

**Pleasure of manual kitchen products:
A checklist for designing manual kitchen tools**
by

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Abstract

As the heart of the home, the kitchen is always a happening place. It can be used to entertain family, cook that holiday meal, or just scrounge for the latest snack. Kitchen tools have an important role in creating entertainment and pleasure in the kitchen. Depending on consumers' preferences, they can have a chef's kitchen with professional tools, such as a good set of knives. Or users can enjoy their own modern host's kitchen, with a bar, counter stools, and plenty of baking tools. As people have increasing expectations for their kitchen products, it will be important to designing pleasurable, high quality manual kitchen tools. In the future, designing pleasurable kitchen tools would allow consumers to use and enjoy the products at the same time. This study will use research to explore the most important elements that a pleasurable kitchen product could have and develop a process for designing pleasurable kitchen products. In order to develop a checklist for designing pleasurable kitchen products, one rule that needs to be understood is that products affect users not only physically but also psychologically. There are three different types of pleasure with products: The emotional, hedonic and practical benefits associated with products. Pleasure with products comes from the relationship between a person and a product (Jordan, 2003). Therefore, pleasurability is not a property of a product but of interaction with that product.

After studying physical and psychological pleasure feelings and ergonomics associated with manual kitchen tools, as well as "the four pleasures" (Tiger, 1992), a checklist for designing pleasurable kitchen tools will be developed in this thesis. All the elements mentioned above are

considered in this checklist. A final physical redesigned model that follows the new checklist will also be included. By applying these guidelines, a better user experience could be expected.

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Chapter 1

Introduction

1.1 Problem statement

The kitchen is one of the most common places in people's everyday life. Frequently used in this space are manual kitchen tools. According to the analysis of existing research, there are three main domains of activities related to manual kitchen tools: 1) cooking, storing and eating food with kitchen tools, 2) social activities, and 3) managing lifestyle for oneself and one's family members (Johansson, Lundberg & Borell, 2011). Kitchen tools are used in various ways for each activity. Due to their multi-functionality and their importance, kitchen tools affect people's everyday lives in many ways.

People are seeking kitchen tools that are a pleasure to use. The issue of pleasure in product design has received growing attention in recent years (Jordan & MacDonald, 1998). As a result, the goal of human factors in product development has enlarged from the relief of pain and discomfort and from contributing to the creation of safe and usable products to promoting the pleasures that products can bring to their users (Jordan & MacDonald, 1998).

The aim of the current study is to find answers to the following questions: how to design products triggering "happiness and pleasure" in one's mind; which product attributes help in the communication of positive emotions; and finally, how to evoke such emotions through a product. In other words, this is an investigation of the meaning that could be designed into a product in order to communicate with the user at an emotional level.

1.2 Need for study

Pleasurable manual kitchen tools have become much more important in today's changing environment. According to 2005 to 2014 statistical data from the Bureau of Labor Statistics, increasingly more time has been spent in the kitchen preparing and cooking meals, entertaining with friends, or spending time with family (Figure 1). Manual kitchen tools are used almost the whole time during these activities, which makes them frequently affect users' feelings.

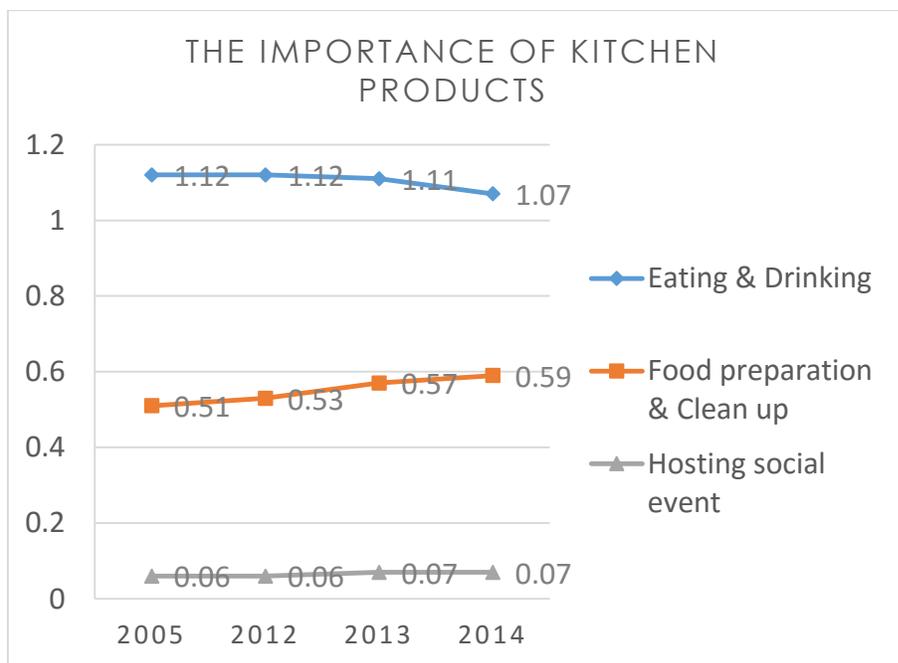


Figure 1, Average hours spent per day, civilian population (BLS, 2015).

Whether planning for a new kitchen, or just wanting to update some manual kitchen tools, the pleasurable feelings that manual kitchen tools give are important not only to the immediate users but also to possible future users, such as growing children, aging parents, or even visiting customers.

