



The Emotional Kitchen Space

Aging with dignity around the kitchen table

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Abstract

How can a kitchen be designed as an elderly-friendly emotional space that encourages people to share positive social experiences of cooking and dining? How can designers support people to age with dignity? This practice-based design research is based on the strong emotional bond between me and my grandfather, and my observations of how he struggled to use his home. I have developed design principles for emotional spaces that support independence, social connection, and cultural belonging. I have focused on the kitchen as a space that poses particular challenges, and ultimately propose an Emotional Kitchen Table, a piece of furniture that could be fitted into existing apartments or houses to provide a more fulfilling spatial experience for the elderly. My methodology centres on developing empathy, and I use ideas from design ethnography (particularly personas and scenarios) and digital technologies for simulating use. My aim is to demonstrate how a concern for emotional space and empathy can help designers like myself give older people the opportunity to age with dignity.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the Acknowledgments), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university of other institution of higher learning.

[signature]

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CH1. Introduction

Research Question

How can a kitchen be designed as an elderly-friendly emotional space that encourages people to share positive social experiences of cooking and dining?

How can designers support old people to age with dignity?

My Grandfather's Story

My parents said, "your grandfather is an elderly person, and we should not argue with him, in order to show respect. If you don't like the words he uses, just don't listen." However, I feel that the way to show respect should be to allow people to express different opinions, rather than just saying some perfunctory words and treating him as a stupid and awkward old man. When I was growing up, I was also dissatisfied with him because of his traditional feudal thoughts. We often quarrelled because of misconceptions. However, when he was hospitalized with a broken leg, he did not want his other children to feed him, only me.

At 84, he broke his leg walking in the park. I called my aunt to inform the family that he had to go to the hospital, and burst into tears. When we arrived at the hospital, he was quarrelling with the doctor and said that he did not want nails in his legs. He felt that his leg could heal itself without surgery.

From the countryside to the city, he witnessed the most important 70 years of modern Chinese history. In the decades after his birth, it was all about wars, and after the wars was the social catastrophe of the ten years of the "Cultural Revolution". He lost his wife in his middle age, and he raised seven children on his own, one of whom is a cousin's child. By the time he was old, everyone was busy with their own lives, so his mood was rarely cared for. Most of his peers passed away. Few people wanted to know about his life. His children may think "we have given him basic living security, which is enough. Anyway, the environment in which he used to live may have even worse." The years of hardships also made him reluctant to admit that he needed the help of others, especially for physical problems.

We all thought that he was going to lie on the bed for the rest of life. Amazingly, after a few months, he started walking around with a cane every day. Grandfather loved freedom, was unwilling to be cared for and disliked interfering with his children's lives. But he also got into a strange habit - collecting garbage.

He collected drink bottles, paper boxes, newspapers filled with food debris, and so on (Figure 1). After a long time, his bedroom was filled with rubbish. The people who came to visit him didn't even want to step in. People advised him not to collect the rubbish anymore as it was not conducive to health, and there were hidden safety risks. But he was stubborn, and continued collecting all kinds of garbage, occasionally selling some to the

recycling station, earning 4 or 5 yuan. For us, the money was insignificant. But I knew he wasn't trying to make money. He couldn't watch what was still usable becoming garbage.



Figure 1. My grandfather was in his room.

Old habits remained, but social activities became increasingly rare. Only opera, played loudly on the radio, accompanied him through one sleepless night after another. He told us about his experience of learning opera when he was young and all the little stories he had learned from his predecessors. As he said this, his face was always full of confidence and he had a smug smile.

He was still an old man living alone, although my parents often cooked and took care of him. He needed to solve the problem of feeding himself when he was hungry; he also needed society and self-fulfillment. Figure 2 shows his kitchen. It was dark, dirty, messy, inconvenient to use, and without any element of cultural or emotional reflection. He used to walk home on crutches and make a bowl of overcooked noodles in the kitchen. The old kitchen didn't have enough space and didn't have the right ergonomics for him to sit down and cook. He used to say, "I'm too old to do anything but wait for death." My grandfather died in 2019 at the age of 91.

He was at the stage of aging that leads to the loss of social diversity. The sense of accomplishment that the kitchen brought to him declined because of the decline in his physical functions, and the lack of cultural heritage and identity. Whether he was refusing to be fed while in therapy, or picking up litter for a bit of self-reliant money, it was a struggle that involved his final dignity. Helping him out in the kitchen, one of the few places where he retained some dignity, let him find it again. This idea had been haunting me.

This study focuses on how to create more emotionally satisfying and supportive kitchen spaces for elderly people like my grandfather, so that they can retain their dignity and emotions and live happily for the rest of their lives.

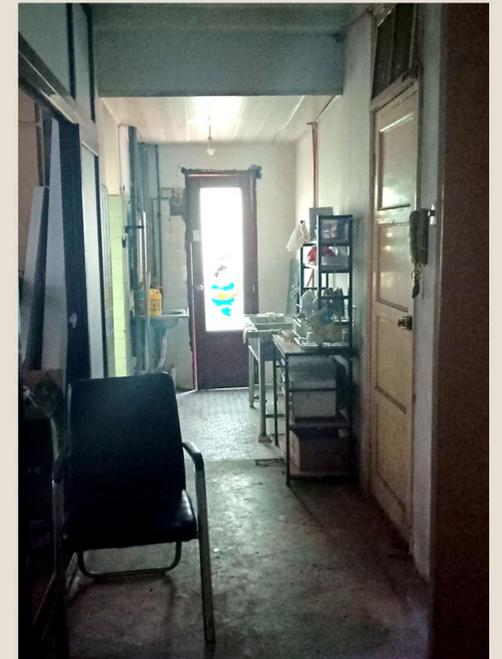
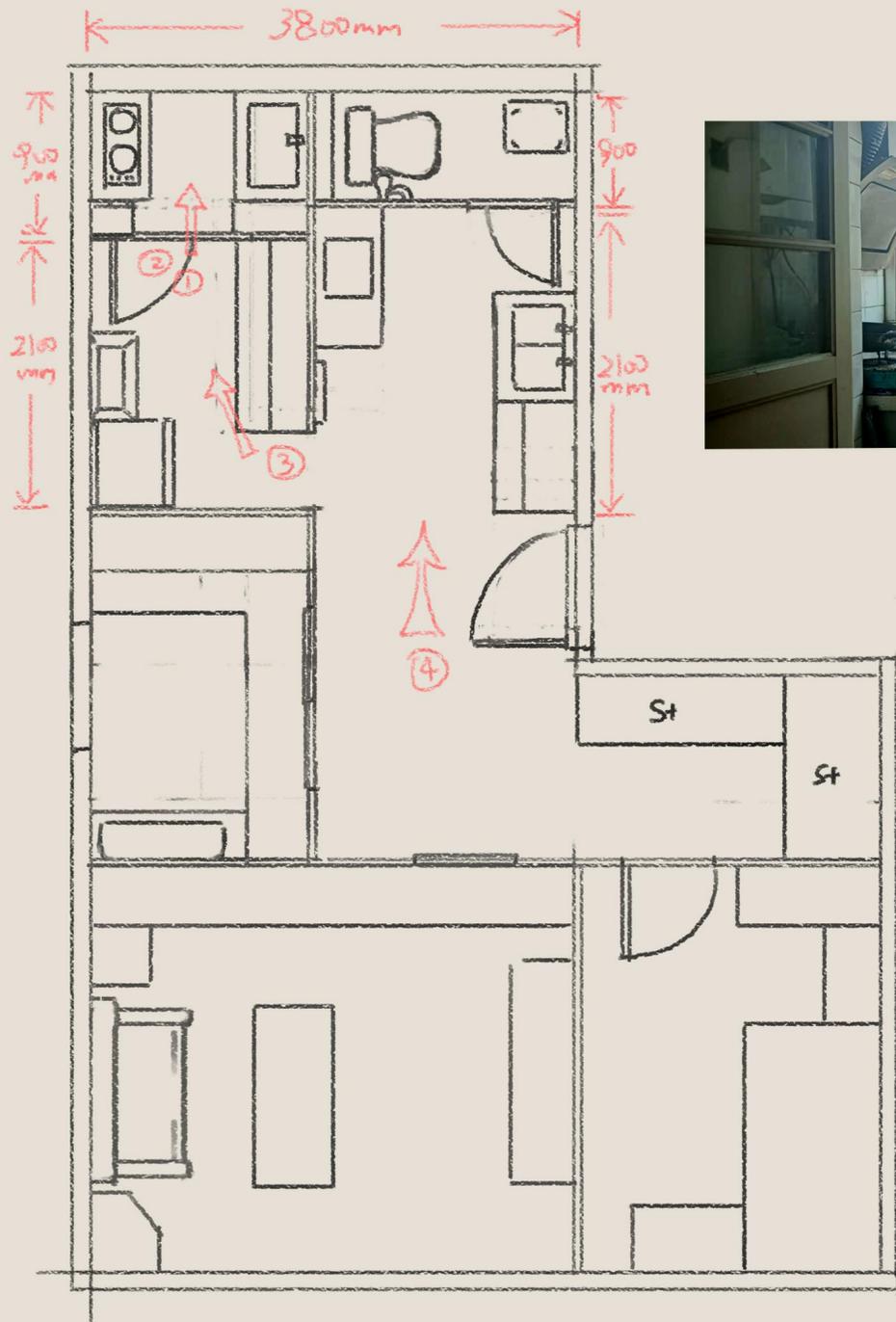


Figure 2. Floor plan and site photos of my grandfather's kitchen.

Scope of this Design Research Project

I am a space designer with experience in designing kitchens using component-based commercial systems. However the template design of kitchens has for a long time made me feel unsatisfied. I want to find a more personal and fulfilling way to make spaces for people.

In this study I will use the design ethnography of my grandfather as a way to develop empathy. My focus is not on gathering empirical data, but on responding in an emotional context.

The project will result in the design of a kitchen table. This table will enable a variety of roles and functions. It can be used as a supplement to an existing kitchen, or as a minimal kitchen space. The target user in the study is aging people (Figure 3) who have, some degree of independence but encounter increasing difficulties with mobility and manual work. By designing with my grandfather in mind, I hope to generate useful ideas for other elderly people.

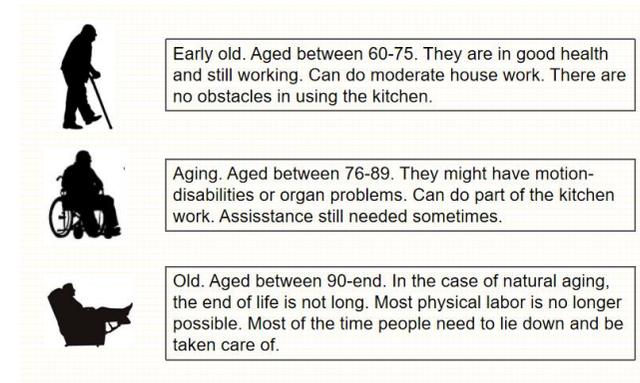
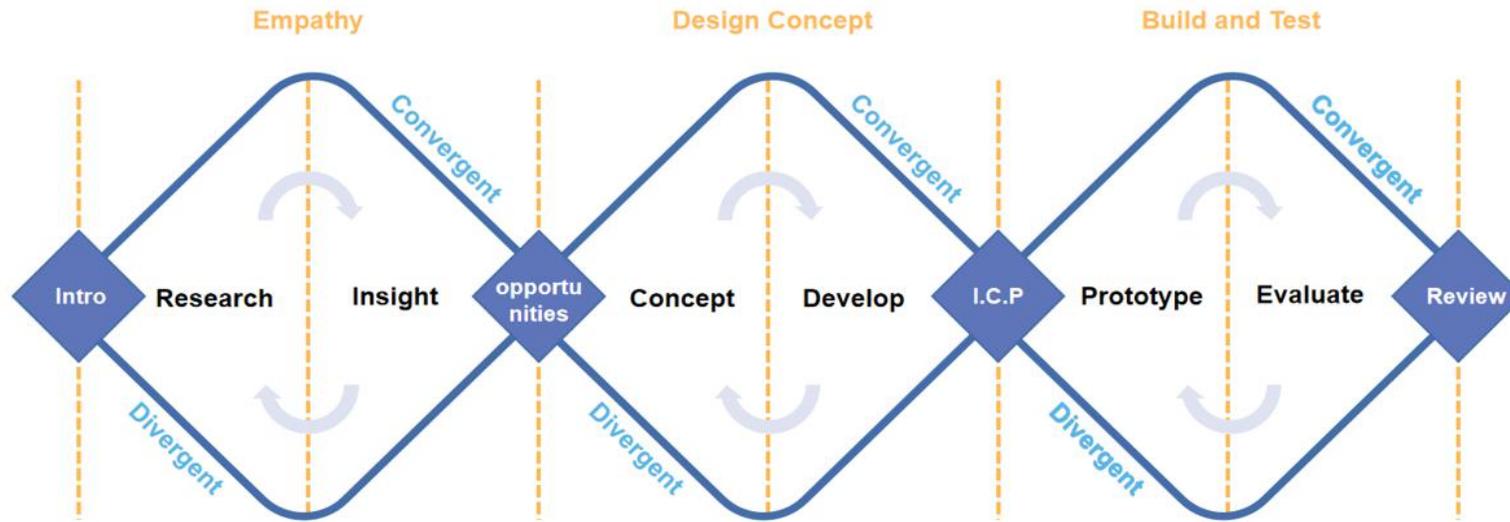


Figure 3. Old people at different stages.

My design research process adopts the triple-diamond design framework (Figure 4), which summarizes design into three important iterative stages. The information obtained during the 'Empathy' phase is the foundation of the design. The 'Design concept' phase is the initial generation and development of the design. The 'Build and test' stage illustrates the attempt to implement a real product. According to the hypothesis obtained in the first stage, the evaluation criteria are set.

In Chapter 2, I will discuss my research contexts, beginning with Donald Norman's idea of emotional design. In Chapter 3, I talk about my methodology. I report on how my design process has worked out in Chapter 4, and conclude by evaluating the emotional design process when designing a space or product. Documentation of the final exhibited work will be appended after examination.

Triple Diamond Design Framework



Introduction	Research	Insight	Opportunities	Concept	Develop	I.C.P	Prototype	Evaluate	Review
Design inspiration	Discover-gain insights	Empathy-define the specific pain	Value and measure of solving the problem	Generate concepts	develop the concepts	Interim concept presentation	Make and test	Formulate evaluation criteria and launch	Target achievement and defects
<u>Grandfather's Story</u>	<u>Observation</u>	<u>Empathy mapping</u>	<u>Opportunity statement</u>	<u>Products brief</u>	<u>Sketches</u>	<u>Scenario test</u>	<u>Sketch Up digital models</u>	<u>Scenario test</u>	<u>Documentation</u>
<u>Biography</u>	<u>Personas</u>	<u>Point of view</u>		<u>Sketches</u>		<u>Unreal engine VR Testing</u>	<u>Cool house rendering</u>	<u>Evaluation matrix</u>	
<u>Status of the elderly</u>	<u>Site scout</u>	<u>Insights</u>		<u>Unreal engine</u>					
				<u>Sensory ethnography</u>					

Figure 4. Triple diamond design framework.

CH2. Contextual Review

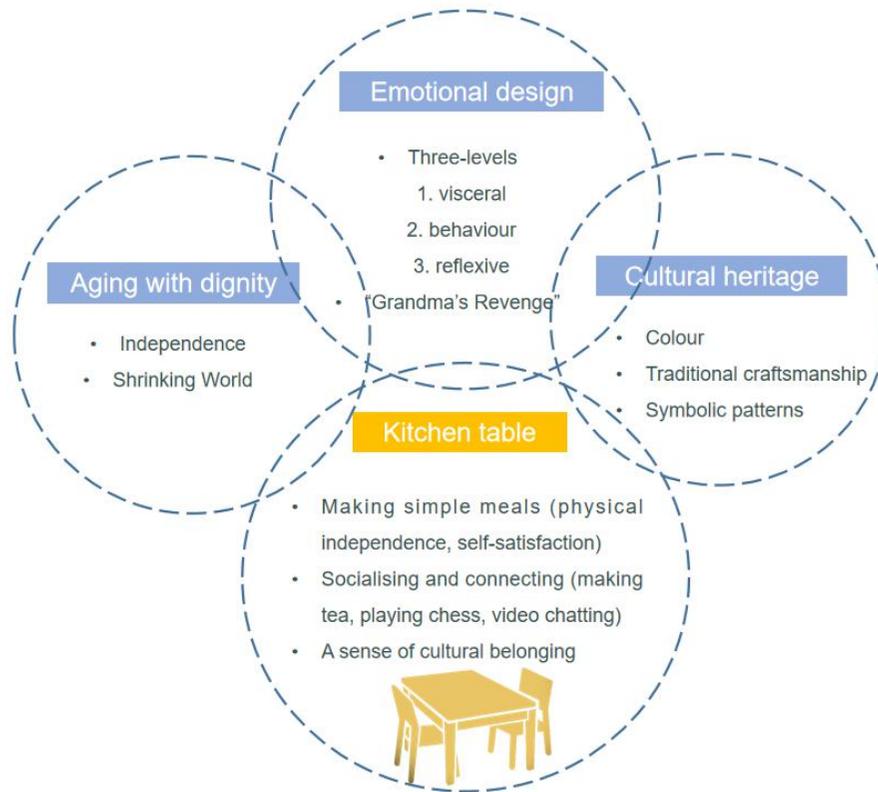


Figure 5. Contexts around this research.

2.1 Emotional Design

Donald A. Norman claimed in his book "*Emotional design: why we love or hate everyday things*", that we are not attached to objects, but that the relationship is with the meanings and feelings the object represents (Donald, 2004, p.48). He proposed three levels: "visceral", "behavioural", and "reflexive" (2004). Emotional design comes partly from its aesthetics, partly from the satisfaction of use, and partly through the emotional needs of the user being met. For example, in the design of a kitchen, people may be easily attracted by the appearance (a visceral response), then indulge in the ease of use of the various functions, (a behavioural response), and ultimately be affected emotionally, (prompting a reflective response).

Many designers have noted the benefits of emotional feedback at the visual level. In this field, many designs are not focused on practicality, but on the fun of the product. Figure 6 shows one of the representative works of Jack Cress's animated furniture series, "Oops chair" (Figure 6). This type of work makes people feel: "I don't know what it is for, but I just want it." Stark's juicer (Figure 7), is specific in its instructions: Don't use it to squeeze juice, because the acidity of the fruit will corrode it. But people still rush to buy it because its special shape is very decorative. Putting it in the kitchen creates a very vivid image. The Uncomfortable (Figure 8) is a collection of deliberately inconvenient everyday objects by Athens-based architect Kamprani. He analyzes every step of the use, then breaks the rules to overturn customer expectations and produce opposing emotional effects. His work produces an absurd and surreal feel, but people still find it interesting.



Figure 6. Jack cress (2002). oops!



Figure 7. Philippe Patrick Starck (1990). Juice Salif.



Figure 8. Katerina Kamprani (2016). Chain Fork from "The uncomfortable" series.

Norman claims that everything people do is emotional and cognitive. Even if people only press the button of the dishwasher, there has to be some expectations or existing knowledge: the user has a basic understanding of the correct operation of the button and expects it to run smoothly. In general, at behavioural level are items that users find very useful, although their appearance is not necessarily appealing. But here we can discuss the combination of "visceral" and "behavioural". If the design can be strengthened at the "visceral" level, it can improved by "behaviour". For example, two Japanese researchers, Kurosu M and Kashimura K (1995), designed two sets of interfaces and controls for ATM machines. They were identical in function, the number of buttons, operation steps, etc. However, the more attractive interface obtained a higher rating for ease of use. Experimental results showed that users of a system with a more appealing interface operated more smoothly and efficiently. Importantly, it got more positive feedback. "A product's aesthetic affected perceived usability" (Miklos, 2017).

Norman claimed that such emotions are actually using and changing the way our brains work (Don, 2003, 5:54-6:14). These experimental results build a bridge between the theory of emotional design and the usability of practical design works. Although the process may be neurological or chemical, it gives us an idea of its great potential.

In other words, the three levels are not completely separate. Form factor design promotes ease of use. Appearance creates pleasant emotions and positive feedback for users. This emotion changes the way we respond.

However, visual and behavioural responses are both subconscious functions. Reflection is conscious, and the emotions generated at this level

are the most enduring. Reflective reactions are part of our memory of events. The duration of memory is much longer than the immediate experience or duration of use, which is the area of visceral and behavioural levels. At this level, designers need to consider how the design works for the target user, or what their attitude is towards such products. A positive emotional response towards the product is what we expect. Figure 9 shows an auxiliary model for training midwives (Mao et al., 2017, p.46). It restores the true human condition as much as possible, and has a simple and comfortable appearance. Consider the self-image of the users - the trained midwives - at a reflective level. It keeps reminding one of the usefulness of this product. Also, its black and white colours are more reflective of science and technology than real skin or other warm colors.

