design brief. The group apparently came from Sichuan, a province in southwest China that is geographically linked to Tibet and has both plateau areas and basin areas.

Goals that need to be designed can be set according to the content of the analysis: if there is no professional motor function requirement and cultural groups are included, the second type of goal can be selected — Design for a certain group, cultural fashion as main, function satisfies the basic requirement.

Design Brief Understanding	Complete the understanding of the brief, analyze the brief, find out the user group, and design needs.
Identify Culture Group	What is the user group?
	What is the footwear user requirement
	Which region does this group come from
Goal Setting	The design is based on sports functionality, supplemented by fashion elements. (Strong function need for design)
	The design for a certain group, the cultural fashion as the main, function satisfies the basic requirement. (Culture aesthetic combine with function and fashion)
	The design considers fashion and innovation as the main.

Figure 5.1 Understanding design brief and set up design goals.

Before starting the research, according to the steps of the tool, it is divided into function and fashion parts. According to the settings of the second type of goal, the designer needs to consider more cultural fashion based on satisfying the basic footwear function. The user group is then researched and analyzed separately by function and fashion.

5.2.1 Function

Because the design brief does not have specific requirements, it also mentions the use scenario of urban. Therefore, I began to conduct research on weather and urban environment, and I chose Chengdu, the most typical representative city in Sichuan, as the starting point of the

research. Because the design brief does not have specific requirements, it also mentions the use scenario of urban. Therefore, I began to conduct research on weather and urban environment, and I chose Chengdu, the most typical representative city in Sichuan, as the starting point of the research.

Climate: Mild climate, four distinct seasons, long frost-free period, abundant rainfall, less sunshine (China Meteorological Administration, 2024)

City walking: Because of the mountainous and hilly terrain of Chengdu, daily walking will encounter a lot of slopes and stairs.

According to the climate and daily travel, I will choose comfort, suitable for walking, moisture-proof, soft midsole, and certain arch support as the main functions. According to the above analysis, the type of shoes I want to identify is urban jogging shoes (Figure 5.2), which are also jogging shoes with outdoor everyday attributes.



Figure 5.2 Salomon(n.d.). Salomon Pulsar Trail Lunar. [Photograph]

5.2.2 Fashion

In the fashion direction, I chose three aesthetic directions for research: Chengdu aesthetic culture, natural element aesthetics, and Sichuan cultural icons. Figure 5.4 is a snow-capped mountain on the western Sichuan Plateau, which is a symbol of purity for Tibetans living in western Sichuan and Tibet. Figure 5.6 shows the color-pond of Jiu Zhai Gou Valley in Sichuan Province. This unique natural landscape is the symbol of Jiuzhaigou Valley in Sichuan Province. Figure 5.5 shows the plateau Domestic yak, which is also a representative creature in the Sichuan Plateau area. Long hair has evolved to protect against extended exposure to cold and ultraviolet light in the plateau area. Figures 5.7 and 5.8 are the traditional costumes of Yi ethnic and Tibetan ethnicities respectively. Tibetans wear gems on their heads and bodies for two reasons: First because Tibetans were nomads in their early years, they needed to carry valuable items with them all the time so that they could facilitate transactions and protect property security. The second reason is that in the Tibetan tradition, different ornaments exist to bless health. Gold and silver were thought to resist poisons, coral to treat inflammation, pearls as medicine for beauty, and so on. Long-term wearing of gems has formed a unique costume aesthetic for Tibetans. (Pando, 2020) These colors and styles are very characteristic of local culture. At the same time, because the user group is a young urban group in Sichuan, I found a lot of popular styles of this group and urban fashion elements related to the outdoors.

Analyze Culture Elements	<p>Function Consideration:</p> <ol style="list-style-type: none"> 1. Confirm a shoe type 2. Analyze this type of shoes' characteristics 3. Analyze shoe parts <p>Fashion Consideration:</p> <ol style="list-style-type: none"> 1. Group aesthetic 2. Inspiration explore: Movie; Religion; Music, Art, Traditional clothing; Pattern; Crafts; Cultural icon; Symbolic aesthetic; explored more elements (pick no more than 3 elements)
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Figure 5.3 Analyze culture elements checklist.