People may have failed to notice, however, that pleasurable products positively affect

consumer's user experience. The most common responses from P. W. Jordan's (1998) interview-based study of the issues of pleasure in product use indicate that consumers' experience with their purchased products will become a benchmark which will help them make their future purchase choices. So if consumers have a pleasurable experience using their manual kitchen tools, then when they are making their next shopping choice, they will look for products of the same brand, or seek similar features in different brands. On the other hand, unsatisfactory experiences with dis-pleasurable kitchen products would be used as a benchmark, which will negatively affect their future purchase choices.

Discovering user's preferences can seem stressful, mainly because most people's needs can be divided into several aspects, like the function, style, usability, cost and so on. Developing a checklist for designing a pleasurable kitchen product could save a lot of time and decrease the overall design cost.

A pleasurable manual kitchen product will not only draw entertainment and personality back into the kitchen, but also aid in increasing enjoyment during cooking time and spending real time with family and friends.

1.3 Objectives of study

- To identify the importance of manual kitchen products by analyzing information through research of existing studies, including magazines and articles.
- To study human factors with kitchen product use.
- To conclude/summarize the most important elements that are related to feelings of pleasure with kitchen product use.
- To study what a pleasurable manual kitchen product looks like.

- To determine how designing a pleasurable product is based on user's behavior.
- To study the design process as it pertains to manual kitchen products design.
- To develop the way that the four pleasures (Tiger, 1992) affect people's use or preferences of manual kitchen products.
- To develop a checklist or some suggestions for designing a pleasurable manual kitchen tool.

1.4 Scopes and limits

1.4.1 Scope

The purpose of this research is to discover a checklist for designing pleasurable product. It will focus specifically on the area of manual kitchen tools; in this case, extracting related information through research of existing studies, and presenting a unified structure in hope that the following benefits will be realized:

- Presenting a general framework integrating the view of authors will provide a structure by which the main idea of this paper may be better understood.
- Reviewing and then listing the existing articles will provide a point of reference for the subject.
- Varying theories discovered by different authors will be integrated so that their commonalties may be observed and understood.

1.4.2 Limitations

Because the research depends on the user's preferences, this study is limited by users' different cultural backgrounds. The checklist for designing pleasurable manual kitchen tools should be considered as references or suggestions. On the other hand, with the development

of the technology and society, user's preferences will change in the future. Because of this reason, the primary limitations of the final checklist are due to time constraints. Further research will need to be done in the future.

1.5 Assumptions

This study was conducted based on the following assumptions:

- This study will focus on developing a checklist for designing manual/ non-electric kitchen tools.
- It is assumed that the pleasurable tools design checklist from this study will serve users who have no lack of five senses.
- It is assumed that the methods used will be able to be used across various cultures.
- It is assumed that the sources used and/or quoted the research in this study have been proven, and widely acknowledged as true.

1.6 Definition of terms

Aesthetic:

Aesthetic can be understood by two concepts: first, the product aesthetic could be related to what the kitchen product transmits to users' physiological senses. Secondly, aesthetic experiences may relate to one particular aspect of cognitive response, the perception of how pleasing the process of regarding an object is (Csikszentmihalyi,1990).

Four pleasures:

- Physio-pleasure: This to do with body and with pleasures derived from the sensory organs. They include touch, taste and smell as well as feelings of sensual pleasure.

- Socio-pleasure: This is the enjoyment derived from relationships with others. This might mean relationships with friends and loved ones, with colleagues or with likeminded people.
- Psycho-pleasure: This pertains to people's cognitive and emotional reactions. In the case of products, this might include issues relating to the cognitive demands of using the product and the emotional reactions engendered through experiencing the product.
- Ideo-pleasure: this pertains to people's values (Jordan, 1996) .

Human mental needs

Needs which are beyond those satisfied by products' basic functions are required to improve product value and better serve users at a higher level.

Human physical needs

Needs related to human ergonomics and completion of actions are satisfied by using a product.

Pleasure and displeasure in product use as follows:

- Pleasure in product use: the emotional and hedonic benefits associated with product use (Jordan, 1996) .
- Displeasure in product use: the emotional and hedonic penalties associated with product use (Jordan, 1996).

1.7 Procedures and methodology

Procedure 1: Study customers' needs of kitchen products, focusing on the following questions:

- What do most users care about regarding kitchen products?

- Do they prefer functionality of the product or the usability of the product?
- What kind of elements will affect customer's feeling and the product's price?

Methodology:

1. Articles, magazines, and internet research
2. Compare different users' preferences among different age, gender, and background.
3. Summarize collected information

Procedure 2: Study the “four pleasures” with kitchen products.

Methodology:

1. Articles, magazines, and internet research
2. Summarize collected information
3. Extrapolate and analyze from human functions, technical functions, production functions and the marketing functions.

Procedure 3: Four pleasures design case study

Methodology:

1. Collect product design cases relating to the four pleasures.
2. Study cases to summarize how four pleasures applies in manual kitchen tools design.
3. Study cases to develop some ideas for final checklist.

Procedure 4: Illustrate the importance of creating a pleasurable tools and the process of designing pleasurable kitchen tools.

The main purpose of this research is to study and improve the way that kitchen products provide pleasure to their users. So for this procedure, kitchen products design properties to be studied are ergonomics of kitchen products, color, form, materials, and pleasurable feelings.

In order to do this, this research will

1. Look up information in related books, articles and journals in the library and on the Internet and gather useful information from these materials.
2. Give an example to explain what these properties are and how these elements affect users.
3. Develop some common rules in order to design a pleasurable product.