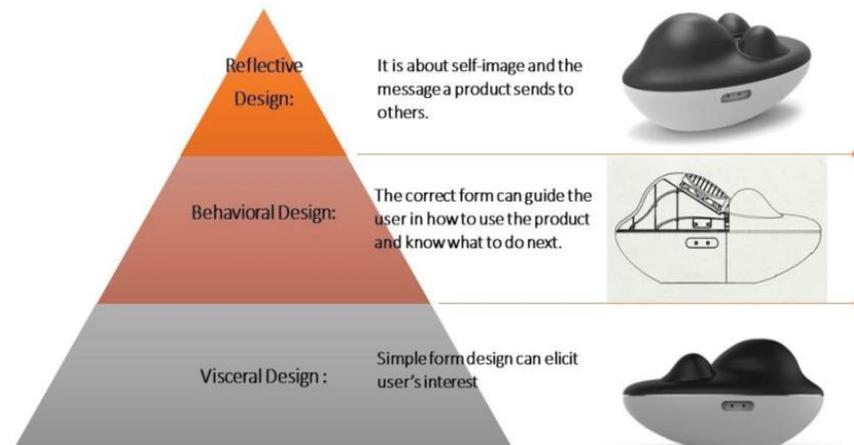


Figure 9. Mao et al (2017). The application of the three levels of emotional design in a midwifery simulator.

The kitchen "Grandma's Revenge" (Klaus & Melanie, 2006), (Figures 10 & 11), transforms from a flat surface into a three-dimensional space. It was named for the personal memory of an "almighty grandma".

The combination of the dining space with the kitchen area is not just for easy operation. It also creates opportunities for people to communicate. People eat at the table, do chores at the table, play games at the table, and watch other family members' activities in the kitchen. The table is an important social condition at this time.

This work is very interesting and attractive in appearance. Various integrations have also been made in the function. Originally, there were some difficulties in operation due to complex deformation, but the designer intelligently designed the panel in a two-dimensional shape, which gives it a certain guiding effect, implicitly improving the smoothness of operation.



Figure 10. Klaus & Melanie (2006). Three modes of "Grandma's revenge".



Figure 11. Klaus & Melanie (2006). Presentation diagrammes people are using.

Emotional design is satisfying at the subconscious level of the visceral response, at the behavioural level where it triggers new active uses, and at the reflective level, as it prompts conscious pleasure and play.

2.2 Aging in place with dignity



Figure 12. An old woman sitting alone with a fire in front of the door.



Figure 13. A group of elderly people in a nursing home.

Just like anybody else, old people are eager to control their bodies without bothering others. They long for proud stories that belong only to them. However, inevitably aging makes many people lose the dignity of life. According to the World Health Organization's (2011) forecast, the proportion of the elderly (over 65 years) in the world's total population will double by 2050.

Wong, P. T.P., & Ujimoto, K. V. (1998) emphasize the importance of old people's self-confidence and self-satisfaction. The foundation for building self-confidence is to independently master and manipulate objects. The second level of behaviour in emotional design also verifies that good interaction with the product can bring positive emotional feedback.

Many older people use wheelchairs or wheeled office chairs in the kitchen to avoid fatigue, even if their joints are healthy. Power changes that occur as a consequence of the aging process, such as a decrease in muscular strength or a decrease in the movement range of joints, can lead to a decrease in locomotion quality, such as a deceleration of walking speed and pace length (Bonenberg et al, 2019). In Figure 14, an image of a kitchen, the main operating area is not integrated enough. This causes the user to repeatedly move long distances and become fatigued. Changing the position of the refrigerator, or placing the cooker in the middle would improve this situation.

Reducing the distance of the operation area can effectively avoid fatigue. After satisfying comfort, users can pay attention to meeting deeper needs. The range and restrictions of the elderly must be considered, especially those in wheelchairs. In terms of reaching and stretching, older people

stretch shorter distances, and this is inversely proportional to the strength they have.



Figure 14. Schematic diagramme of user movement direction.

A conference report from Maguire et al. (2011) showed that about 37% of the sample they surveyed reported having a visual impairment when using the kitchen. Generally speaking, the problems with vision mainly focus on reading instructions, seeing the control parts of electrical appliances, and seeing items in the cabinet. People usually use glasses or place a light source as a solution. My grandfather's kitchen is a case of insufficient and uneven light (Figure 15). The light source during the day is only one side window, and an overhanging wall blocks the light to the operating counter, forming a dead end of light. At night, only one of the two spaces lights up. Light problems also severely affect the experience in the kitchen.



Figure 15. The light direction and the dark corners of the grandfather's kitchen.

In another picture of the kitchen (Figure 16) we can observe that single down-lights are not enough in the kitchen area. They cause what is called a "glare bomb". The top light is blocked by the wall cabinets, which block the light to the countertop. Ceramic materials are popular in China because they are easy to clean, but when used for flooring they are not suitable for the elderly. Not only are ceramics slippery, they also reflect light and affect sight. In response to such a problem, Garceau (2019) emphasizes that the lighting of the kitchen needs to be implemented using task lighting, ambient lighting, accent lighting and decorative lighting, which can overcome the glare of a single source.



Figure 16. Lighting analysis of a kitchen.

Multiple studies have found that older people over 65 have problems adapting to work and storage areas. The aging of old people's physical functions accelerates year by year. Maintaining a flexible and sustainable space becomes a practical and humanistic proposal. Pennathur et al. (2003) proposed an assembly cabinet with movable space. This area is 1350 mm (Figure 17). Baskets are built into the hard-to-reach spaces on the upper and lower floors; these are equipped with hydraulic brackets to help users transport items to a more comfortable area.

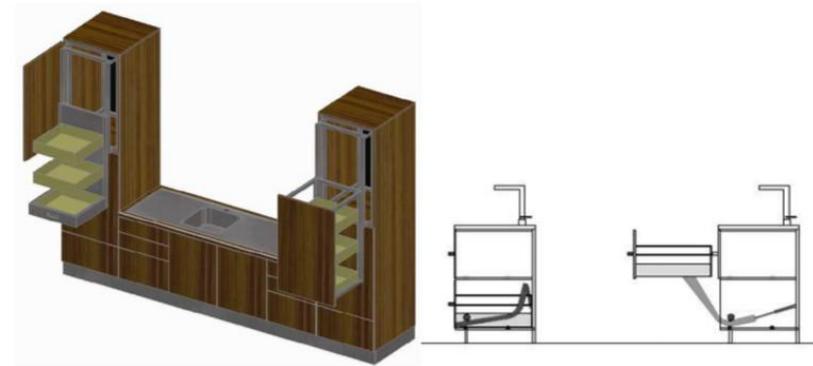


Figure 17. Hrovatin, J., & Vizintin, J. (2013). The structure of built-in baskets to help users get hard-to-reach items.

But the practical challenges of the kitchen are only part of the problem. One third of the elderly in China suffer from depression. Socializing and caring are important (Zhai et al., 2017). According to this survey by Zhai et al., children's support plays a decisive role in the mental health of the elderly in China. Social activities and social participation are also important factors. Ewart and Luck (2012) also suggest in the article that older people need to establish a link with the world, a "portal" through which to extend their boundaries and reduce the impact of changes in location on themselves. Older people are often seen as having fixed behaviours and a low ability to learn and accept new things. This is not to say that our participants were helpless in offsetting these effects, and in fact the trend to embracing communication technologies seems to be an effective strategy in mitigating a reduced social environment.



Figure 18. Liu (2017). Volunteers in China teaching the elderly to use smart phone.

Old people who have difficulty in achieving dignity in their home life usually suffer from:

- Physical motion disability
- Unreasonable kitchen layout
- Light problems
- Restrictions on stretching and reaching
- Shrinking world, lack of social “portal”

2.3 Cultural Heritage

Part of social connection is cultural connection. Without cultural heritage, societies and countries lose their main source of self-expression and eventually lose their ability to realize themselves (Idilfitri, 2016). It is the same for individuals. Older people's self-awareness and self-identification are important. Culture is one of the best ways for them to communicate with the next generation, and it is also the key to establishing a connection between different generations. Sufficient personal cultural heritage completes the self-awareness and self-realization of the entire society and country.

The Chinese philosopher Lao Tzu said: "致虚极，守静笃。万物并作，吾以观复。夫物芸芸，各复归其根。归根曰静，是为复命。” This is the idea that reaching a hazy state of nothingness and lack of desire, which can be called "peaceful", is important. The Chinese aesthetic appreciates a state of "mountain tranquility", which is eternal and lasting tranquility, also known as the "cosmic sense" (Zhu, 2016). It is not a void that instructs people to become disheartened, nor is it used to describe the state of the universe. It is a lively vitality that transcends time and space under a calm and ordinary appearance. In this study, cultural heritage provides

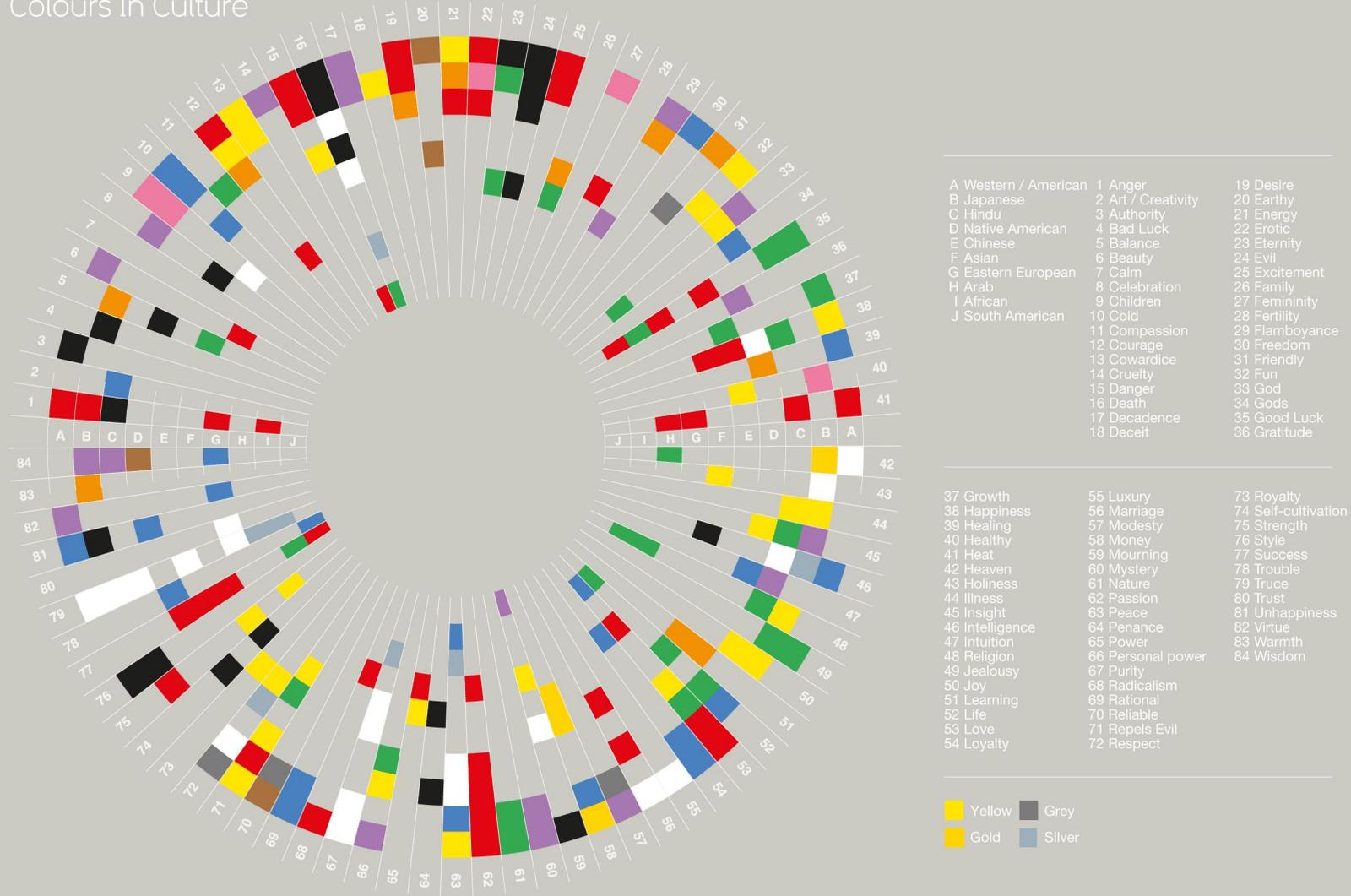
continuous thinking for design exercises. Colour, craftsmanship and a meaningful medium are culturally effective output methods.

In theory, colour can stimulate our brain chemical reactions and generate emotions based on these reactions, and emotions affect our decisions (as explained in the previous chapter). This colour psychology is often given a fixed meaning, for example, red=angry, black=authority, blue=trust, green=healthy, and there are other simple matches. However Wolf (2018) points out that this simple correspondence is not suitable for everyone. The effect of colour on human emotion is influenced by the user's experience, culture and environment at the time. As shown in Figure 19 below, red may represent an emotion of anger or danger in the West, but it has more positive connotations such as happiness and success in China. Moreover, she also proposed that when choosing the right colour combination, age is also one of the considerations.

"With maturity comes a greater liking for hues of shorter wavelength (blue, green, purple) than for hues of longer wavelength (red, orange, and yellow)" Color Psychology and Color Therapy (1961, p. 613).

The design exercise should therefore choose colours more consciously.

Colours In Culture



The modern industry lacks social participation, cultural recognition and "humane care" (Nascimento, 2009), but pays more attention to efficiency, output and practicality. Crafts represent authenticity, skill and tradition. The manufacturing industry cannot replace the sense of belonging that crafts bring to the user in the emotional and cultural dimensions.

Mortise-and-tenon (M & T) is usually referred to as a structure where two pieces of wood at different angles are connected in a complementary manner. The frame this creates is stable, not easy to damage, and has an anti-seismic function. Its material unity makes the product easier to be handled in nature.



Figure 20. (2018). Different types of mortise and tenon.

In the Chinese-style M & T is difficult to observe the joint structure from the outside. Its appearance looks delicate and complete, achieving a calm and vivid effect. It can be seen that the use of materials and the development of craftsmanship reflect the Chinese style by being hazy, following the pursuit of values that are free of artificial traces on the surface but full of wisdom and effort inside. Because of its "hidden" attributes, its ability to be inherited is not strong.

Nascimento (2009) believes that the best state of craftsmanship is how contemporary people understand traditional culture as the most natural and effective innovation mechanism.





Figure 21. A stool case with a complete M & T structure.

Human beings are good at exploring, creating, and giving meaning to the world (Johnson, 2007), and these meanings do not come out of thin air. On the contrary, it exists in our connection with things and plays a role in our process of "participation through sensory motor". Sounds, tastes, images, words and so on can all be used as a medium of meaning. For example, my grandfather lived in his hometown by the bamboo forest for many years. His memories and perceptions were formed by the fresh air and tranquil atmosphere of the bamboo forest. Thus objects related to bamboo were likely to bring him a familiar and calm feeling. This is a subconscious reaction. The formation of this created meaning has formed an individual or group culture. The cultural medium has become one of the inspiration sources for design.

Cultural heritage has extraordinary significance for the elderly. Old people find their value in the cultural awareness they carry, and get positive emotions from it.

2.4 The Kitchen Table

Maslow's hierarchy of human needs (Figure 22) shows that physiology and safety are the prerequisites for humans to pursue higher emotions. At any time, accomplishing self-actualization is an advanced method for achieving truly lasting pleasure. This is also the pleasure that cooking enthusiasts often enjoy in the process of preparing food. In response to my research into the problems of aging, particularly in China, and the significance of cultural heritage to individuals, I have developed my own framework for emotional design (Figure 23).

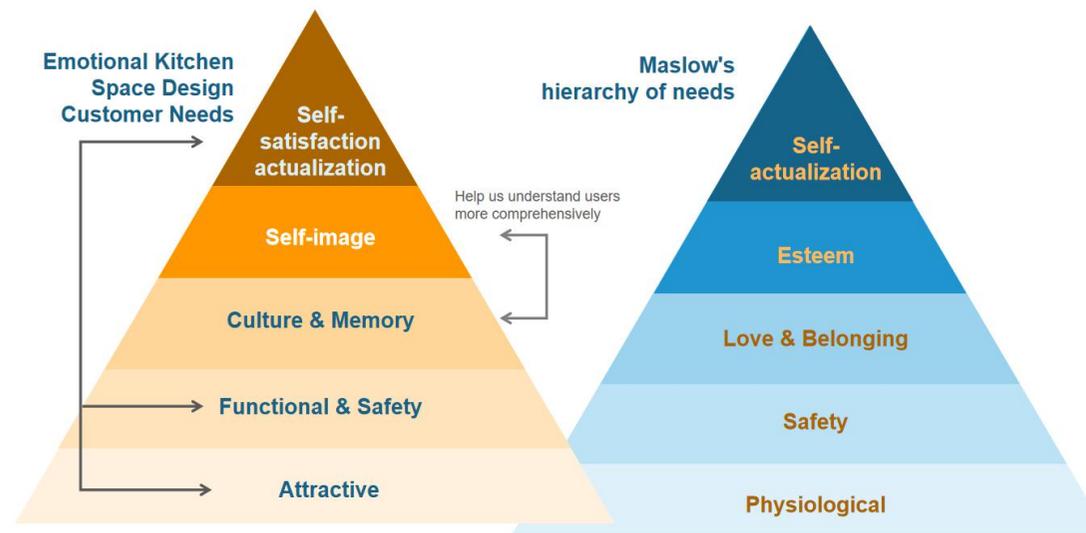


Figure 22. Maslow's and emotional design demand theory pyramid.

Note. Maslow's hierarchy of needs is the inspiration for emotional user needs. Figures 22 and 23 are in a continuous relationship.

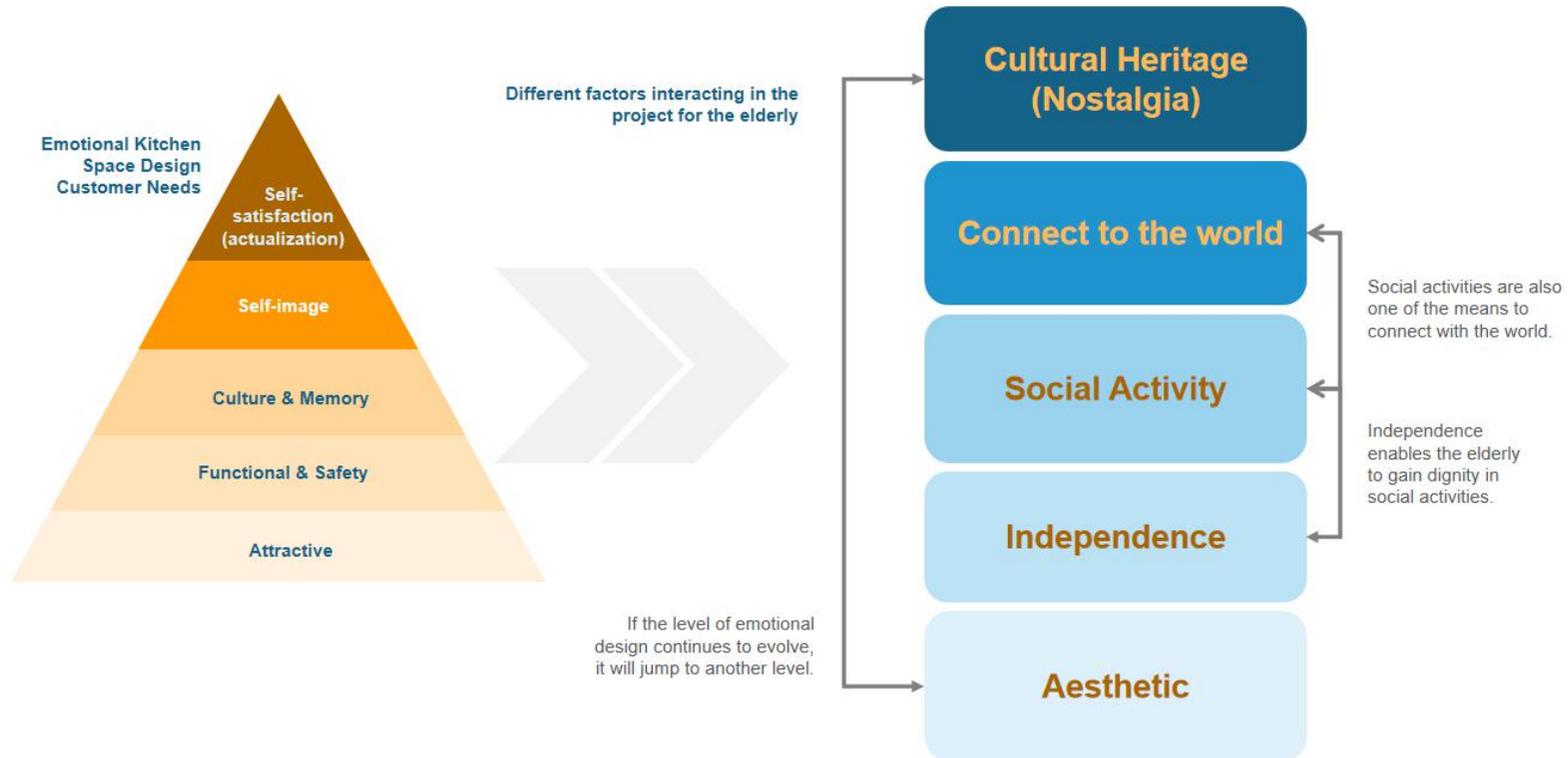


Figure 23. Specific design directions.

Independence, connectivity and cultural heritage are regarded as the three representative needs in this study. This determines the following three prominent design principles of the table kitchen.