Figure 5.4 Huang, W (2019). Aba Snow Mountain in Sichuan Province. [Photograph]



Figure 5.5 Sohu (2023), White Yak with Tibetan decoration. [Photograph]



Figure 5.6 Qi (2021), Jiu Zhai Gou. [Photograph]



Figure 5.7 Wang, Q. (2018). Zhou Jiayu's fashion collection is inspired by Yi ethnic traditional clothing. [Photograph]. CGTN.



Figure 5.8 KBCMW (2019, October). Traditional Tibetan opera. [Photograph].

5.3 Shoe Last and Parts Thinking

Based on the previous research and confirmation of the shoe type, I will not make too many adjustments and changes to the shoe lasts. Based on a universal hiking and jogging shoe last and Asian adult male foot shape data (Luximon, 2013), I improved the shoe last I needed (Figure 5.9)

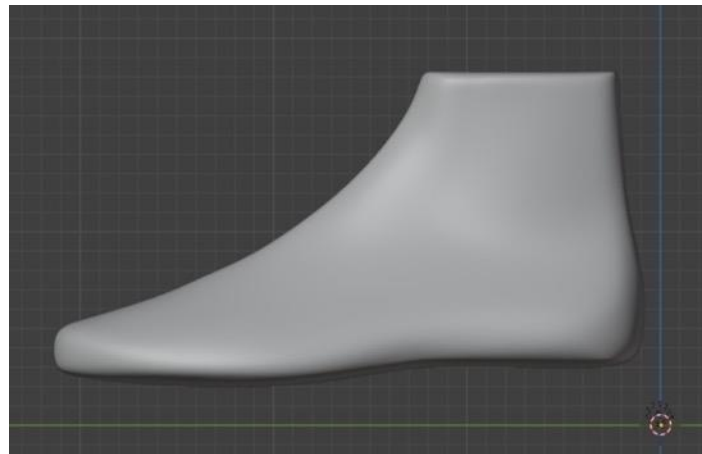


Figure 5.9 Shoe last model in Blender

According to my tooltips, I completed the following table and determined the shoe parts I needed to design, The original tool is shown in Figure 5.10

Shoe top type: low-top mid-top high-top

Whether or not the shoe is an integrated upper: No

Whether the shoes need laces: No

Ankle support: Yes

Arch support: Yes

Vamp Materials: Leather and so on

Midsole material: 3D printed TPU.

Whether the shoes need out-sole: Yes

Outsole Material: Vibram rubber

Additional considerations: The shoe sole will be 3D printed, and the hardness of the sole can be determined according to the density of 3D printed support.

Shoe top type:
low-top mid-top high-top
Whether or not the shoe is an integrated upper:

Whether the shoes need laces:

Ankle support:

Arch support:

Upper Materials:

Mid-sole material:

Whether the shoes need out-sole:

Out-sole Material:

Additional considerations:

Figure 5.10 Checklist of shoe upper thinking.

5.4 Confirm Visual Direction

According to the previous research consideration and shoe type confirmation, I made a mood board as shown in Figure 5.11.



Figure 5.11 Mood board

5.5 Concept Explore

Based on my visual mood board, I made some concept attempts and sketches (Figure 5.12). I combined the shape of the Jiuzhaigou pond with the sole of my shoe, then combined the yak's cat texture with the upper material, and then also added some jewelry elements based on Yi

and Tibetan jewelry. Finally, the overall feeling is still in line with the style of urban outdoor shoes (Figure 5.13).