Procedure 5: Development of final checklist for designing pleasurable manual kitchen tools.

Methodology:

1. Summarize collected information.
2. Classify the information into specific pleasurable design elements to support the final checklist.
3. Develop a checklist for designing pleasurable manual kitchen tools.

Procedure 6: Redesign a product based on developed final checklist.

Methodology:

1. Select and analyze the weakness of an existing manual kitchen product.
2. Use developed final checklist for redesigning this product.
3. Evaluate the product.

Chapter 2

Literature Review

2.1 Introduction

In order to develop a checklist for designing pleasurable manual kitchen tools, three different aspects need to be analyzed. First of all, the designer must understand customer needs, which includes the product's functionality and ability to fulfill user requirements. Second, the satisfaction with products comes from the relationship between a user and a product. Therefore, the pleasurable feeling is more about the way users interact with products. This kind of interaction affects users not only physically, but also psychologically. Since the intended checklist is to help designers to create pleasing kitchen tools, figuring out what kind of product can create pleasurable feelings and applying this knowledge to the checklist are obviously necessary.

After understanding customers' needs and pleasure feelings, the human factors surrounding the product must be studied. The goal of human factors in manual kitchen tools development arises from the relief of pain and uncomfortable feelings. Doing so will contribute to the creation of safe and usable products in order to promote the pleasures that products can bring to their users (Jordan & MacDonald, 1998). Also, for optimum usage of a manual kitchen tool, such as cleaning and storage, the material used must be stable and safe for users.

2.2 Customer needs

Knowing and understanding customer needs is one of the most important things of every successful product design. However good the product is, the simple truth is that no one will buy it

if they do not want it or believe they do not need it (Jordan, 1998). Also, the product cannot please anyone that wants or needs to buy what is being offered unless the designer clearly understands what the customers actually want.

In order to better understand the specific qualities of user experience impacting desirability and pleasure-ability, it is necessary to understand the way users interact with the product. In that way, a designer can design a pleasurable product.

2.2.1 Functionality

At the heart of every different kind of manual kitchen tool design, whether it is a knife, a cutting board, a can opener, a knife sharpener, or anything else, it must have a function, a task that the tool is expected to perform. Some tools even have more than one major function. For designing pleasurable kitchen tools, a designer need to create a product that first fulfills its intended function or functions.

A product's functionality is used by marketers to identify product features and enables a user to have a set of capabilities (archsoa.techtarget.com/). A pleasurable product must first function properly for the intended purpose and perform properly for the designated period of time. When evaluating a product's functionality, the point of evaluation is to answer the question: "What does the product do?" The usefulness of device features, maintainability, and reliability are some of the issues that could be addressed in such an evaluation (McNamara & Kwiatkowski, 2006).

2.2.2 Usability

The tools used in the kitchen have become increasingly complex; in this case, the necessity of usability becomes more important. When people talk about usability of the product, the concept is sometimes reduced to “easy to use”, but this oversimplifies the problem. Traditionally, manufacturers often see usability as a commercial issue. The usability of a product is increasingly considered a domain where manufacturers can gain advantages over their competitors (Jordan, 1998). The International Standards Organization (ISO) defines usability as “... the effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments” (ISO DIS 9241-11)

This definition mentions “Satisfaction” as the attitudinal factor of usability, which refers to avoiding negative feeling rather than creating positive/pleasure emotions. But for a better understanding of usability, apart from the satisfaction of fulfilling a utilitarian function, a product can give its user pleasure, not only in terms of its ergonomic fit, but also through its aesthetic qualities (qualities pertaining to beauty) (MacDonald, 1998).

For further and deeper study, the definition of usability has been expanded into several dimensions of the user’s interactions with the product (March, 1994). In traditional design, usability concerns ergonomics “... embodying in physical forms knowledge about how people reach for, pick up, carry, hold, operate, sit in, and otherwise use artifacts” (March,1994).

However, pleasurable product design goes beyond that definition. Usability should also include the user experience and the interaction between the user and product. For example, does the product invite users and provide a pleasurable experience? Do consumers consider the experience of using the purchased product as a benchmark that positively affects their future purchase choices?

Additionally, feedback is a kind of scale that can tell a designer about users' feeling. Do the products feel good? Do they think this product is ease to use? Do users enjoy using the product? And so on. Feedback can illuminate the usability of the product. And usability can be measured by the periods between disruptions and by the time required to correct them (Krippendorff, 2006). Designers should consider and listen to the users' feedback to design better products. Also, designers should concern themselves with ways of discouraging meaning that could distract users from achieving reliance on kitchen products.

Usability is an important area for designing pleasurable kitchen tools. Studying the definition of usability can be used to understand the user's requirements, identify the target of usability, and develop the best method for usability evaluations (Quesenbery, 2001).

2.3 Pleasurable Feelings

A product can elicit many emotions, including both positive/pleasure and negative/displeasure feelings. By studying pleasurable feelings and avoiding dis-pleasurable feelings, a designer can develop a checklist for designing pleasurable manual kitchen products. According to an existing research "... In terms of behavioral impact, these positive and negative emotions are fundamentally different: Whereas negative emotions stimulate individuals to reject (or withdraw from) the object of their emotion, positive emotions stimulate individuals to accept (or approach) the object "(Frijda, Kuipers, & Schure, 1989).