- Making simple meals (physical independence, self-satisfaction)
- Socializing and connecting (making tea, playing chess, video chatting)
- A sense of cultural belonging

CH3: Methodology

I aim to design a kitchen table that enables people to age with dignity. I have based my design on the social and cultural background of China, using my own grandfather and his kitchen as a starting point. My research required me to identify with and understand people who are different to me. To understand them better, I adopted methods from user-centred design, particularly from ethnographic personas, and from virtual reality visualisation. Because I am working outside China, disconnected from my peer group, these methods have been adapted as ways to shape my imagination and empathy. The arrival of the Covid-19 pandemic part-way through my research reinforced this disconnection. Rather than stop work, I chose to explore how these methods can remain useful design tools. Is it necessary to consider who the user will be and how to involve customers in the design process before designing? What are the expectations of the users and designers? How can these be anticipated without direct access to the user group?

For the overall design methodology, I referred to the triple diamond design model. Like Dubberly and Pangaro, I regard design as “conversations of action” and emphasize action feedback on issues while proceeding systematically. The design follows a triple diamond framework and is divided into three iterative processes: empathy, design concept, and build and test. Empathy is mainly reflected in exploring the formation of the engaged people and the designer's objective observations and subjective analysis, forming opportunities for design projects. The design concept stage is based on the preliminary feasible product draft produced by empathy, and is accompanied by a large number of sketches and

preliminary ideas until the iteration forms a product that has the most potential. Building and testing takes place through the creation of prototypes. In particular, I have used the design ethnography methods of personas and scenario testing as a way to conceptualise and evaluate my design.

3.1 Design Ethnography

Design ethnography is a qualitative research method that can be simply defined as a systematic study of the behaviour and culture of a certain group of people (Hammersley, 2007). While design ethnography was particularly important at the start of my design process (in the research phases), it continued throughout the process as I re-evaluated and reimagined my users through my own evolving experiences.

Since my grandfather has passed away, it was not possible to get a direct user statement, or for him to participate in the project. But my close relationship with him may have become a dependency on describing various characteristics of the personae.

As per the description at the beginning of this article, the biography that records the story of my grandfather became a crucial source of inspiration. “As a research method, biographies not only involve collecting data about a particular individual, whether the individual is alive or dead, but also includes interpreting the data to create or portray specific aspects of the object's life and era (Given, 2008). The biography that records the story of my grandfather became a source of inspiration. Writing my narrative

required me to dig deep into memory, and turned up many important details.

As an example, I reflected on Figure 24, a picture of my grandfather's happiest activity in his old age — meeting friends. He was reluctant to use a wheelchair even he was exhausted. When the relatives of both parties came home together and chatted, they discovered this was true of both men. By narrating the emotions of the image, I gained insight into the life experiences and challenges of my intended users.



Figure 24. (2018). My grandfather, meeting with his peers.

Sensory ethnography, a method developed in particular by Sarah Pink (2009), illustrates how multiple sensations become an integral part of the lives of the people involved in our research.

Researchers have often separated the mind and body to analyze sensory effects. But material experience can be defined by mental reflection and meaning. These ideas resonate with the three levels of Norman's

emotional design. People can also redefine certain emotions through reflection. In other words, the way to realize the sensory is to treat the body as a medium of experience, and the brain produces new substances after a secondary processing. Sociologist Coffey (1999) summarized the core position of the human body in ethnographic field research and wrote: “ We locate our physical being alongside those of others as we negotiate the spatial context of the field” (Coffey, 1999: 59). When the body becomes the source and agency of knowledge, the senses become a medium of communication.

As Norman repeatedly emphasizes, it is necessary to explore user needs and expectations to form insights and opportunities. “ The user's participation determines the final experience of the product. Their involvement lead to more effective, efficient and safer products and contribute[s] to the acceptance and success of products (Kurniawan, 2004). However, during this research, direct user participation was not possible. To compensate for this, I used immersive research methods such as scenario testing, using my grandfather's story as a representative role.

Personas are abstractions of groups of real consumers who share common characteristics and needs (Pruitt & Adlin, 2006). This method is used for two purposes: 1. make the abstract target group real to get closer to the user's feeling: 2. provide vivid stories in the context of product design. Personas can help focus the designer's attention on the user's needs, thereby avoiding self-references and contradictory assumptions. There are limitations, however. If a persona is fictitious, it has to be imagined by the designer. This is easily questioned. In addition, the summarized text or scene may not necessarily provide the effective content required for product design.

	Scenario Description	Evaluation principles and objectives
1	Making noodles alone	<ul style="list-style-type: none"> • <u>Independence: Can complete the operation process independently.</u> • <u>Self-satisfaction: There is no necessary operation beyond the comfort range during use.</u>
2	Sharing a cup of tea and playing chess with a friend	<ul style="list-style-type: none"> • <u>Social activities: Flexible and diverse social methods.</u> • <u>Cultural heritage: A cultural atmosphere that reflects the owner 's background.</u> • <u>Sense of achievement: Conveniently share the entire space with others, and create a space for easy conversation and communication.</u>
3	Sharing a meal with a group of family members, including some on the video screen.	<ul style="list-style-type: none"> • <u>Connect to the world: Convenient and easy to operate electronic equipment.</u> • <u>Social activities: Flexible and diverse social methods.</u>

Figure 25. Scenario testing principles.

Kaner (2003) summarizes the goals of this approach as:“understanding the product, linking testing and users requirements, exposing failures to provide expected benefits, exploring the use of programs by experts, and relating to requirements Issues have surfaced, which may involve renegotiating old needs discussions (using new data) or showing unidentified requirements. Similarly, the evaluation principles of scenario testing (Figure 25) are derived from the observation phase and are continuously applied to each phase.

These biographical and sensory ethnographic methods solve problems by considering the relationship between experience and thought, material and senses. It explores how experience gives meaning, encourages empathy, and helps us know how to live and respond. Insights developed

using ethnographic methods can also be used to evaluate existing designs at a later time, but this is just an auxiliary function. Logan (2009) claimed that “Its true value comes from an early understanding of related fields, audiences, processes, goals and usage background”. It has the disadvantage of being time consuming, and it is not easy to gain user trust in a short time. In my research, these two flaws were weakened as my close relationship with my grandfather made all my observations happen naturally.

3.2 Visualization as mood induction

Every designer visualizes things they haven’t yet made, and there are a huge range of ways to do this. Visualisation is also an important way to build empathy and understand user experiences.

Sketching, for example, is a basic operation for generating design plans. This reduced way allows me to think calmly and avoid the interference of too many tools. Its main uses are:

1. “As an external storage device, leaving the thought as a visual mark in it” (Cross, 1982).
2. Thinking and painting happen at the same time. Thought will benefit from the externalization of mental images. This is also one of the embodiments of sensory ethnography.
3. As a source of visual-spatial cues associated with functional problems (Cross, 1982).

My design concepts were initially presented in the form of sketches and were then evaluated. Its rapidity and effectiveness means it often appears in the link to facilitate my collation in research. But its intuitiveness is not strong, and some details are not easy to expose.

My prototypes are “digital simulations or demonstrations of products or services, allowing designers to test hypotheses and conduct virtual explorations before product construction (Weber, 2018). Its format depends on the medium and the use of the final product. The purpose of a rapid model establishment is to achieve the conceptual structure of the final product without the cost of the entire product development cycle (Jones, Li & Merrill, 1992). In this project, the three-dimensional digital model is mainly built in Sketch-Up and Unreal Engine, to get a visual experience with a sense of space.

These digital models can also be tested in Virtual Reality. I work in the virtual reality laboratory (Figure 26). In my VR space, allowing observers to interact with objects in the scene may enhance a sense of being present, as, for example, in acting out the process of cooking noodles. In order to better understand its effectiveness with induced emotions, when entering a VR environment participants could attach a sandbag to their hands to increase resistance to movement and sit in a wheelchair all the time to simulate the feeling of the motion-disabled elderly. This provides a way to emphasise spatial experience and generate physical empathy with the user.



Figure 26. Working in the VR Lab.

Comparing the abstraction and planarization of traditional media, VEs provide richer emotions and interactions. Felnhofer et al. (2015) used VR as a “mood induction procedure (MIP) to explore whether specific affective states (ie, joy, sadness, boredom, anger, and anxiety) would be triggered in five different virtual park scenes”(Felnhofer et al., 2015, p.49). By using VR I wanted to check for emotions such as sympathy, understanding, sadness, or pleasure. There are obvious limits to VR as a prototyping environment. It cannot provide the tactile experience of real products, and the ability to induce emotions is also limited by the model and rendering technology.

I hope that by presenting my final design in VR younger participants will empathise with the anxiety of the elderly due to their physical obstacles.

Summary

I have not taken on a systematic design ethnography, but I have adapted ethnographic and visual methods to develop empathy and design emotionally. These methods start with the need for users to identify needs or problems and to establish potential solutions that are valuable to them. This is in line with my focus on my grandfather’s story and my own experiences. The triple-diamond design process allows the creativity to be continuously explored and improved. The VR experience also echoes emotional design. How do we tell stories, and how can the space created by VR induce audience emotions?

CH4. Concepts and Development



4.1 Empathy: Research and Insights

In this chapter I describe some of the key moments in my design process, organized according to the three main stages of the triple-triangle design process (see Chapter 3).

Engaging Personas

The first part of my process was to develop empathy with my user group to develop insights. The engaged perspective is rooted in the ability of stories to produce involvement and insight. Through an understanding of characters and stories, it is possible to create a vivid and realistic description of people (Canziba, 2018).

Some of my grandpa's experiences and feelings are beyond the reach of young people. I think it is very important to sincerely record and capture the user's instant feelings. Miaskiewicz and Kozar (2011) stated that by using narratives, pictures, and names, characters can provide product designers with vivid representations of design goals. Therefore, personas based on my grandfather's personal situation are shown in Figure 27.

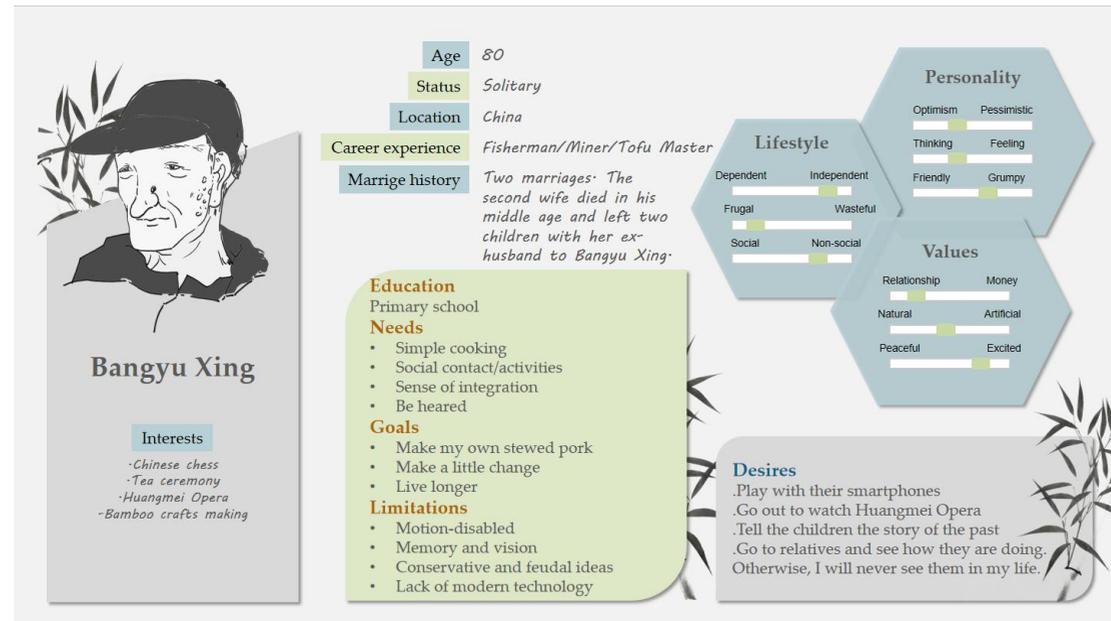


Figure 27. Persona developed from my grandfather's story.

Form the Opportunity

Figure 28 shows some scenes from my grandfather's life. By observing his expressions and behaviour patterns, interesting and representative life details have been recorded to form empathy mapping (Figure 29). There is an observation board (Figure 30) in the studio to record some observed details and some thoughts on the table kitchen.



Figure 28. Behaviour pattern.

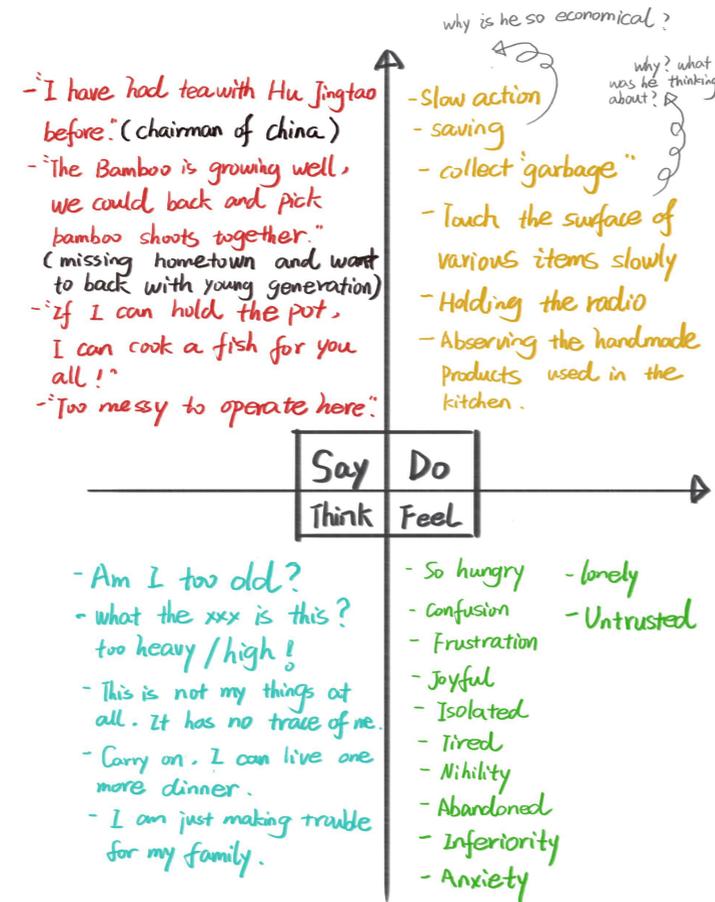


Figure 29. Empathy mapping.

There exists an important opportunity to improve the emotional experience of motion-disabled elderly people in the kitchen who may suffer negative emotions because of developing physical and emotional challenges related to old age.



Figure 31. Opportunity Statement.

Design Brief

The purpose of the design is to create a platform that integrates cooking needs and social functions to maintain or improve the emotional health of the elderly. I collectively refer to these different emotions and mental activities as the dignity of the elderly. To the right is the design brief (Figure 32) I developed.

Design Brief					
Purpose	To create a kitchen space based on the principle of emotional design so that the elderly with mobility disabilities can find dignity in it.				
Performance	<table border="1"> <tr> <td> Function list <ul style="list-style-type: none"> • Able to make a meal for himself • Social meal with 2-5 family members or friends • Multi-media equipment -video call • Tea ceremony for two </td> <td> Practical Usability Affordances Ergonomics </td> </tr> <tr> <td></td> <td> Emotional <ul style="list-style-type: none"> • Support elderly to be independence • Make social connections </td> </tr> </table>	Function list <ul style="list-style-type: none"> • Able to make a meal for himself • Social meal with 2-5 family members or friends • Multi-media equipment -video call • Tea ceremony for two 	Practical Usability Affordances Ergonomics		Emotional <ul style="list-style-type: none"> • Support elderly to be independence • Make social connections
Function list <ul style="list-style-type: none"> • Able to make a meal for himself • Social meal with 2-5 family members or friends • Multi-media equipment -video call • Tea ceremony for two 	Practical Usability Affordances Ergonomics				
	Emotional <ul style="list-style-type: none"> • Support elderly to be independence • Make social connections 				
Features	<p>A look that feels safe, like a thick structure. Non-slip handle. The main material is sustainable and environmentally friendly.</p> <table border="1"> <tr> <td> Needed elements Functional <ul style="list-style-type: none"> • Cooking station • Water source • Media equipment - TV and Radio • Traditional pattern Making tea • Thick structure • Easy to put into an existing kitchen space • Screen </td> <td> Needed elements Emotional <ul style="list-style-type: none"> • Independence • Feeling of Trusted and safe • Culture belonging • Self satisfaction • Self-actualization • Confidence • Memorable </td> </tr> </table>	Needed elements Functional <ul style="list-style-type: none"> • Cooking station • Water source • Media equipment - TV and Radio • Traditional pattern Making tea • Thick structure • Easy to put into an existing kitchen space • Screen 	Needed elements Emotional <ul style="list-style-type: none"> • Independence • Feeling of Trusted and safe • Culture belonging • Self satisfaction • Self-actualization • Confidence • Memorable 		
Needed elements Functional <ul style="list-style-type: none"> • Cooking station • Water source • Media equipment - TV and Radio • Traditional pattern Making tea • Thick structure • Easy to put into an existing kitchen space • Screen 	Needed elements Emotional <ul style="list-style-type: none"> • Independence • Feeling of Trusted and safe • Culture belonging • Self satisfaction • Self-actualization • Confidence • Memorable 				
Reliability	Expect higher quality materials to be used at different stages of the elderly. The product is sturdy but not sharp, so that the elderly who fall easily can be supported without harm.				
Aesthetics	Materials, shapes, and craftsmanship are designed in accordance with Chinese aesthetics. Bring people a sense of cultural belonging. Ergonomics is important.				
Cost	<p>Customized products for special populations are expensive. But the elderly in China are not among the wealthy. It will strive to use less cost and a smaller footprint. Find common ground among different users, so as to expect that the products can be mass-produced and reduce costs.</p> <p>The product can be used for a long time and is sustainable. Value for money.</p>				

Figure 32. Design Brief.

I first look for inspiration about design solutions from personas behavioural patterns. Three scenes were set.

Cooking noodles

A simple cooking process that can be carried out at the table.

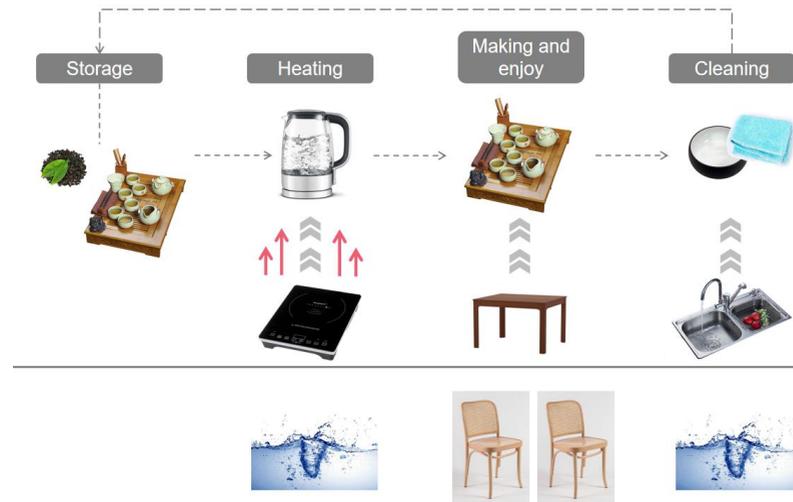


Tea ceremony

A type of social activity for two or three people.

Party

A larger social event for five or more people, including people joining remotely via screen.



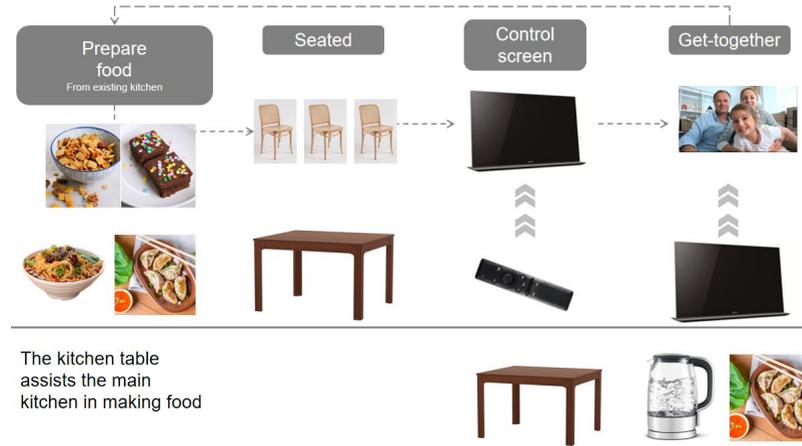


Figure 33. Noodle making process and collaborators.

Figure 34. Tea making process and collaborators.

Figure 35. Large party and long distance party.

	Scenario Description	Evaluation principles and objectives
1	Making noodles alone	<ul style="list-style-type: none"> • <u>Independence: Can complete the operation process independently.</u> • <u>Self-satisfaction: There is no necessary operation beyond the comfort range during use.</u>
2	Sharing a cup of tea and playing chess with a friend	<ul style="list-style-type: none"> • <u>Social activities: Flexible and diverse social methods.</u> • <u>Cultural heritage: A cultural atmosphere that reflects the owner 's background.</u> • <u>Sense of achievement: Conveniently share the entire space with others, and create a space for easy conversation and communication.</u>
3	Sharing a meal with a group of family members, including some on the video screen.	<ul style="list-style-type: none"> • <u>Connect to the world: Convenient and easy to operate electronic equipment.</u> • <u>Social activities: Flexible and diverse social methods.</u>

Figure 36. Scenario testing principles.