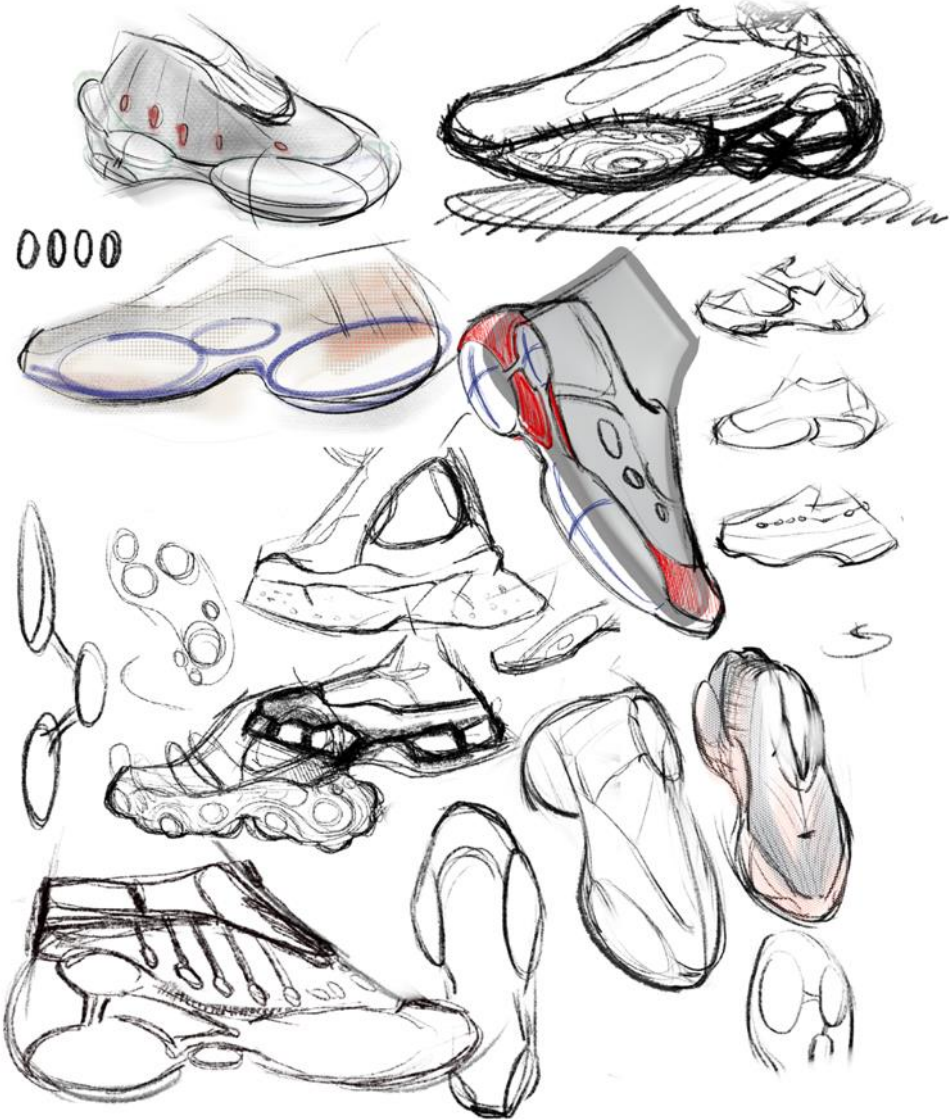


Figure 5.12 Sketch of shoe



Figure 5.13 Sketch of shoe (2)

5.6 Shoe Prototype

If the designer wants to know more details about the prototype process of Shoes, please refer to *How Shoes are Made series* by Wade Motawi. It should be noted that a prototype does not need to be perfect. In this stage, as long as the function and fashion are satisfied, the goal has been achieved, and more details need not be completed in this stage. And prototype doesn't only have one theory, it can have many ways, which can be used if the goal can be achieved.