This idea refers to the fact that the pleasurable product is considered a benchmark by consumers that positively affects their future purchase choices. In this general tendency, pleasurable feelings stimulate product purchase intentions (Bitner, 1992; Pham, 1998), seeking similar feature product intentions (Wesbrook & Oliver, 1991). Pleasurable feelings contribute to

creating usage comfort and decrease the usage discomfort (Vink, 2005). “Products that evoke positive emotions are bought more often, used more often, and are more pleasurable to use. It is therefore indisputably worthwhile to design products that evoke positive emotions – products that make users feel good” (Desmet, 2012).

To design a pleasurable and effective product, designers should not only consider usefulness or functionality, but also should improve the design on an emotional/psychological level. The point of creating pleasurable kitchen tools is to have an in-depth understanding of feelings of pleasure, or in other words, positive emotions.

2.3.1 Positive emotions

From Dr. Pieter Desmet’s (2012) studies of emotional design, 25 positive emotion types were clustered from a long list of 150 positive emotion words. These positive emotions are assembled by three steps: The first step is to cluster an extensive overview of emotion words from published emotion studies, then clean up the database by removing non-related emotion words. The last step was to exclude words of negative feeling. The difference between positive and negative emotion words are obvious (i.e., positive emotions feel good, and negative emotions feel bad). Also, these 25 positive emotions can be further organized into 9 categories: Enjoyment, Gratification, Empathy, Affection, Interest, Aspiration, Optimism, Assurance, and Animation. These categories were developed by using a study that simplified similar emotion types.

Emotion type	Emotion words (drawn from the list in Appendix 2)
Admiration	Admiration, impressed, esteem
Amusement	Amused, entertained, gaiety, merry, playful, humorous, glee, funny, laughing, jolly
Anticipation	Anticipation, eager, expectant
Confidence	Confident, assurance, secure, trust
Courage	Courageous, brave, heartened
Desire	Desire, attracted, ardent, longing, craving, yearning, nostalgic
Dreaminess	Dreamy, contemplative, pensive
Enchantment	Enchanted, awe, charmed, moved, touched, enthrallment, wonder
Energized	Energetic, exuberant, zest, active, excited, stimulated
Euphoria	Euphoric, rapture, ecstasy, exaltation, thrilled, elated, high, exhilaration, exultation, jubilant, enraptured
Fascination	Fascinated, interest, curious, inquisitive, attentive, engrossed
Hope	Hope, optimistic, encouraged, wishful
Inspiration	Inspiration, enthusiasm, tempted, determined, challenged, zeal
Joy	Joy, bliss, overjoyed, pleasure, happy, good, delighted, wonderful, rejoice, smile, cheerful, enjoyment
Kindness	Kind, caring, friendly, tenderness, warm
Love	Love, romantic, infatuation, sentimental, fondness, in love, liking, affection, intimate
Lust	Lust, horny, passion, aroused, sensual, sexy
Pride	Pride, triumphant, self-satisfaction, smug
Relaxation	Relaxed, at peace, at ease, comfortable, peaceful, lighthearted, carefree, placid, serene, tranquil, easygoing, calm
Relief	Relief, reassured, gratitude, soothed, thankful
Respect	Respect, appreciating, approve
Satisfaction	Satisfaction, gratified, pleased, contentment, fulfilled, glad
Surprise	Surprise, amazement, astonished, startled, dazzled
Sympathy	Sympathy, compassion, empathy, pity, understanding, forgiving
Worship	Worship, adoration, devotion, reverence

Figure 2, Emotion clusters representing 25 positive emotion types (Desmet, 2012)

By studying positive emotions, a better understanding of the four pleasures can be attained.

2.3.2 Four Pleasures

In 1992, Canadian anthropologist Dr. Lionel Tiger proposed a framework that classified positive emotions into four different types. This framework of pleasurable feelings was further

popularized by Dr. Patrick Jordan in 1996. The Four Pleasures model is developed for looking at human experience and understanding people. It can be used to help evaluate how pleasurable feelings will apply to a product. It can also be used to enhance an existing product.

To connect with users and achieve the goal of pleasure in people, designers need to provide them with positive, pleasurable experiences. These experiences can come into one of four categories – physical, social, psychological, or ideological. By using the framework explained below to understand people and their needs, designers can create products that are successful in the marketplace and which are a genuine joy to own and use.

Physio-Pleasure

Physio, or physical, pleasure comes through the stimulation of the five senses. This has to do with the body with pleasures derived from the senses (Jordan, 2003). It includes tactile, visual, and olfactory properties, and so on (Hagel-Sorensen, 2006). Some examples include significant visual, olfactory, and auditory components, such as coffee shop decorations, smells, and dance club sounds.

For a better understanding of physio-pleasure, an example from the Amazon best sellers is provided.

The Wusthof cooks knife (Figure 3), a refined and well-engineered manual kitchen tool, has very pleasing heft and balance. According to the reviews on Amazon, users can feel the pleasing heft and balance immediately when using it. It also delivers a pleasure to the user of being highly effective, making light work of often mundane tasks.



Figure 3, Wusthof cooks knife (Giordano, 2012)

Socio-Pleasure

Socio-pleasure (social pleasure) has to do with relationships. This is the enjoyment derived from relationships with others. Products and services may help to enhance or facilitate a particular social situations and may confer social or cultural status on the user. Socio-pleasure often found in the social interaction that is created in social situations, such as when people meet friends and new acquaintances. “Social pleasure also comes from belonging to groups and strengthening or improving one's social position” (Jordan, 2003).