Reflective Statement

In the empathy phase, it is more challenging to actually record and understand the needs of the elderly, and what kind of thinking they are based on. As a person of 30, I need to understand the thinking of old people around 80 years old. I think this is the hardest part. But the empathy map helped me very well. Its four quadrants expose the inner connection between language and behaviour, and constantly remind me to put myself in the place of the elderly. In addition, the setting of the observation board created a focused research atmosphere, making it makes easier for me to come back from other places and find everything I needed quickly.

In order to find a feasible design plan, I analyzed and visualized the flow of activities that I hope old people can do in this space. This directly helped me discover the possibility of the "table kitchen". Organizing the relationship diagramme between the design elements (Figure 35) before the design sketch began to assist the next stage of work.

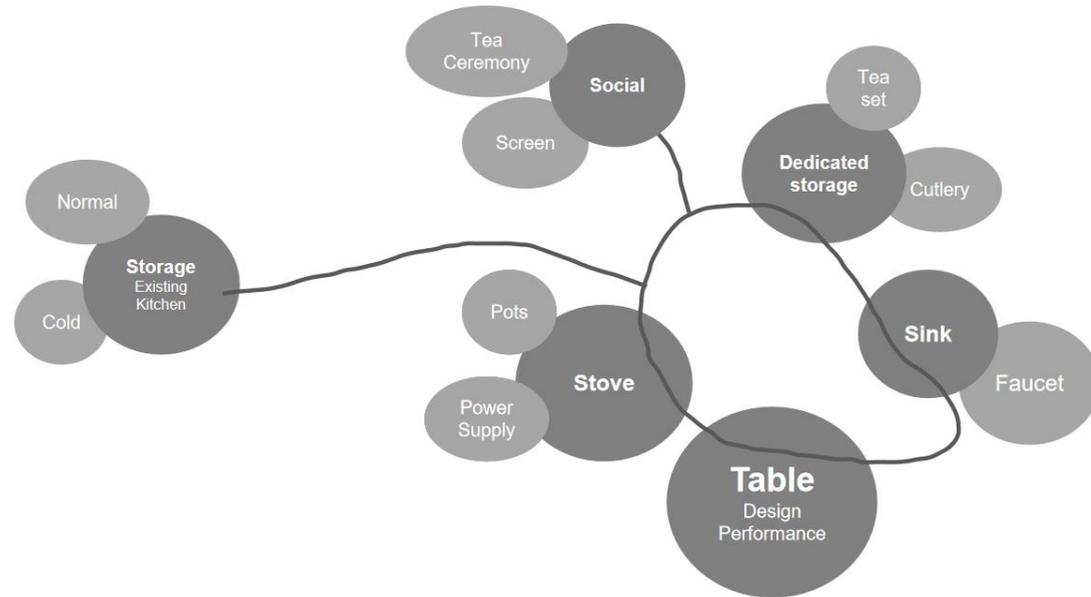


Figure 37. Relationship of design elements.

4.2 Design concepts: Concepts and development

Sketches

I started with basic shapes. The heating area and the cleaning area are simply represented by circles and squares.

Keywords are: crescent, simplicity, nature, docking, folding, assembled, hidden, tee, shadow, and stealth.

Key words are the “*tools of navigation and how one navigates ones way through thought itself*” (Bruno 2008, p. 144).

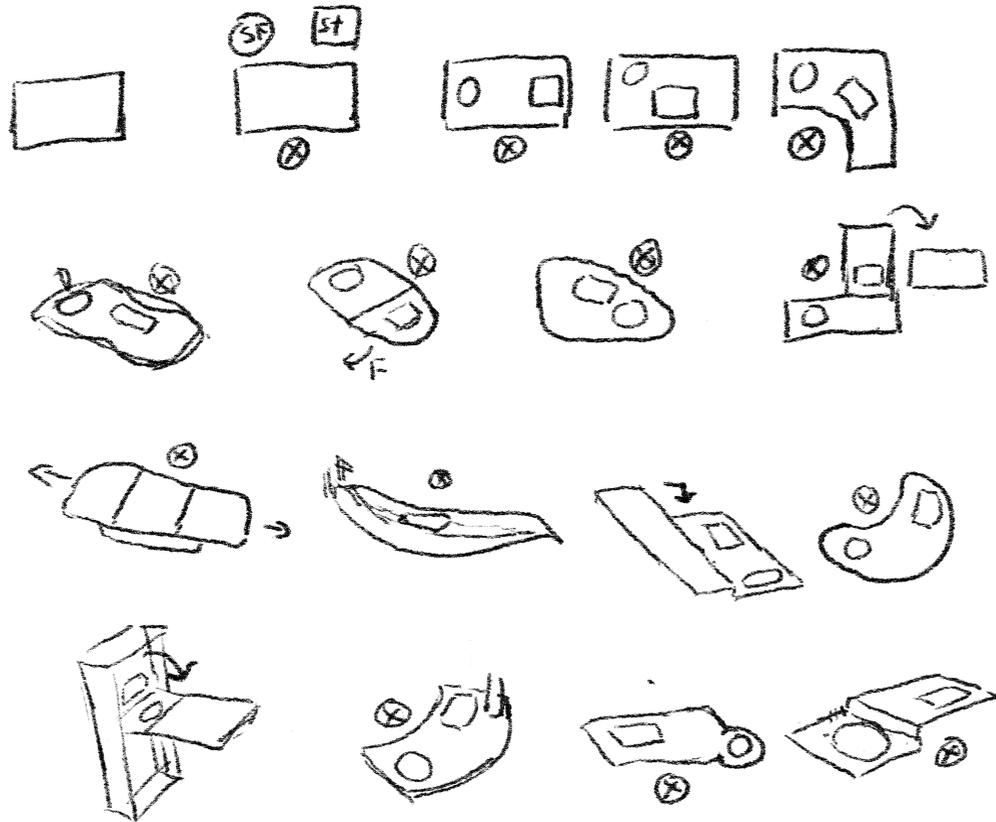


Figure 38. Sample shape concepts.

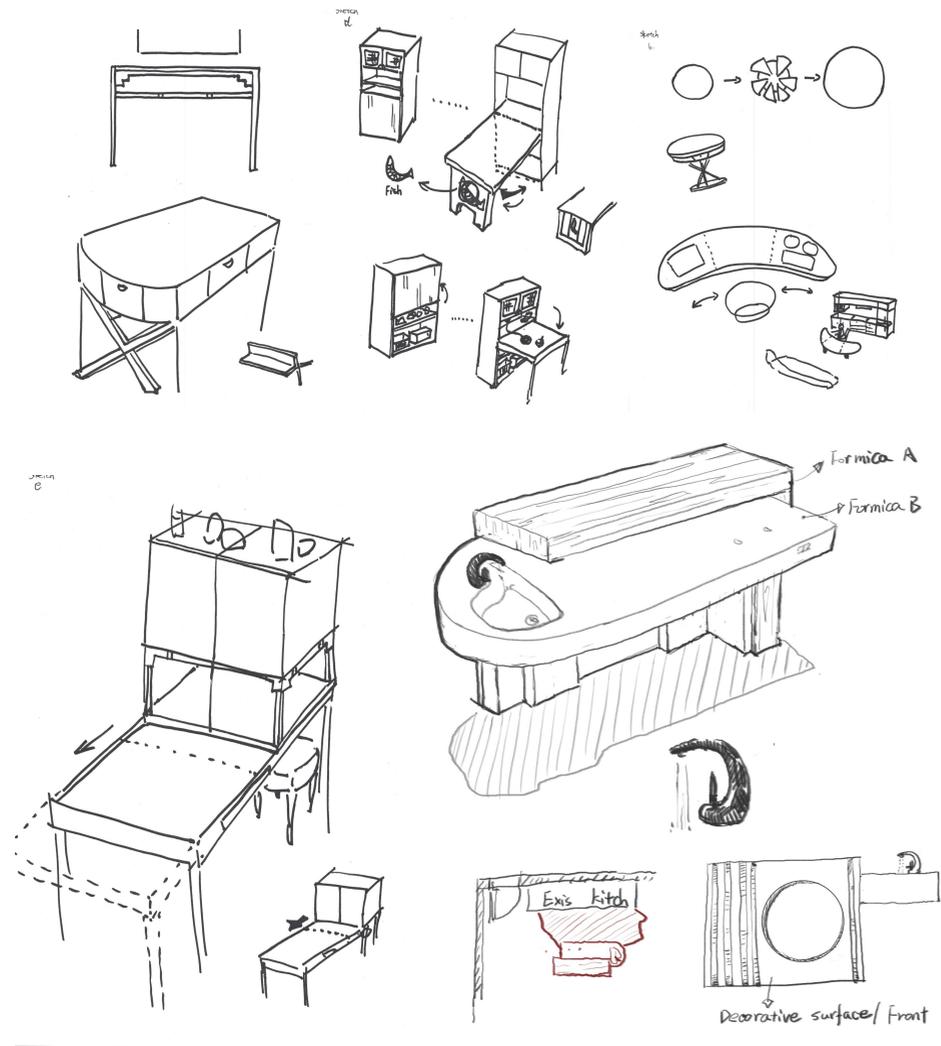


Figure 39. Sketches of original thinking.

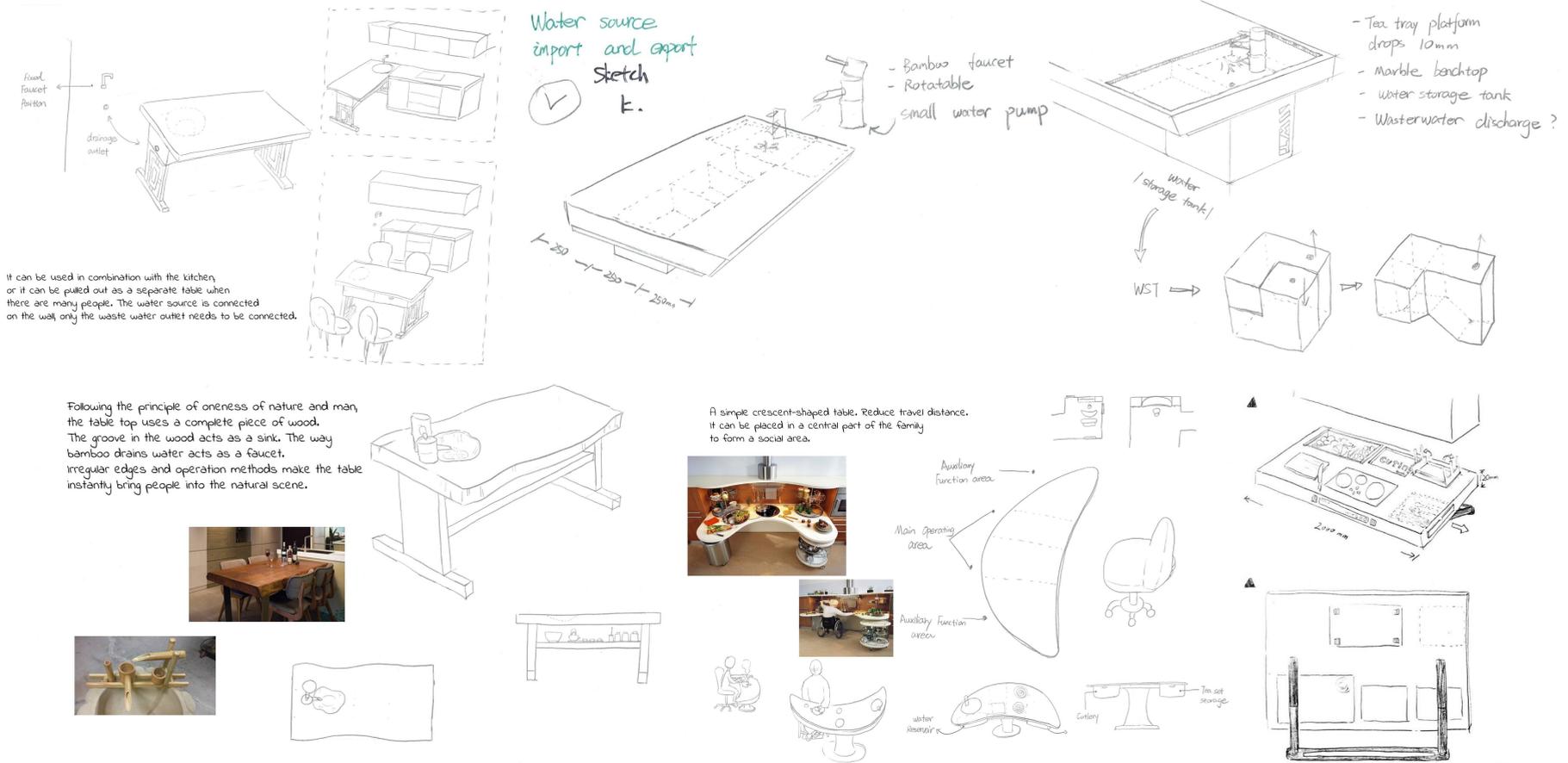


Figure 40. Desk concept brainstorming 1.

I developed several initial concepts:

Docking: Table connects to the existing kitchen space.

Tee: Allows users to move comfortably on both sides of the table.

Nature: Irregular wooden edges that create natural comfort and security.

Crescent: Puts more work surface in reach. **Stealth:** Easy hide to the wall.

Folding: Occupies a very small area.

Simplicity: Simple table with obvious tea culture.

Hidden: Hide functional drawers.

Assembly: Combination of cabinet and table.

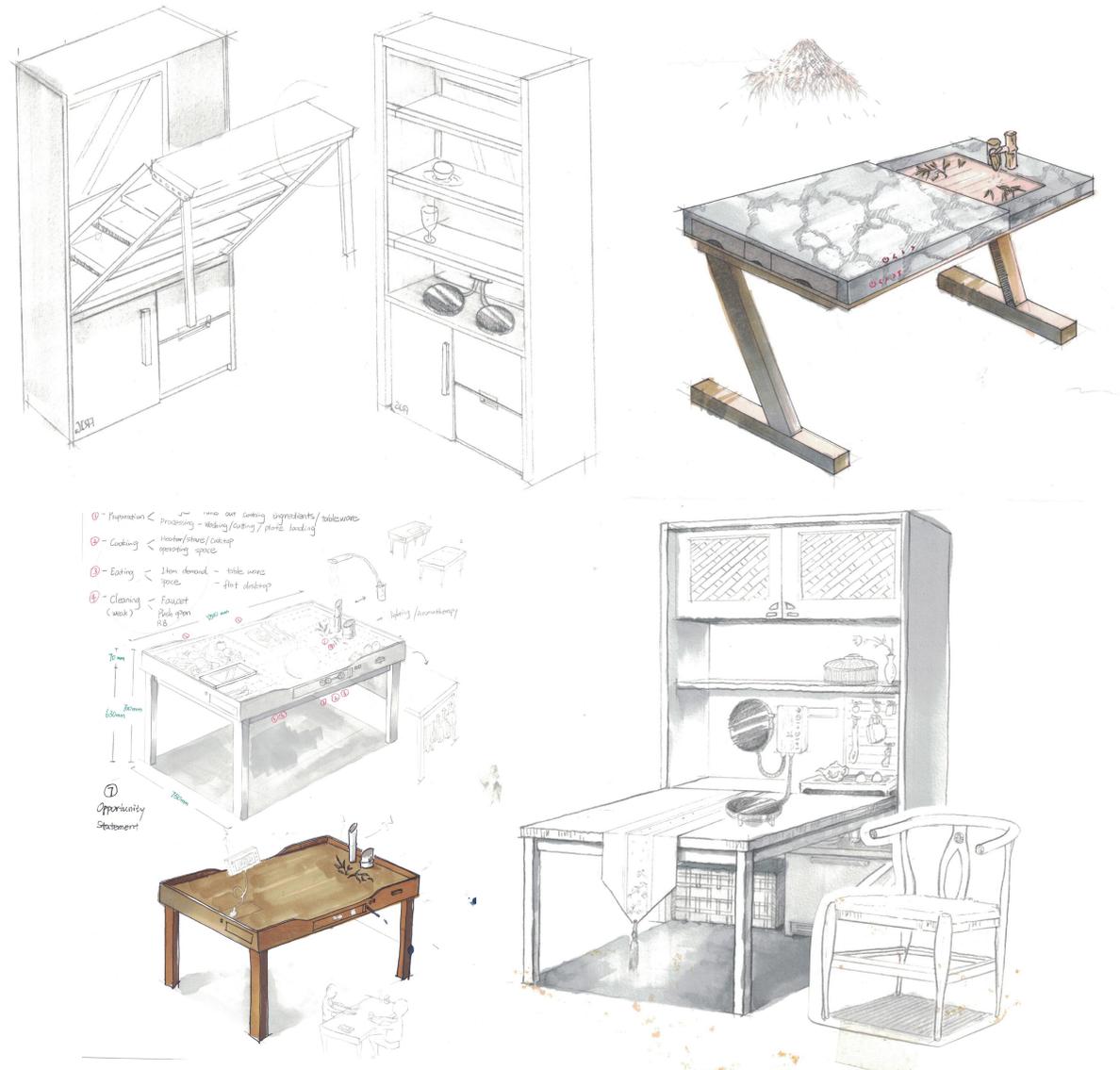


Figure 41. Desk concept brainstorming 2.

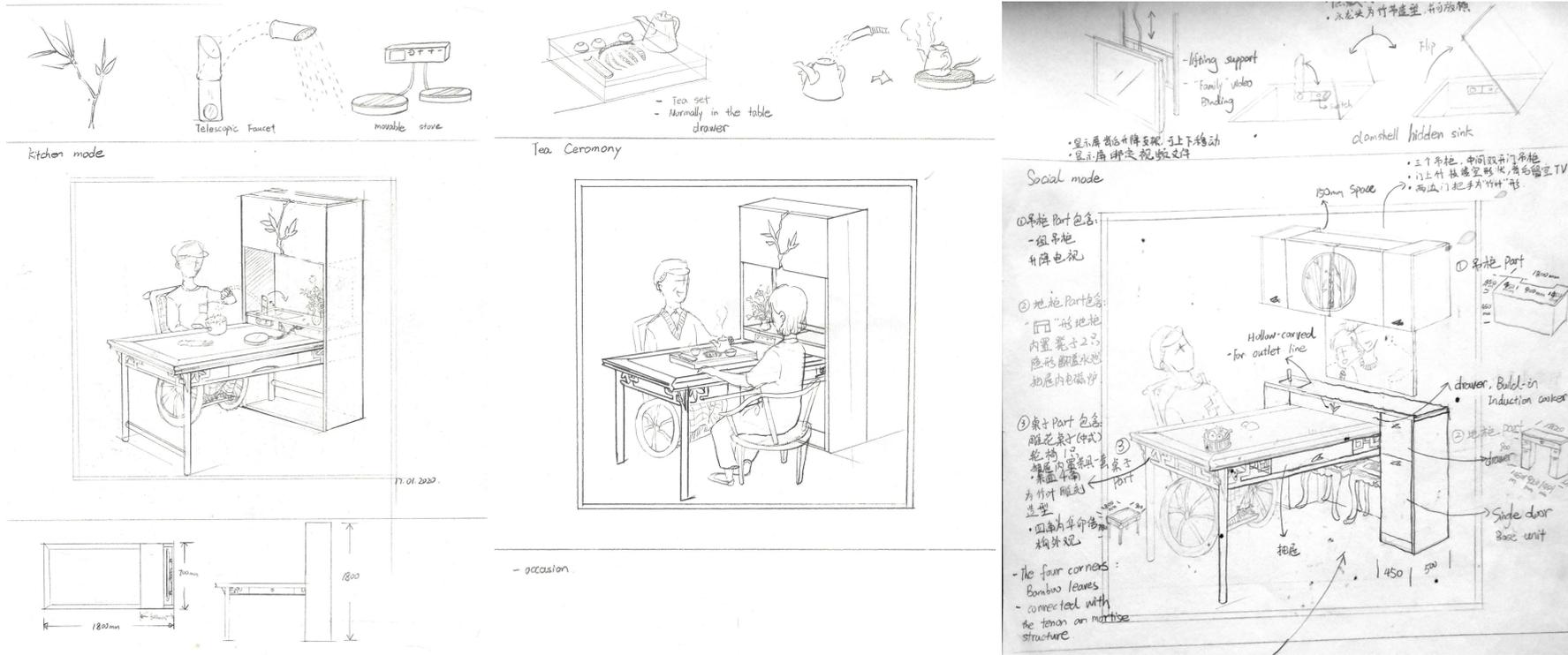
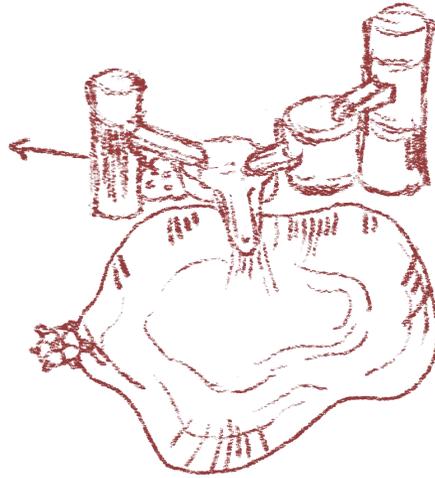


Figure 42. Scene testing in sketches.