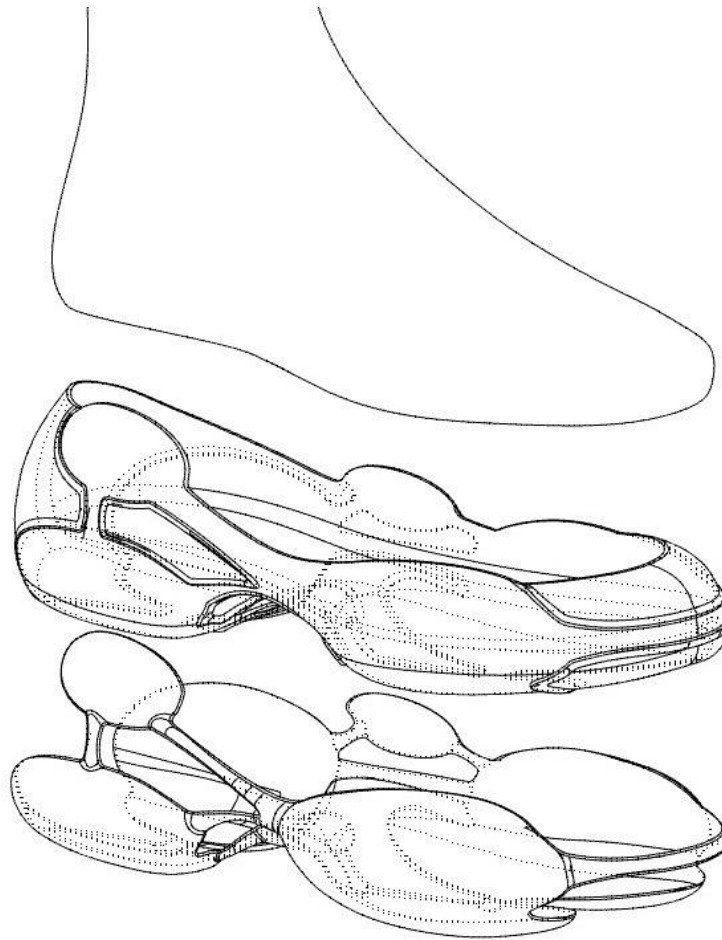


Figure 5.14 3D model shoe sole in rhino software

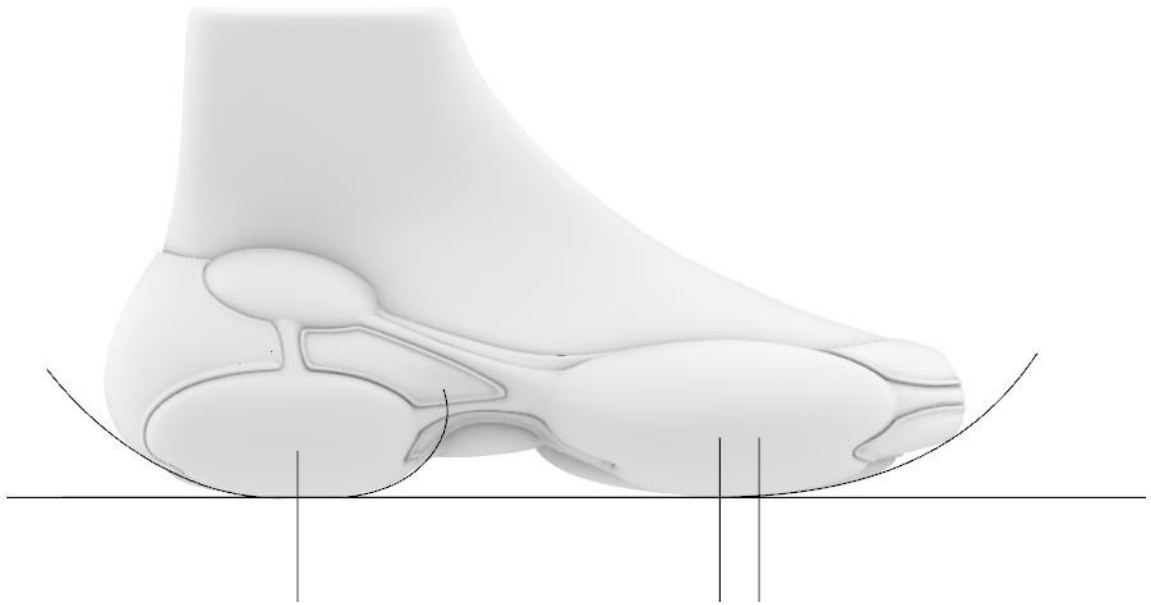


Figure 5.15 Sideview of shoe sole model



Figure 5.16 Taping shoe last



Figure 5.17 From top to bottom, left to right. Draw design on shoe lasts, then cut the design by line. Flatten the tape and cut down the shape to make shoe upper pattern.



Figure 5.18 Cut leather with pattern.



Figure 5.19 Sew every part together.



Figure 5.20 Fixing the upper shape.



Figure 5.21 Details of shoe prototype



Figure 5.22 Final Prototype

Confirm Visual Direction	Based on culture elements	Mood board making
Concept Explore	Sketch	
Shoe Prototype	Function test Fashion test Repeat until until satisfy the design brief and needs	
Goal achievement	The footwear for a certain group, the cultural fashion as the main, function satisfies the basic requirement.	