For example, the Godinger 3-Tier Server (Figure 4) is normally used as a display or a serve-ware for events. According to the reviews on Amazon, consumes can enjoy the events with guests by using this product, and it bring a sense of identity which makes the owner often experience feelings of pride. It also delivers socio-pleasure by providing a talking topic, a pleasing talking environment, or a sense of identity.



Figure 4, Godinger 3-Tier Server (Pinterest, n.d.)

Designing social interaction includes creating common interests and activities as well as just making a space where people can interact and give them a reason to come together.

Psycho-Pleasure

Psycho-pleasure has to do with thoughts and mind. It is created when the person thinks about the situation, consciously or unconsciously (Jordan, 2003). This type of pleasure refers to people's cognitive and emotional reactions, including their reactions to the products and services that they use (Hagel-Sorensen, 2006).

This can be created by intellectual games such as Sudoku or Scrabble that stimulate thinking and give the pleasure of winning. The brain rewards itself with a shot of natural opiates when it sees patterns and learns, making this another powerful motivational approach. Jordan (2003) mentioned that usability as a product property that is connected to psycho-pleasure. Good usability brings positive emotions, and poor usability can cause dis-pleasurable feelings.

For example, the Adjustable Mandoline Slicer (Figure 5), one of the best seller on Amazon, has multi-blade choices.



Figure 5, The adjustable Mandoline Slicer (Amazon, 2015)

The reviews on Amazon mentioned the blades are sharp that creates very pleasing results, and have some unexpected features, such as it is good enough for even onions, and it feels safe because it has a protective hand guard. Also, the experience of figuring out how many chopping choices is very interesting. In general, this product has a high level of usability, an interesting process for getting the idea of how it works, and some unexpected features. All of these lead to a certain sense of satisfaction, which creates psycho-pleasure feelings.

Ideo-Pleasure

Ideological pleasure concerns a product's values and is related to values and beliefs. Dr. Tiger (1992) refers to deriving pleasure from "theoretical" entities such as art. When related to product design, ideo-pleasure is more about aesthetics of a product design (Jordan, 2006). The design may stand on its own, such as in environmentalism, or may be social, as in Marxism. People would buy products that express their personal values, for example, concern for the environment or sustainable living. "In terms of Maslow's Hierarchy, idealism tends to be higher

up the scale and may either be a form of self-actualization or a requirement by a group for members to believe in order to belong” (Jordan,2002).

An example is the Juicy Salif Citrus-squeezer (Figure 6), often mentioned by its stylish appearance. It is not just a kitchen tool but also a fascinating decorative object for the kitchen. This kind of aesthetic sensibility is related to ideology, and brings ideo-pleasure.



Figure 6, The Juicy Salif Citrus-squeezer (Amazon, 2006)

Conclusions

The Four Pleasure model is a framework that can be used to create pleasurable products, and to measure how satisfying the product is. It can also be used to bring opportunities to enhance a product. By using the Four Pleasures theory, a checklist can be developed to evaluate pleasurable manual kitchen tools.

2.3.3. Real case study

Aims

This part will be illustrated with a well-known product that has succeeded in connecting with one or more of these Four Pleasures areas. This example is chosen from one of the Amazon best sellers. The purpose here is to:

- To identify the pleasure and displeasure feelings that are engendered by use of the example product.
- To identify different emotions that are related to four pleasures.
- To identify the features that can contribute to making the product particularly pleasurable or displeasurable to use.

Existing product example

The example analyzed here is the Edge Grip knife sharpener. It is one of the best seller on Amazon.com (Figure 7).



Figure 7, Edge Grip 2-Step Knife Sharpener (Amazon, 2008).

This knife sharpener has carbide blades (Coarse) that provide edge setting capabilities, and ceramic rods (Fine) are used for the final edge honing. The selling point of this product is the patented V-grip base that allows for added stability and comfort when using the sharpener on the edge of your countertop or table. It comes with non-slip rubber feet and a soft grip rubber handle for comfort and steadiness when sharpening.

Method

The Amazon website allows their customers to give from 1 to 5 stars to rate the purchased product. The Edge Grip knife sharpener on Amazon has 3071 reviews in total. There are 64% of customers who gave five stars; 21% of customer gave four stars; 7% of customer gave 3 stars; 4% 2 stars as well as 1 star (Figure 8). Fifty reviews have been randomly chosen from these five sections (10 for each number of stars). By studying the example, a wide range of reviews from purchased customers can be summarized. Then the results will be extracted from these reviews.

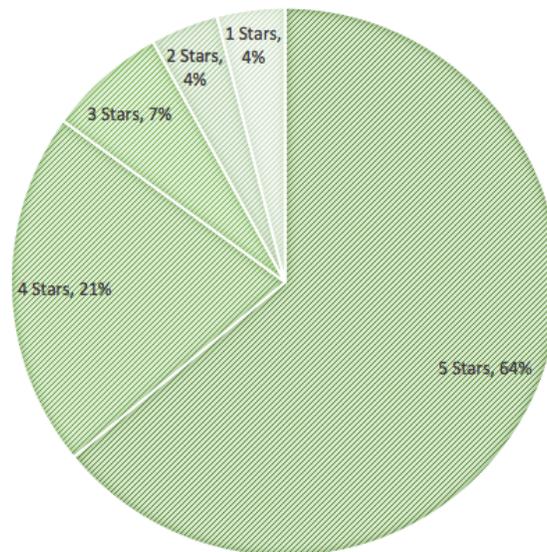


Figure 8, Star rate of Amazon review

Results and analysis

Figure 9 lists the properties that are associated with pleasure and displeasure feelings when using the knife sharpener.