Development

After the first round of evaluation and reflection, three design concepts were screened and detailed before entering the next stage. These three concepts were obtained through the integration of different design features from the sketch stage, and refer to the design brief for comprehensive evaluation.

1. **Simplicity** - "The quality or condition of being plain or uncomplicated in form or design." (Definition from Oxford Languages).

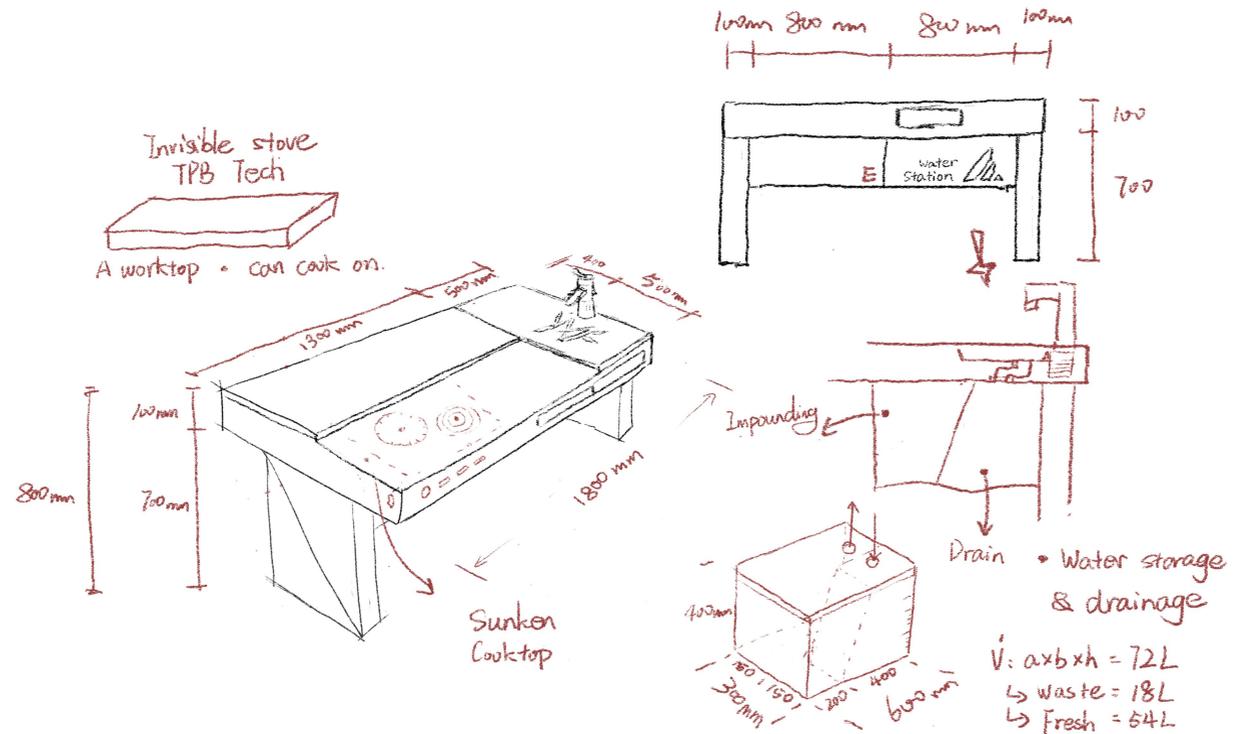
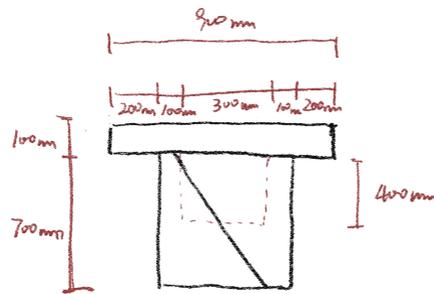


Figure 43. Sketches of simplicity.

2. **Nature** - "The basic or inherent features, character, or qualities of something."
(Definitions from Oxford Languages).

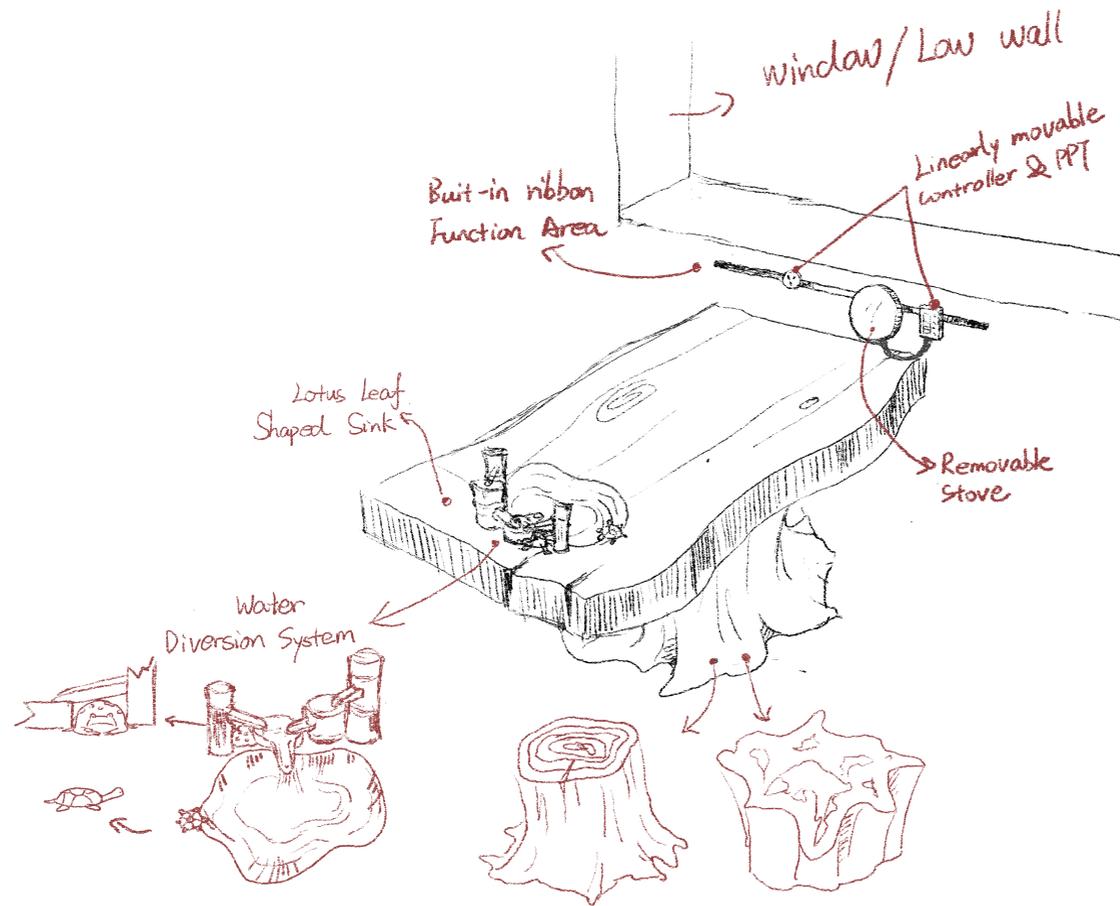
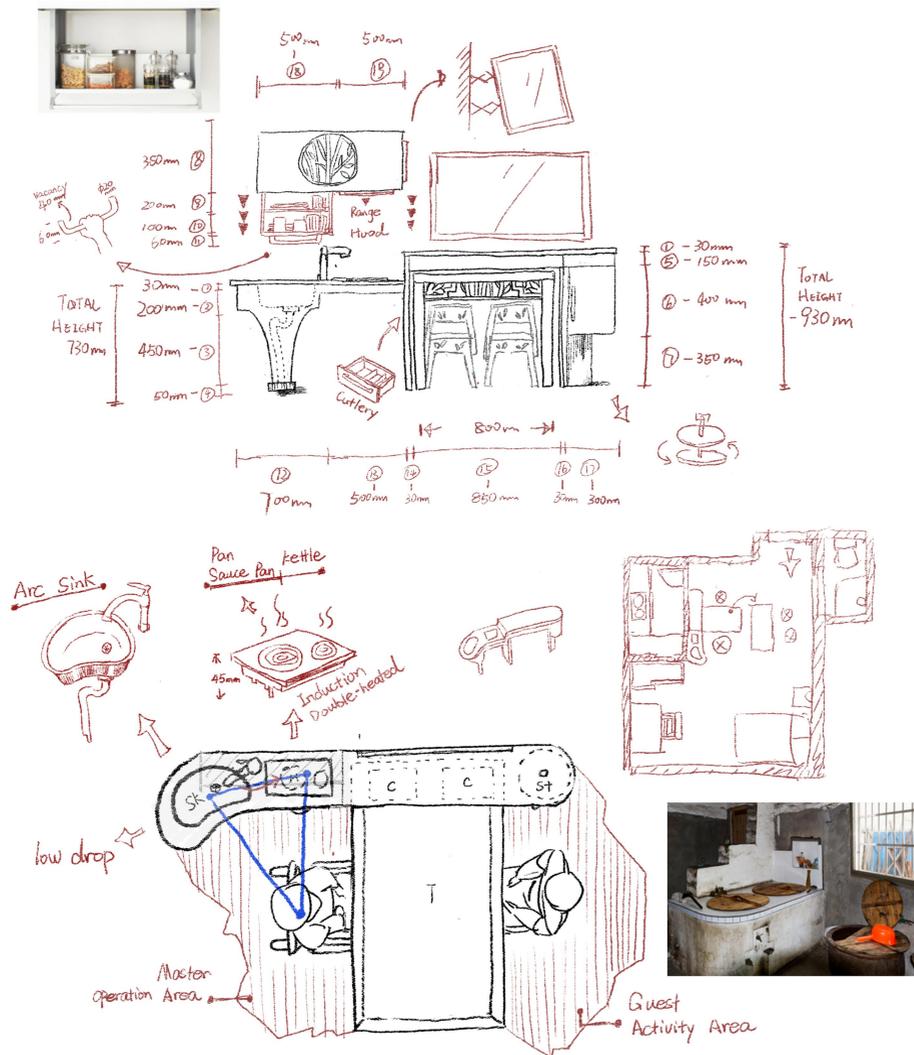


Figure 44. Sketches from nature.



3. **Assembly** - "the action of gathering together as a group for a common purpose." (Definitions from Oxford Languages). I developed several versions.

Figure 45. Sketches of Assembly.

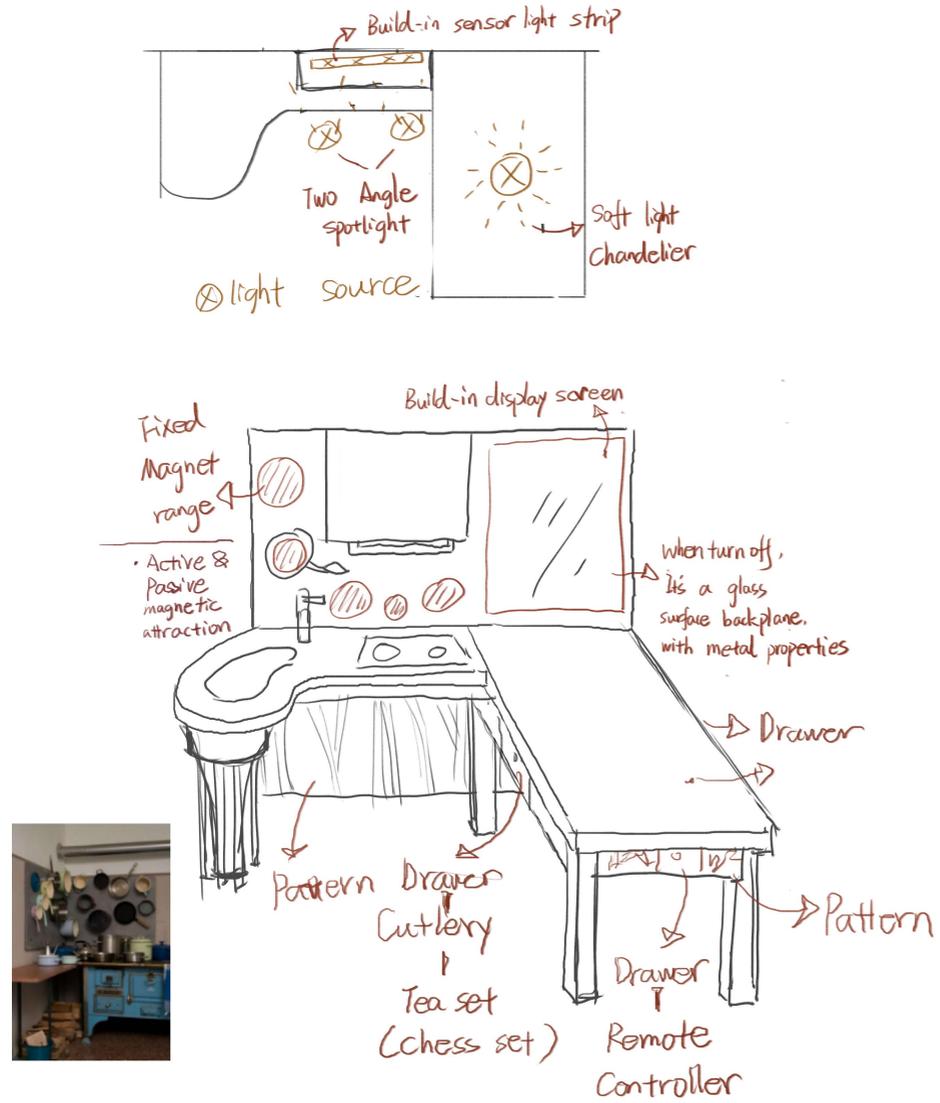


Figure 46. Sketches of Assembly

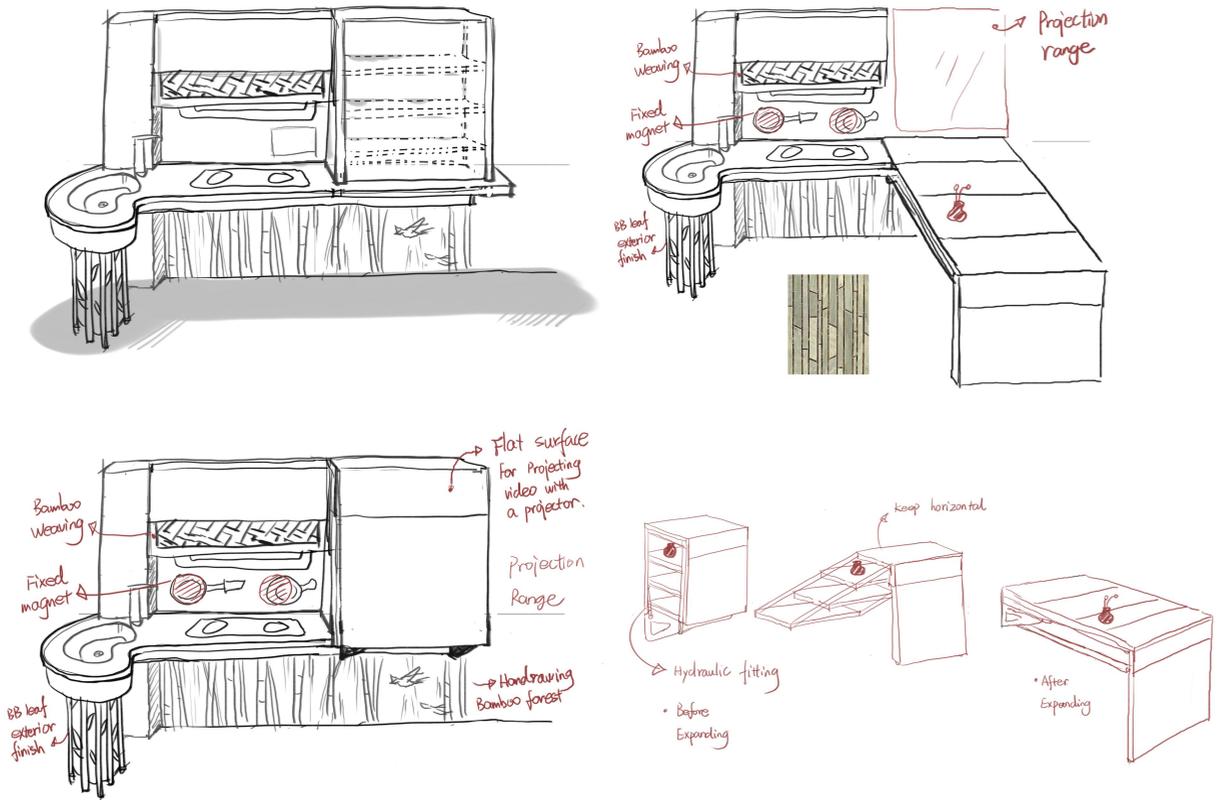


Figure 47. Sketches of Assembly.

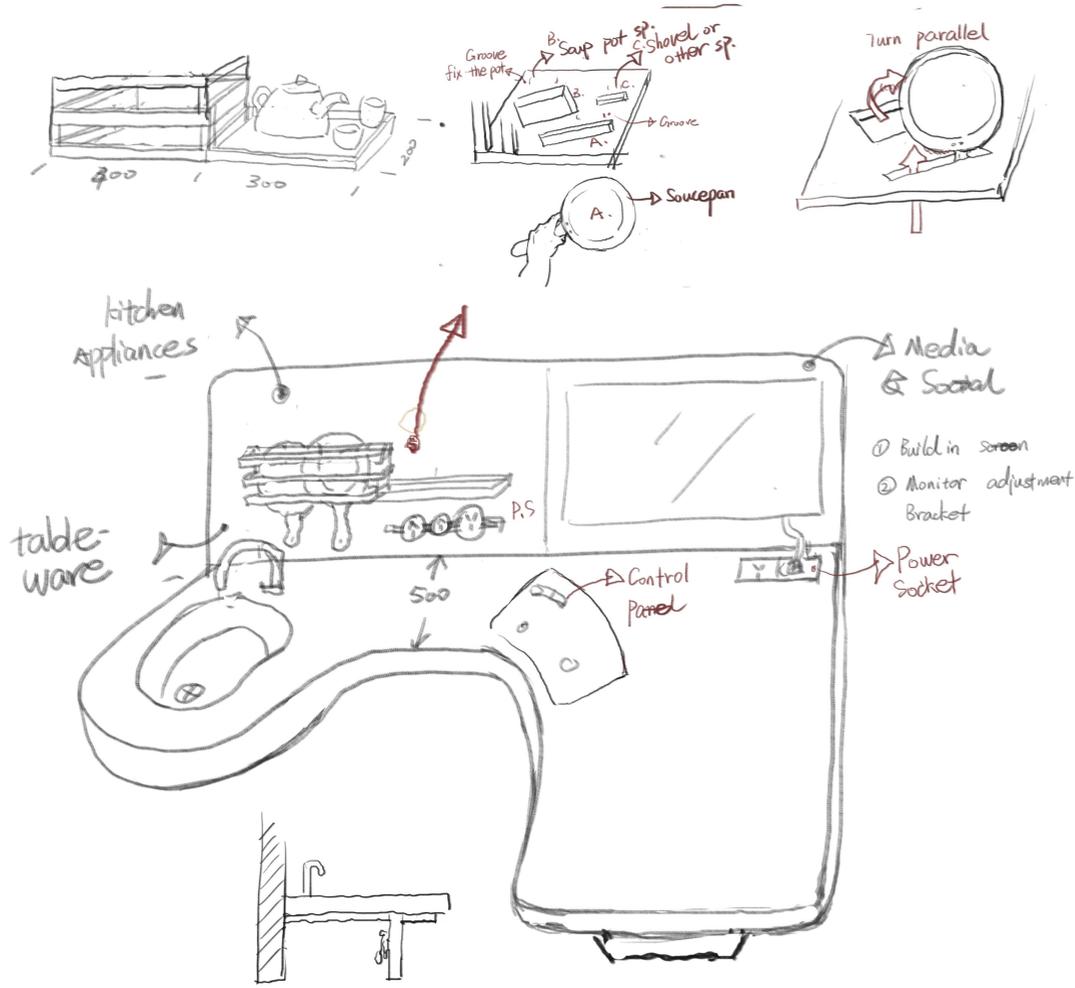


Figure 48. Sketches of Assembly.