Figure 5.23 Checklist From section 5.4-5.6

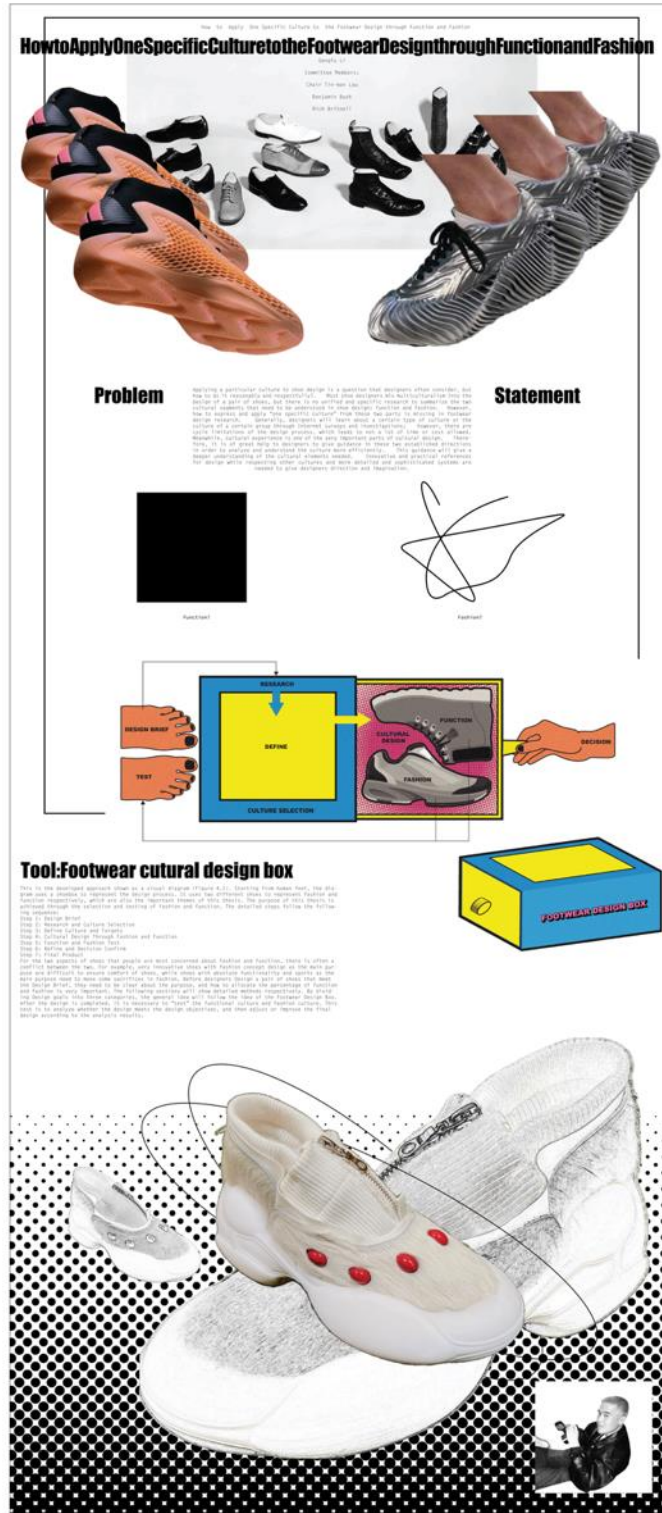


Figure 5.24 Poster of Final prototype

CHAPTER 6 Conclusion

The objective of this thesis is to apply culture to footwear design through fashion and function. Goals were designed for three different situations through the percentage configuration of fashion and function. This approach is to balance the considerations of fashion and function in the actual design so that the designer is clearer about his goals and more targeted to complete the design. This thesis makes culture more concrete through function and fashion and turns cultural abstract content into elements. Chapter 4 summarizes this tool, and finally, chapter 5 applies this tool to real design scenarios and achieves goals. Although the content covered in this thesis is still limited, it still completes the initial hypothesis. In conclusion, this thesis can help designers combine culture and footwear from the aspects of fashion and function.

As for the application of this article in the future, as mentioned at the beginning, culture is always developing and progressing, and human culture will constantly update and learn, in this process, the value of cultural application will always exist. As a part of the culture, the acceptance, understanding, discussion, controversy, and learning in the transmission culture are all breeding new cultures. As a designer, I hope to convey people's respect and tolerance for world cultures through this thesis.

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