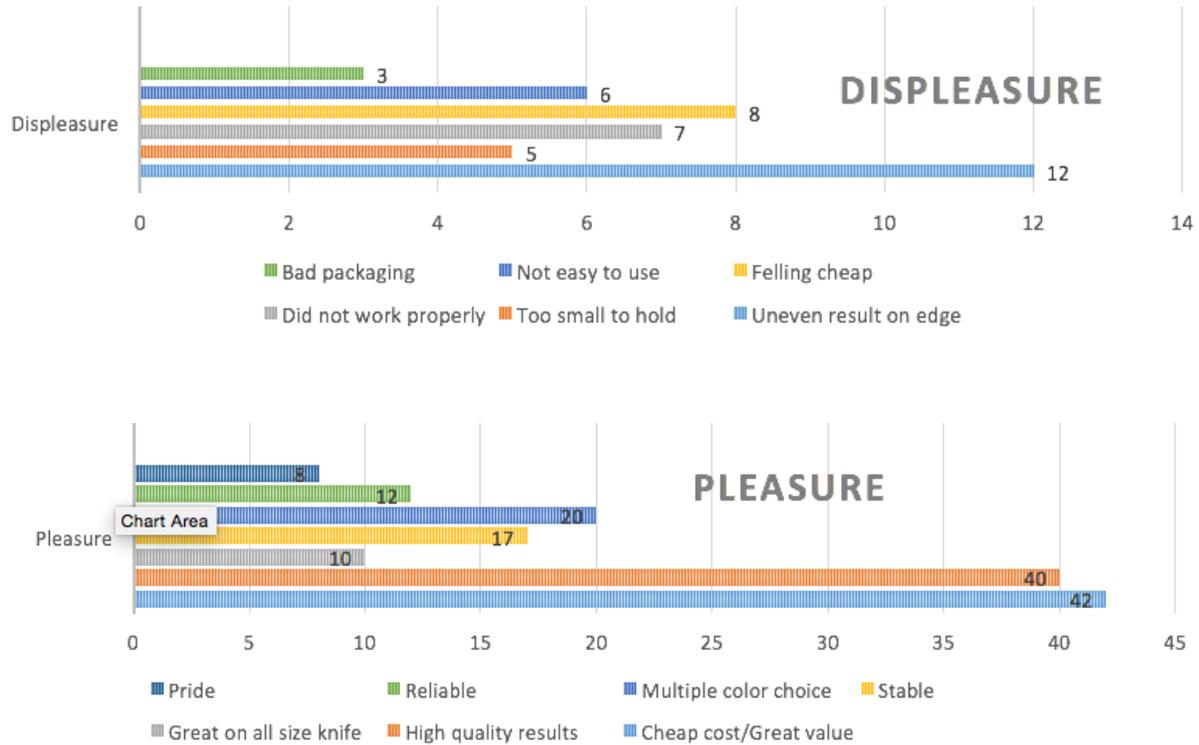


Figure 9, Number of reviews associating product attribute with pleasure/displeasure

Figure 9 has indicated the contribution of particular property dimensions to both pleasure and displeasure feelings. For example, high-quality results contribute to creating pleasure feelings, while an uneven result on the knife edge creates displeasure feelings.

From the results, several elements that affect users' feeling can be summarized as below:

- **Usability:** this is the problem that most commonly mentioned. Forty reviews have mentioned the knife sharpener creates high-quality results. Usability is one of the

most important issues as a contributor to the pleasure and the absence of it would cause displeasure (Jordan, 1996).

- **Cost:** The level of pleasure feeling associated with the features could be enhanced if the product had a low cost to purchase. Forty-two users mentioned this knife sharpener had great value. Eight users mentioned the product felt cheap.
- **Aesthetics:** Almost half of users mentioned this product has multiple color choices. Color is one of the features of a product's appearance. Appearance is the first thing users take from the product and strongly contribute to creating pleasure. Twenty reviews mentioned that they enjoy having a color that they preferred. Three reviews said the products they received had a bad package that left them feeling displeased.
- **Performance:** Performance refers to whether a product does its major task excellently (Jordan, 1996). Ten people mentioned their knife sharpener can fit all size knives, which brings pleasurable feelings because of its versatility.
- **Safety:** Safety makes the user feel reliability and confidence, and both were engendered by using pleasurable products. For manual kitchen tools, safety is quite important. Seventeen reviews mentioned the knife sharpener is stable when using it on the cabinet. That stability makes them feel safe when using a knife with the sharpener.
- **Size:** Five users mentioned the knife sharpener is too small for them to hold which bring dis-pleasurable feelings. An appropriate size for the hand tool enhances the operation of the product and makes a significant contribution to creating pleasure feelings.