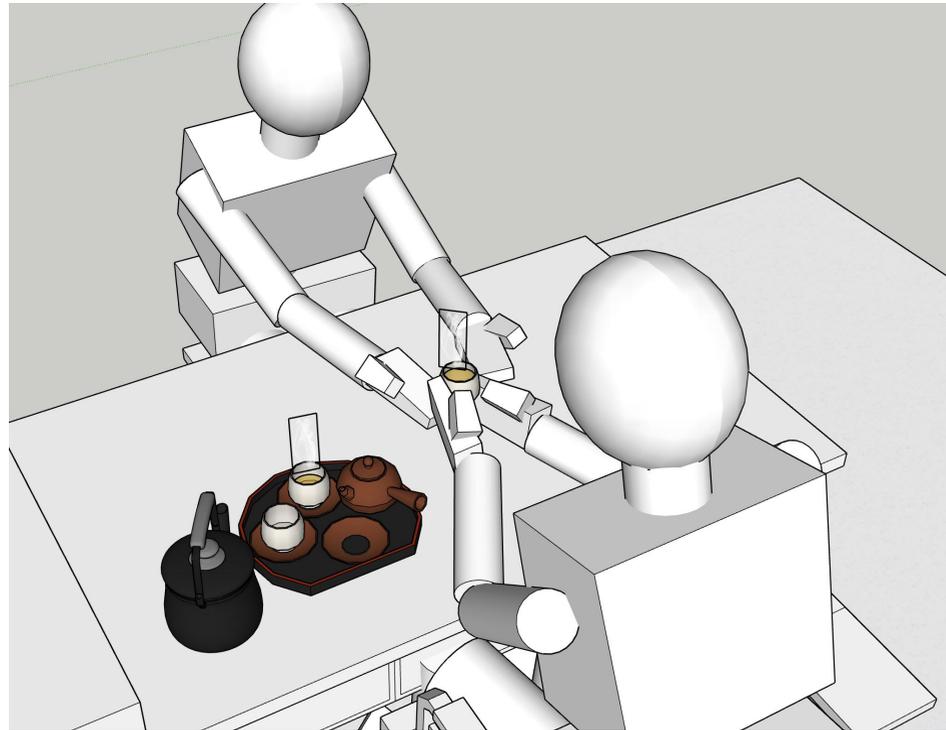
Reflective Statement

The design concept stage is a preliminary exploration, which plays the role of undertaking the research content of the previous stage and integrating personal creativity. The sketches assisted me in recording and initially showing my idea, however I struggled with the painting method for a while before slowly forming a stable and easy to review sketch drawing mode.

My "Assembly" design fulfills the design expectations for the auxiliary space, meets the user's independent operation needs, and offers proper activities and storage space. Socially, it can entertain a different number of guests and has a variety of functions.

4.3 Build and Test: Prototyping and Evaluating

Having settled on a basic design strategy, I needed to test my design, which I did using digital mannequins and VR.



Independence

The height of the target user affects the height and reachable depth of the product. When establishing the auxiliary space, it is necessary to consider the applicable size range. As the user may use a wheelchair at a certain height, the size of the wheelchair also needs consideration.

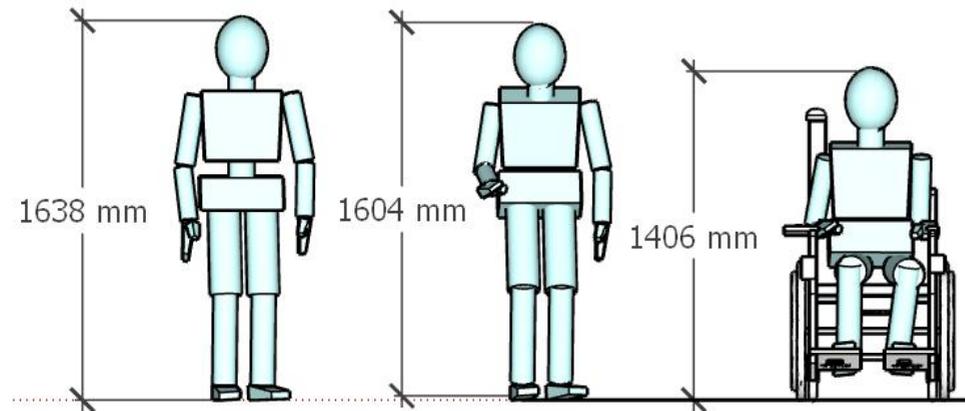


Figure 49. Character model.

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According to Wikipedia's 2014 Chinese height survey data (age survey range 18-69), it can be inferred that the average height per person is about 1638mm. The product model created based on this data is suitable for people with a height of 1738mm-1538mm.

Combining the existing ergonomic data and predictions at the sketch stage, the user's activity range can be divided into upper and lower parts.

At work, the upper arm strength of the elderly is usually very low. This means that it is difficult for them to raise the upper arm beyond the level of the lift while grasping objects of with a certain weight so they reduce possible injuries by bending their elbows.

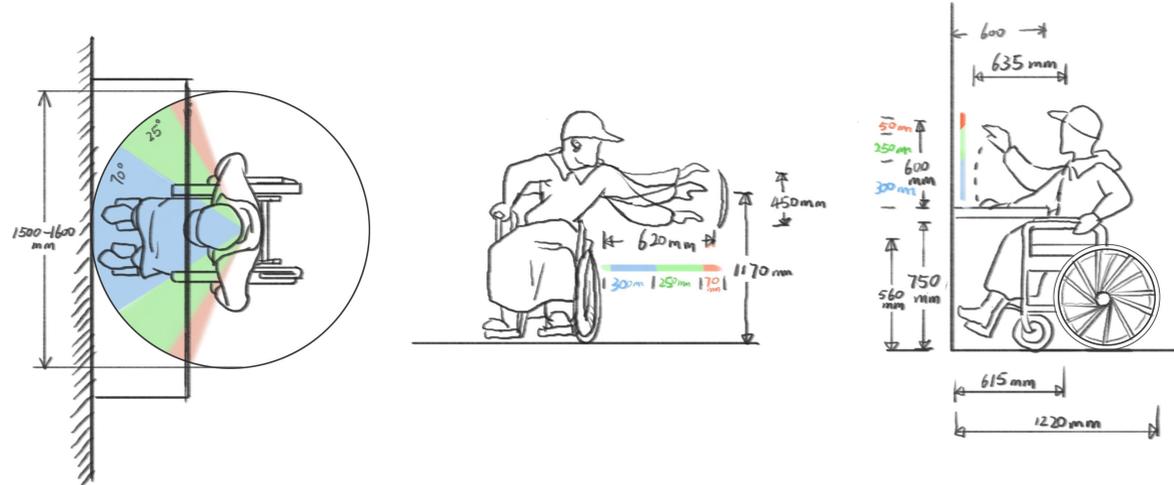


Figure 50. Specific range of activity of the elderly sitting in a chair.

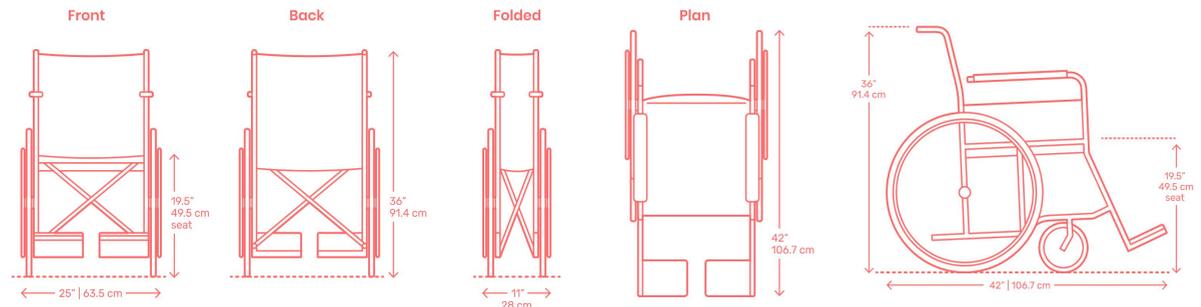


Figure 51. Wheelchair size.

Scenario 1

A set of "Cooking noodles" scene test.

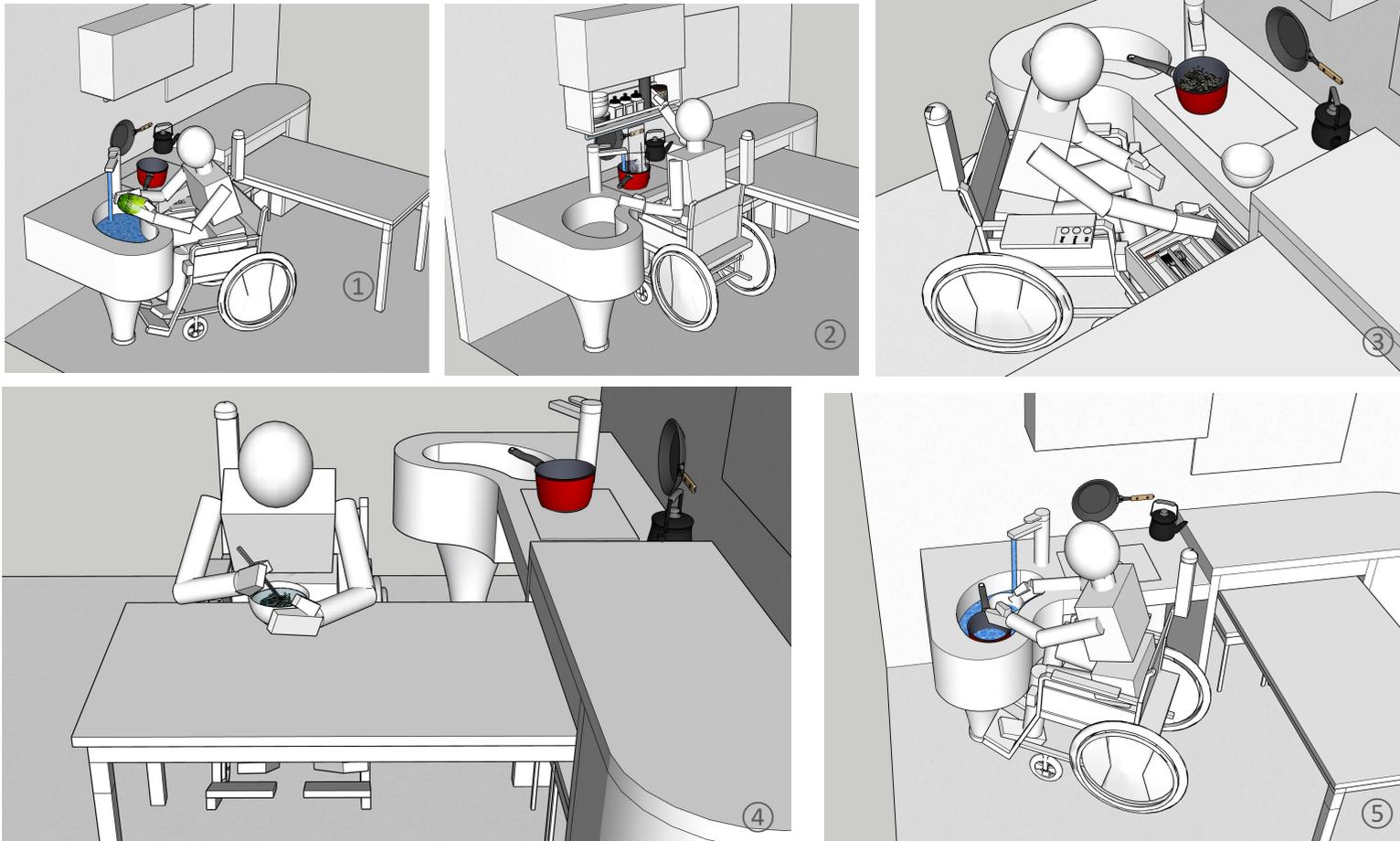


Figure 52. Scenario 1.

Scenario testing 2

A set of "Making Tea & Entertaining guests" test.

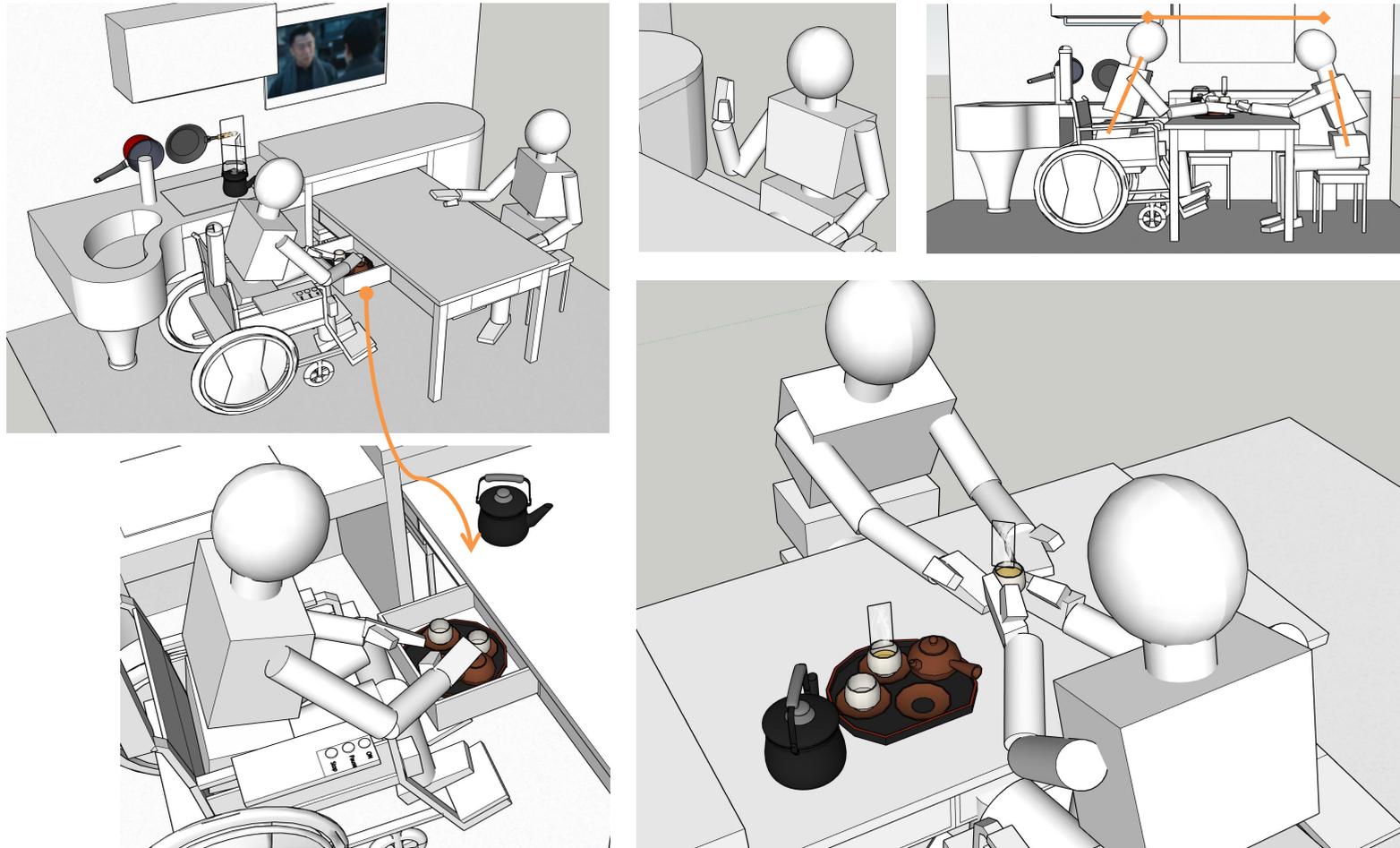


Figure 53. Scenario 2.

Scenario testing 3

A set of "Family Video Call" scene test.

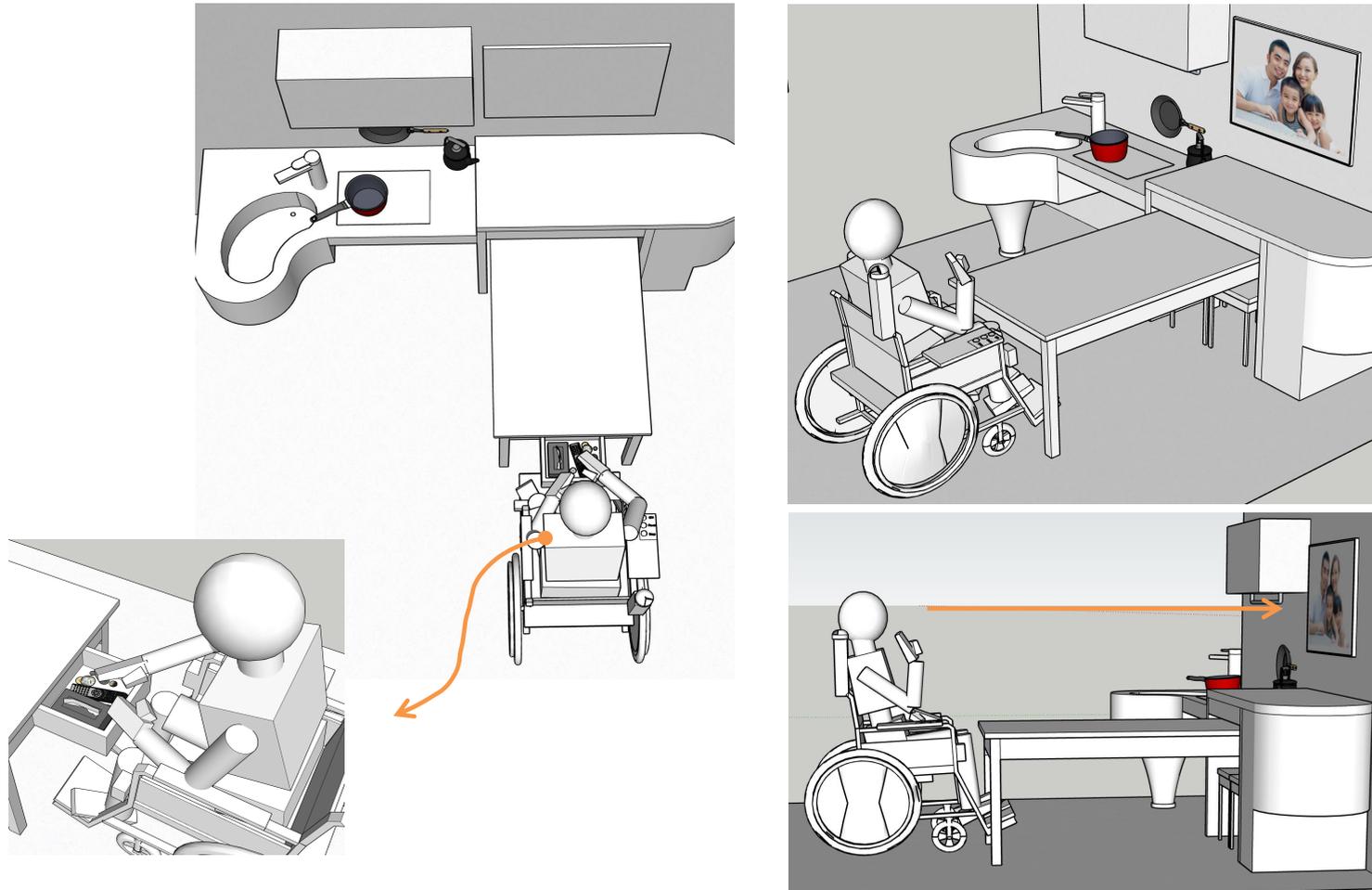


Figure 54. Scenario 3.

	Scenario Description	Evaluation principles and objectives
1	Making noodles alone	<ul style="list-style-type: none"> • <u>Independence: Can complete the operation process independently.</u> • <u>Self-satisfaction: There is no necessary operation beyond the comfort range during use.</u>
2	Sharing a cup of tea and playing chess with a friend	<ul style="list-style-type: none"> • <u>Social activities: Flexible and diverse social methods.</u> • <u>Cultural heritage: A cultural atmosphere that reflects the owner's background.</u> • <u>Sense of achievement: Conveniently share the entire space with others, and create a space for easy conversation and communication.</u>
3	Sharing a meal with a group of family members, including some on the video screen.	<ul style="list-style-type: none"> • <u>Connect to the world: Convenient and easy to operate electronic equipment.</u> • <u>Social activities: Flexible and diverse social methods.</u>



Reflections on Scenario Testing

Problems-

The auxiliary tables in the guest area are narrow.

There is not enough space under the sink to accommodate the legs.

Difficulties exist when different users use the functional area. The influence of the height is greater.

There is insufficient space for ground activities in the Golden Triangle area.

The height for comfort of the host and guests is conflicting.

Pulling out the table requires additional labour.

Achieved-

The golden triangle forms the operating area.

The edge of the arc forms a wrapping effect, reducing the moving distance.

Damage reduction.

Multi-lattice drawers beneath the table allow storage space for special items. This saves work and enhances the user's experience of self-sufficiency and independence.

The multimedia screen is aligned with the user's line of sight, producing a real companionship effect.

The rotatable faucet serves for both cleaning and water supply.

The pull-out table makes it possible to hold dinners for up to 5 people.

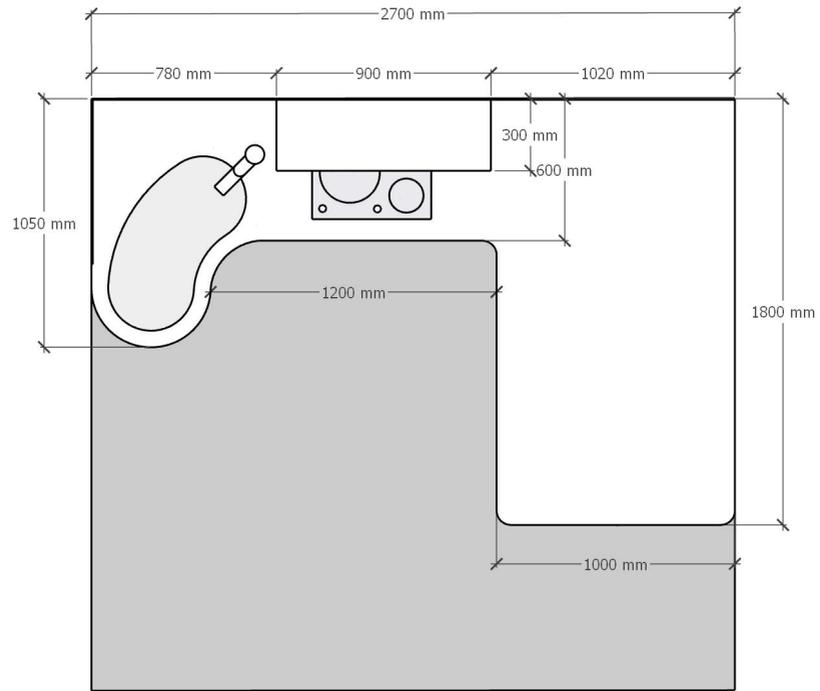


Figure 55. Dimension plan.