Relationship with four pleasures

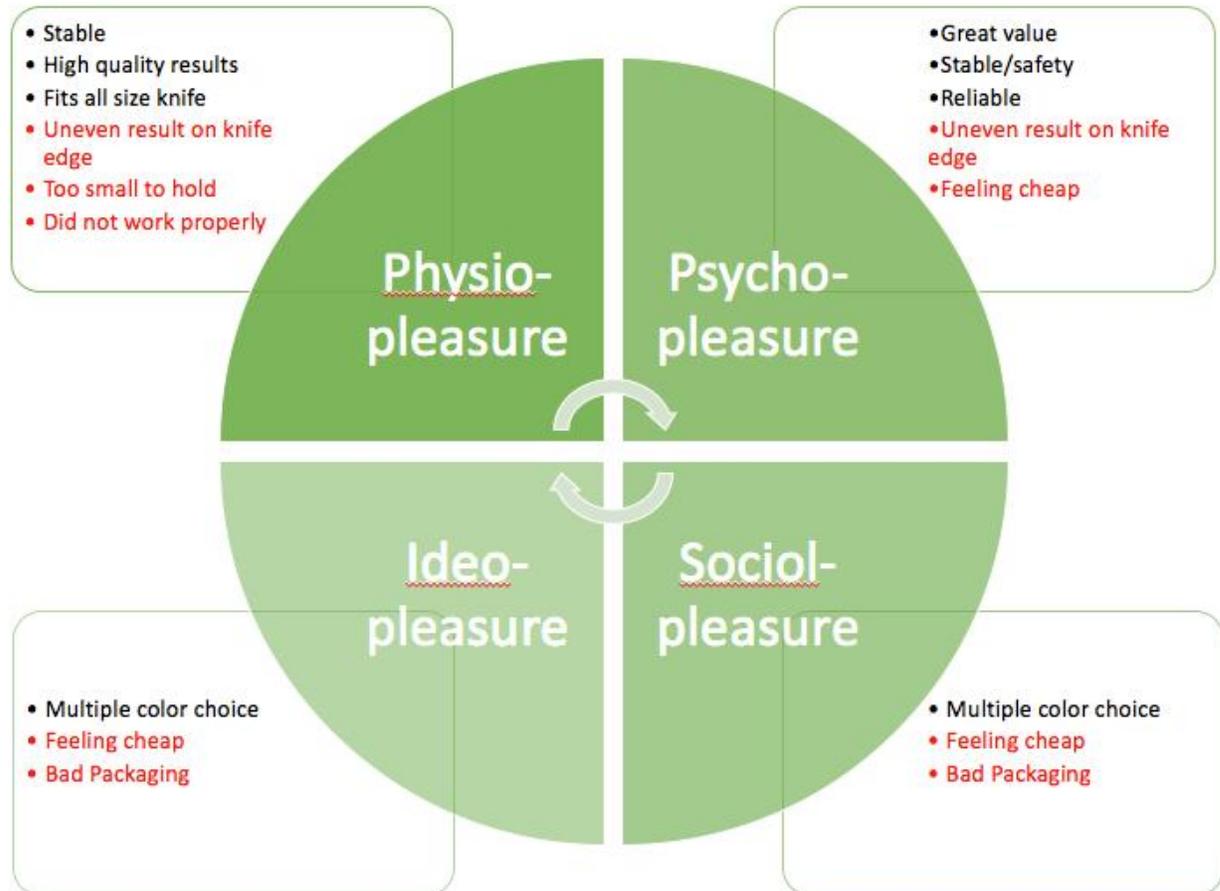


Figure 10, Knife sharpener's relationship with four pleasures.

These reviews can be classified into the four pleasures (Figure 10). In this way, the four pleasures can be applied for designing pleasurable manual kitchen tools.

2.4 Human factors and ergonomic factors in manual kitchen tools

2.4.1. Introduction

Traditionally, designers have tended to use human factors to concentrate on making products 'usable' which means focusing on utilitarian, functional product benefits. However, as

the kitchen products that we use in our homes become increasingly complex, the issue of usability becomes ever more pertinent. Users also appear to be developing an increased awareness of usability issues and seem less and less willing to accept low usability as a price that must be paid for “technical wizardry” (Jordan, 1998) . The importance of user-centered design is increasingly being recognized. Perhaps the most significant evidence for this is the growing number of human factors professionals employed both in academia and in industry (Jordan, 1996). In other words, there is no way a good kitchen product can be designed without doing research on human factors.

2.4.2. Human factors and ergonomic in kitchen and kitchen product

The U.S. Food and Drug Administration (FDA) defines Human factors as: “Human factors (HF) is the study of how people use technology. It involves the interaction of human abilities, expectations, and limitations, with work environments and system design” (FDA, 2014)

The International Ergonomics Association defines ergonomics or human factors as follows:

“Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance” (International Ergonomics Association, 2014).

Human factors relate to the consideration of human beings’ physiological and psychological abilities that are affected when engaged in the use of manmade objects. These abilities include, but are not limited to, visual acuity, hearing, tactile sense, sense of smell,

mobility, dexterity, flexibility, and cognitive processing (Johnson, Duncan, Gabriel, & Carter, 1999).

Because humans come in different body builds, and most kitchen products are related to human hands, the ergonomic factors of the hands should be considered when designing a kitchen or a kitchen product. Products without ergonomic considerations may have risks of causing serious working injuries.

Ergonomic for kitchen hand tools

Due to the fact that kitchen tools may have moving parts or a sharp edge, hand tools can be dangerous to use. They can result in serious work-related injuries. Some research estimates that there are over 260,000 hand tool-related injuries in the U.S. each year and that associated medical costs come to 400 million dollars. For example, an estimated 8,250,914 knife-related injuries were treated in US EDs (United States Emergency Department) from 1990 to 2008, averaging 434,259 injuries annually, or 1190 per day. The injury rate was 1.56 injuries per 1000 US resident population per year (MED, 2013).