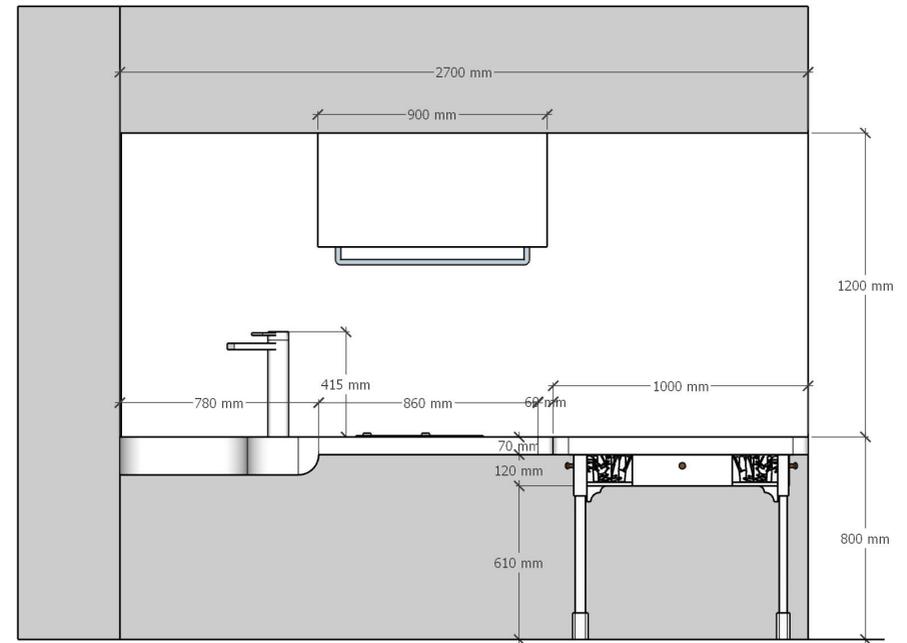


Figure 56. Dimension elevation.

According to the reflections on Assembly, in order to solve the problems that arise, the plan is optimized and combined with alternative plans to produce staged results.

The table itself is a whole stone countertop or bamboo board.

The shallow sink depth allows users to easily sit down and put their legs under the table. A table height of 800mm makes it perfectly feasible for users within the standard height range to operate. The faucet is centred between two separate functional areas - the cleaning area and the heating area. The rotatable, taller faucet serves the cleaning function while easily adding water to the stock pot during cooking.

The high magnetic back board, such as a wall cabinet, is laid on the wall, so that the whole easily accessible area can be used to store common articles. The wall cabinet is pull-down and can store commonly used condiments and dishes. Multiple sockets are set in the lower right corner of the wall as the "portal" (Ewart & Luck, 2012) for connecting multimedia devices.

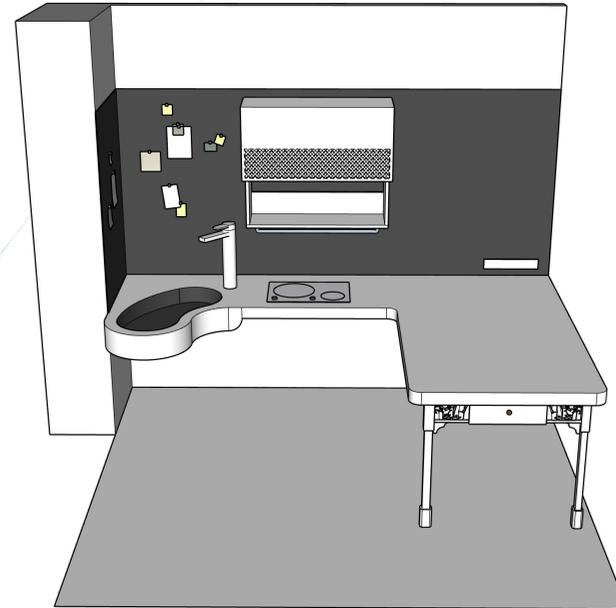


Figure 57. 3D model of the project.

The bottom of the table is mostly empty. Under the rectangular table on the right, there are built-in drawers and cultural decorative patterns. The manufacturing technology is the traditional mortise and tenon structure. Each drawer has a different mission. Through the scene test, we know that large drawers close to the host area store cutlery box and tea sets. The small drawers on the opposite side of the wall contain some common multimedia devices or controllers (such as iPad or TV remote control). Next to the drawer of the guest, there are some spare items such as tissues.

Cultural Heritage

Harmonizing colours and materials

Based on the spirit of advocating harmony that Chinese people advocate, along with the so-called pursuit of a "hazy and peaceful" state, I developed an approach towards colour using the five elements (五行).

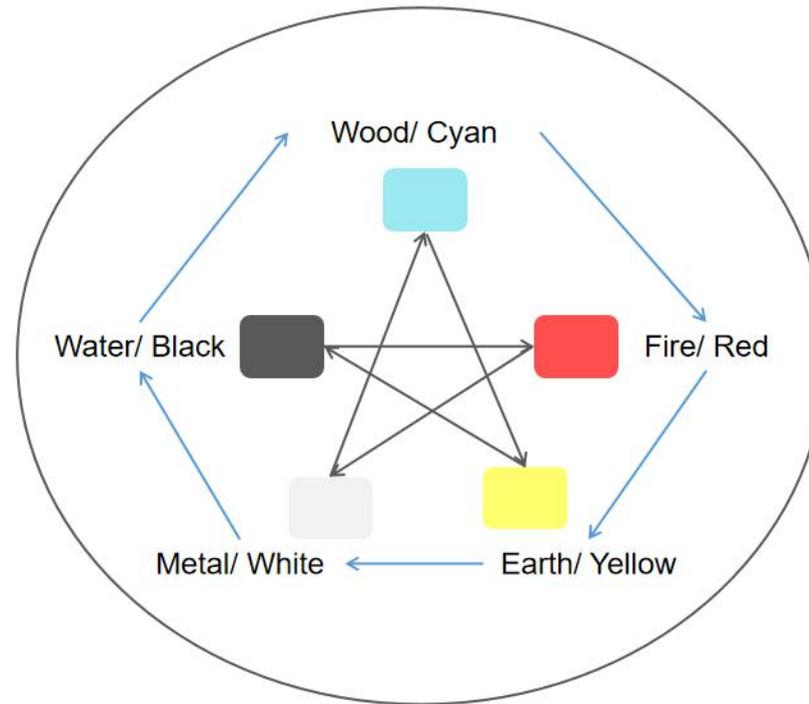


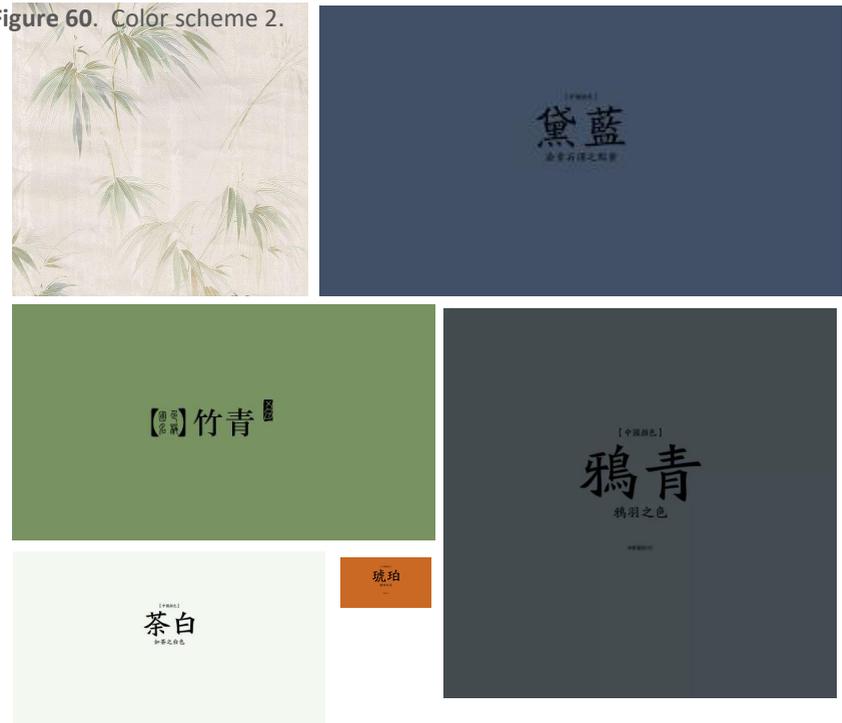
Figure 58. The “Wu Xing” (五行) or five elements of Chinese colour culture.



Figure 59. Colour scheme 1.



Figure 60. Color scheme 2.



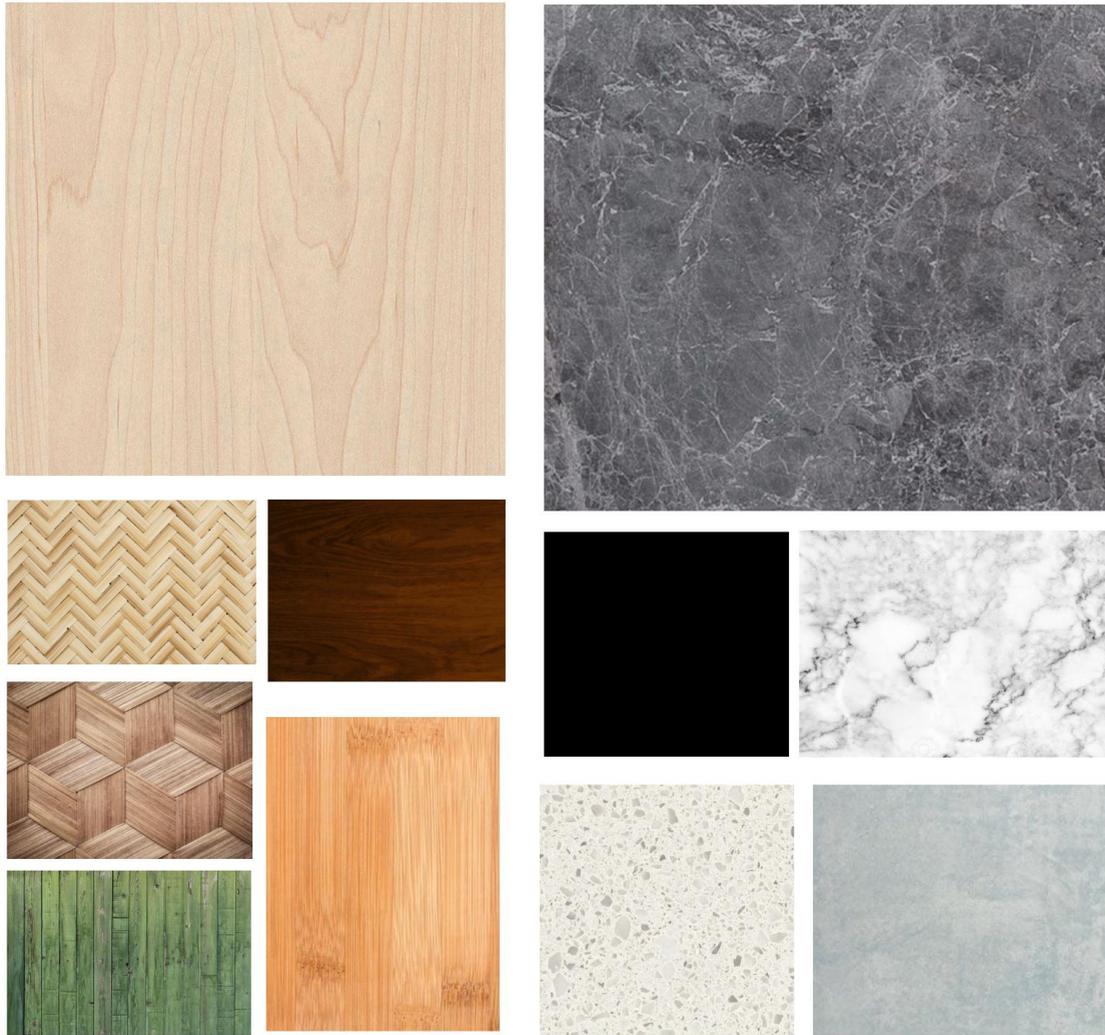


Figure 61. Material scheme.

Materials selection

The choice of materials follows the natural tones of Chinese colours, such as dark gray being used to provide a natural texture. Lighter or more conspicuous colours can be used in the wood selection, such as bamboo boards and rosewood. Other colours can be used in accessories or decorations.

Bamboo weaving



Figure 62. Bamboo weaving.



Figure 63. Bamboo weaving testing.

Bamboo weaving is a local craft. The emotional temperature that hand made products brings is higher than that of mechanized products. I explored its emotional infectivity early in the study. It can be used as a kind of manufacturing process for cabinets, and can also be reflected in small objects commonly used in kitchens.

Mortise and tenon

I developed ideas for how to build the table using mortise-and-tenon joints (see Chapter 2).

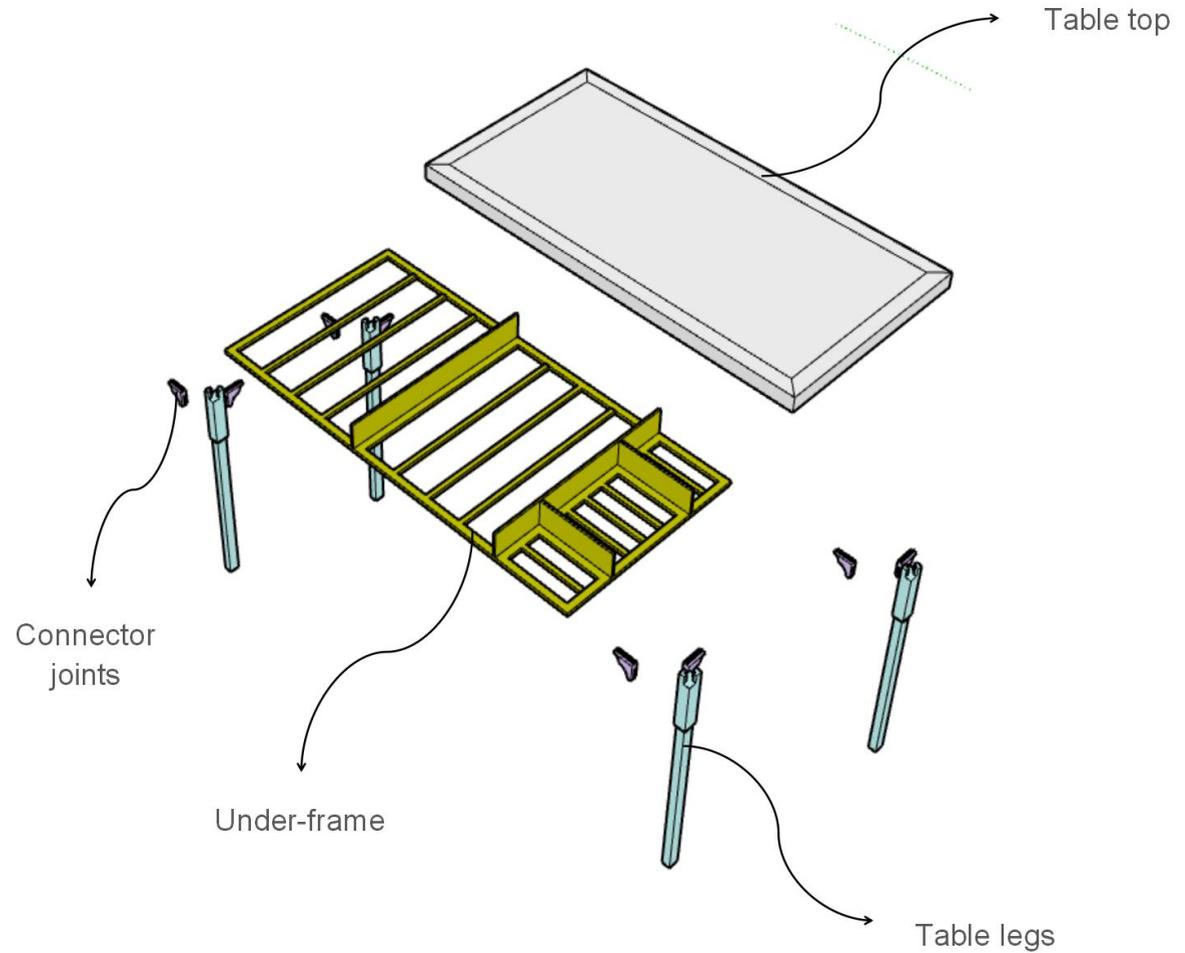


Figure 64. Internal structure of the table.

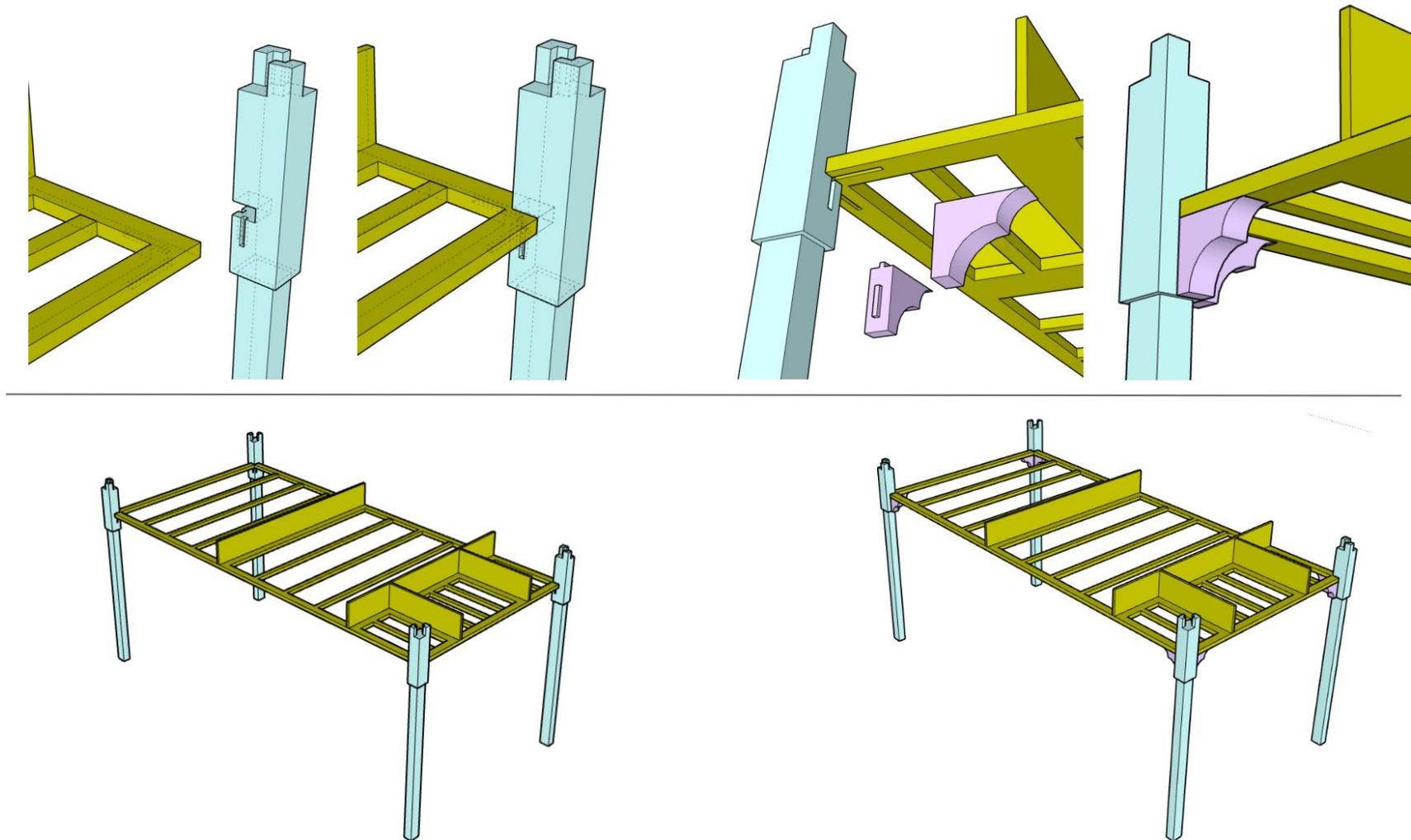


Figure 65. Tenon and mortise structure assembly process.

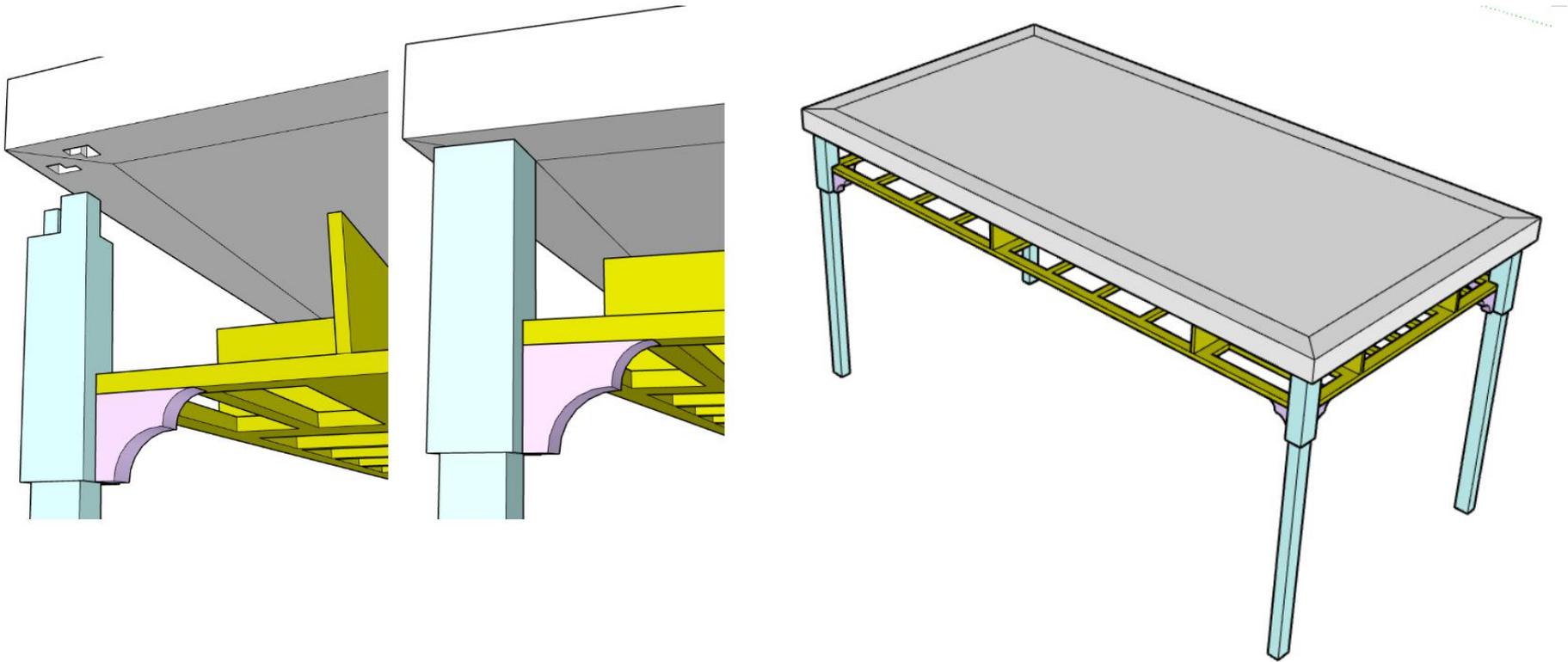


Figure 66. Tenon and mortise structure assembly process.

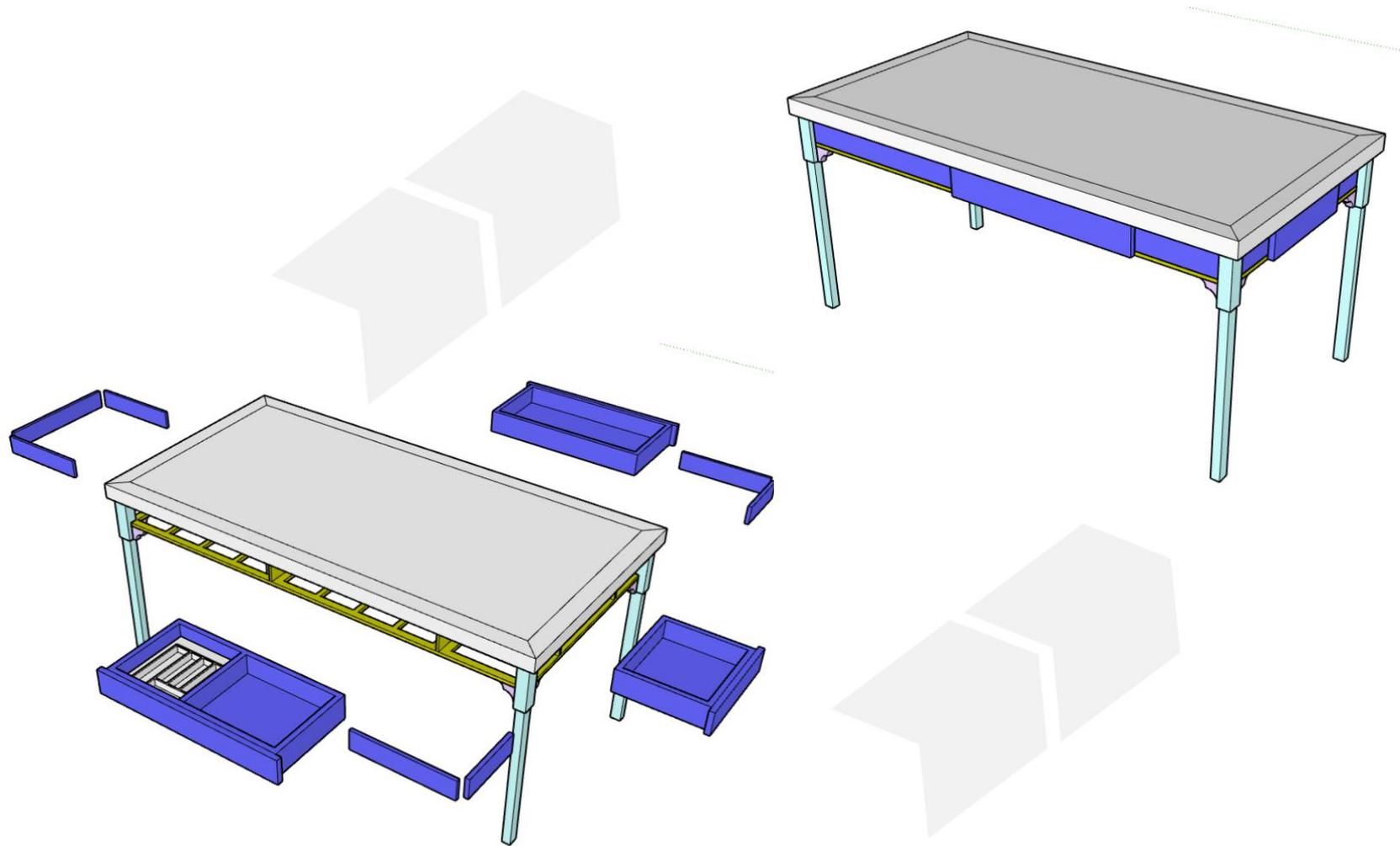


Figure 67. Tenon and mortise structure assembly process.

Bamboo Pattern

Drawing inspiration from Chinese ink paintings and bamboo forest layouts.

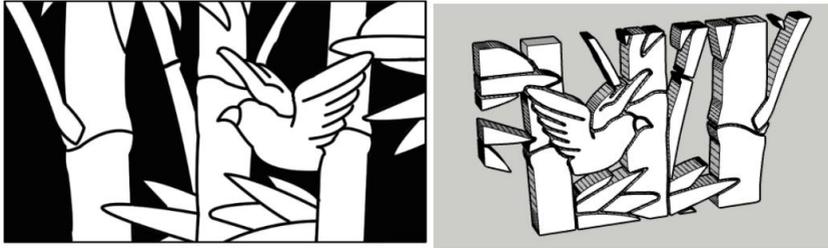


Figure 68. Graphic printing.



Figure 69. He (n.d). 高节图. Chinese bamboo paintings.

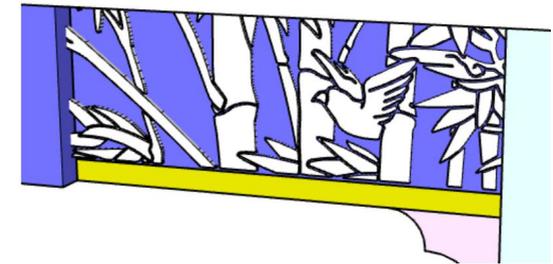
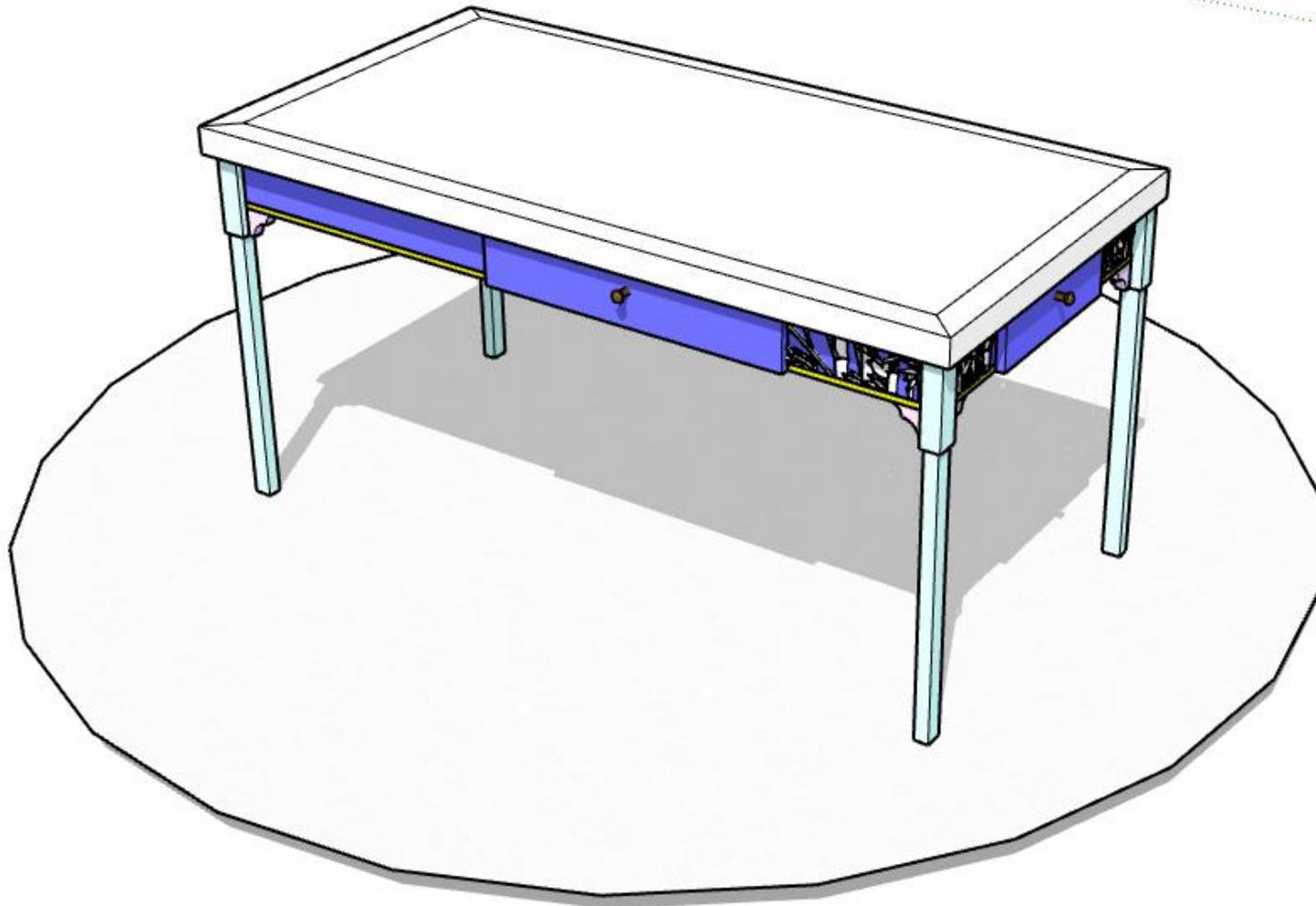


Figure 70. Carved patterns applied to the corner of the table.



Reflections on VR Testing

The purpose of rapid VR testing is to understand the possibility and emotional inducement of design. The real material rendering and spatial visual experience of the virtual space driven by Unreal Engine are undoubtedly successful emotion inducers. But there are still many technical problems in the test.

Advantages:

1. Preliminarily predicts the user's scenario and mood.
2. Clear structure, clear details, easy to observe and reflect.
3. Immersive experience, emotional induction programme is better than all other methods.

Disadvantages:

1. It is time-consuming and difficult to modify.
2. Technical problems.

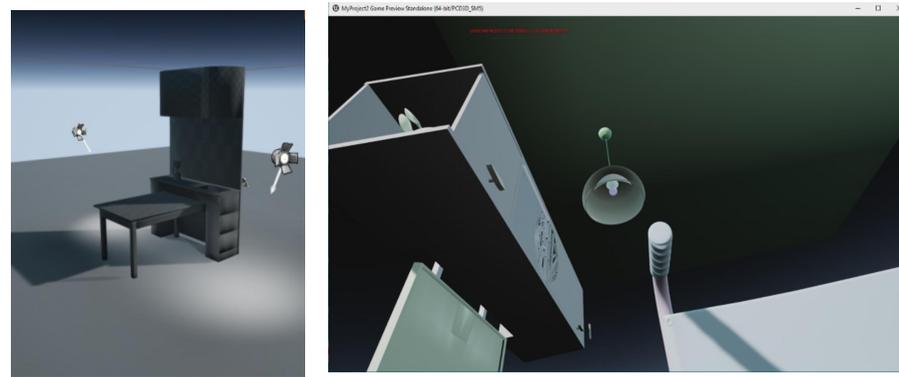


Figure 71. Model technical problems.

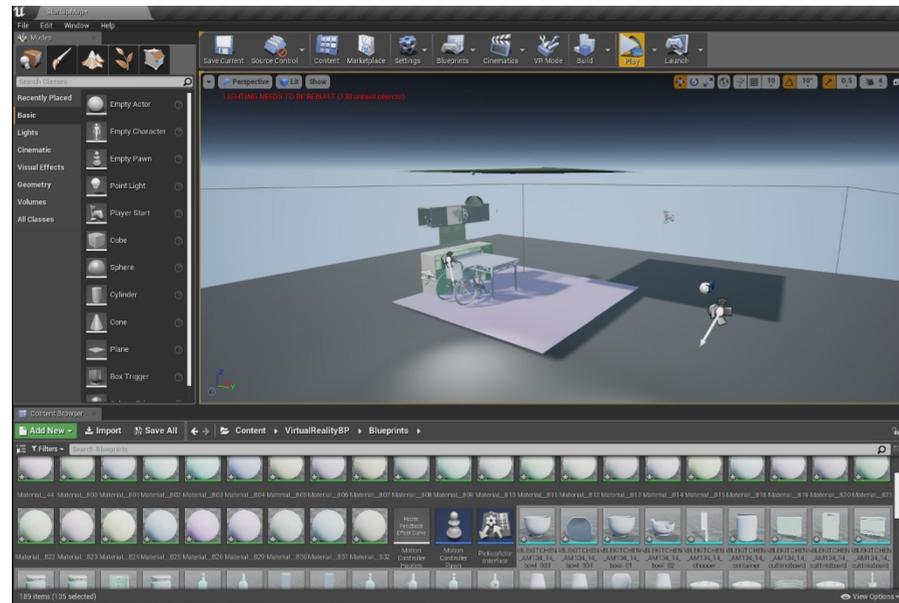


Figure 72. Working interface of Unreal Engine.



Figure 73. Visual effect of virtual space.

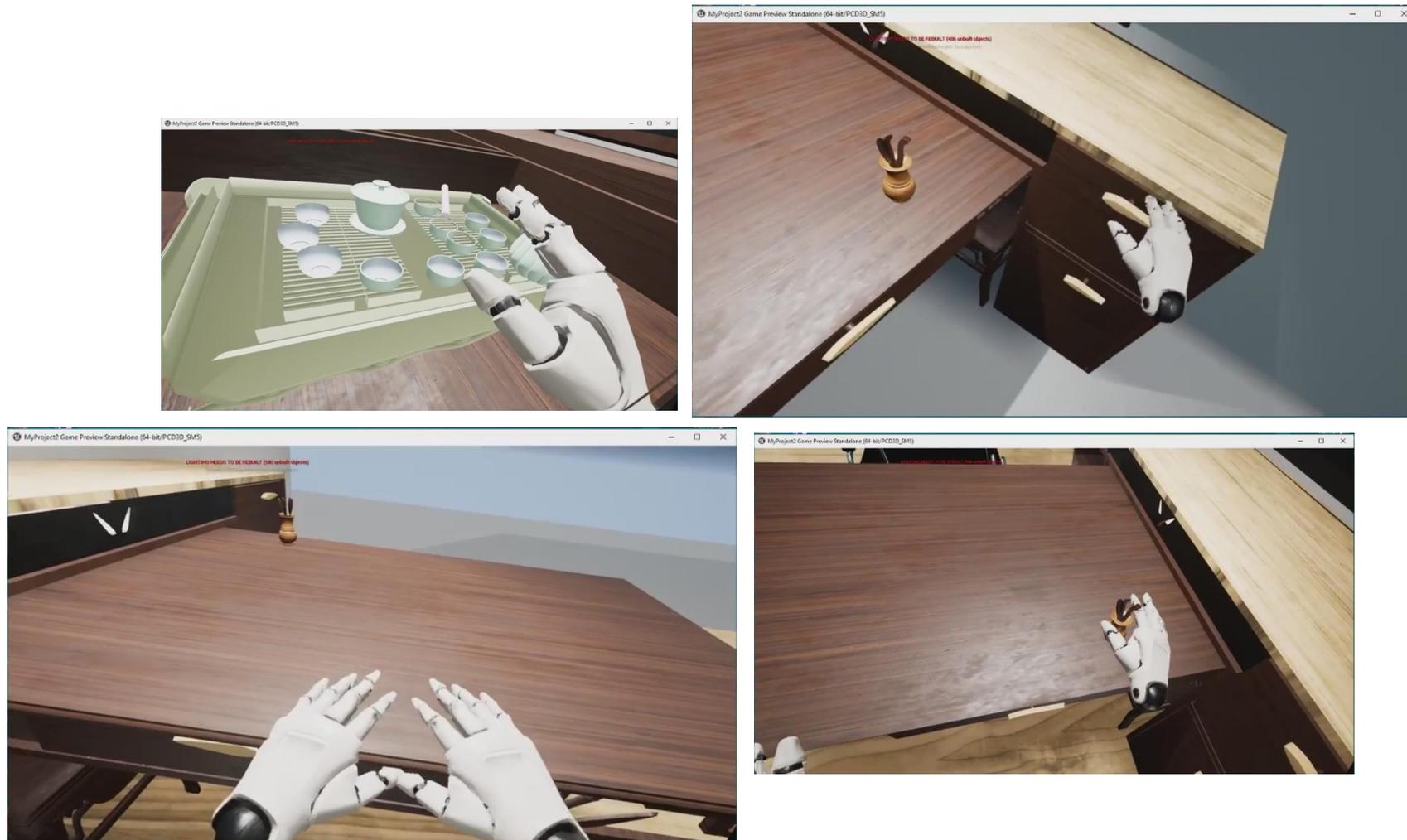
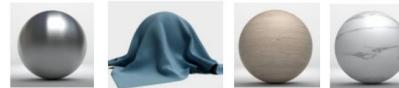


Figure 74. The first visual interactive interface of virtual space.



Stainless steel matte. Cloth gusset. Maple. Marble statuario.



Stainless steel matte. Oak. Black matte. Black natural stone.



Stainless steel matte. Black glass. Rosewood. Marble white.



Stainless steel matte. Bamboo. Marble gray.

Figure 75. Material rendering.



Figure 76. "Grandfather's kitchen" rendering.



Figure 77. Cooking mode rendering.



Figure 78. Tea ceremony mode rendering

Reflective Statement

The prototype testing stage mainly tests and evaluates the previous work and makes new changes. In the process, many original designs were overturned. It is easy to enter the bottleneck period during the iteration process. It is the period of greatest pressure to consider all issues in this period.

The scene testing in 3D space at this stage is efficient, but the efficiency of modification is much slower than that of the sketch. I was excited by some handicraft attempts, which is completely different from the feeling of building an digital model. The producers are more fulfilled and happy, and the viewers appreciate the beauty and emotion brought by the craftsmanship. However, I think the exploration of weaving is not enough. Because its cultural performance in the product is not enough.



Figure 79. Social mode rendering.

CH5. Discussion

This research report has described the contexts, methods and theories of my design approach, and recorded the design process for the Emotional Kitchen Table. The final table is still in development, but the most recent digital prototypes can be seen in Figure 76.

A design carried out in the context of emotional design theory keeps the designer always immersed in a positive emotion. Designers also have their own emotions in mind while designing products for users. This emotion is complicated, not simply happy or sad. It requires embracing emotional complexity before beginning.

In this study, multiple factors such as independence, cultural heritage, social connections and social activities flexibly affect the mental health and emotional fluctuations of the elderly in a small family space such as the kitchen. But the part of this study that can be improved on is the lack of stakeholder roles. I believe that potential user groups and manufacturers will have their own opinions.

I think the practice is always imperfect, but the process is always fun. There are many technical challenges in trying out emerging display methods like VR. The immersive feeling it brings shows great potential for it to have a place in future home and product design.

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