Improving the comfort level of the hand-use kitchen product by considering the human factors and the ergonomic factors of the user can bring pleasure in using the product. The Herb Scissors is a well ergonomically designed product that has 91% of 5-star reviews on Amazon (Figure 11). The design of the comfortable upright handle keeps the wrist in a stress-free position. This feature design reduces the chances of the wrist bending and developing injuries while performing kitchen tasks.



Figure 11, The herb scissors. (Amazon, 2014)

Anatomy of the Wrist

To understand how a product can be designed ergonomically, a designer must understand the anatomy of the wrist. The bones of the wrist connect to the two long bones of the forearms, the ulna and the radius (Figure 12). The radius connects to the thumb side of the wrist, and the ulna connects to the little-finger side of the wrist (Bhattacharya & McGlothlin, 1996). The ulna and radius of the forearm connect to the humerus of the upper arm. The bicep muscle connects to the radius. The bones of the hand and wrist provide the body with the support and flexibility to manipulate objects in many different ways. Each hand contains 27 distinct bones that give the hand an incredible range and precision of motion (Speedy Publishing, 2014). The forearm's ulna and radius support the many muscles that manipulate the bones of the hand and wrist.

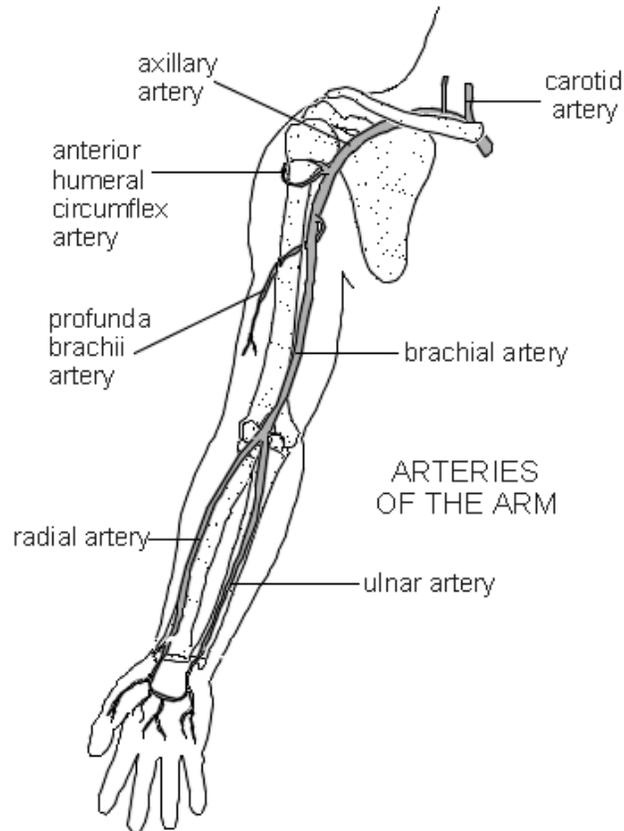


Figure 12, Arteries of the arm. (Patient, n.d.)

The major hand-use kitchen product design principles are related to the biomechanics of the user's hands based on each specific manual task. The main point is to maintain a straight wrist. The flexor tendons of the fingers pass through the carpal tunnel of the wrist. When the wrist is aligned with the forearm, all is well. If the wrist is bent, especially in Palmar flexion or ulnar deviation, it creates stress on the tendons that pass through the carpal tunnel causing the tendons to swell and put pressure on the ulnar & median nerves. Multiple times using a hand-use product with a bent wrist will cause two common types of injuries: Tenosynovitis and Carpal Tunnel Syndrome (Figure 13).

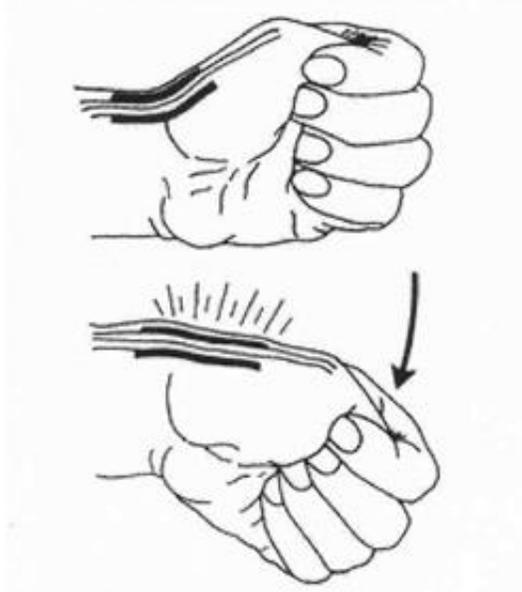


Figure 13, Hand tool using experience (Howard, 2015).

It has been observed where the mechanical pressure is being applied, the position of the finger(s) applying the pressure, the positions where the user loses strength. This user is violating the straight-wrist principle. The right hand is in ulnar deviation while the left hand is in dorsiflexion.

Tenosynovitis is when the tendons bend and bunch up in the carpal tunnel; continued use will cause inflammation of the tendons and their sheaths. Carpal Tunnel Syndrome is a disorder caused by injury to the median nerve where it passes through the carpal tunnel of the wrist (Tichauer & Gage, 2010). Symptoms of carpal tunnel syndrome usually progress gradually over weeks and months and sometimes years (Nytime, n.d.).

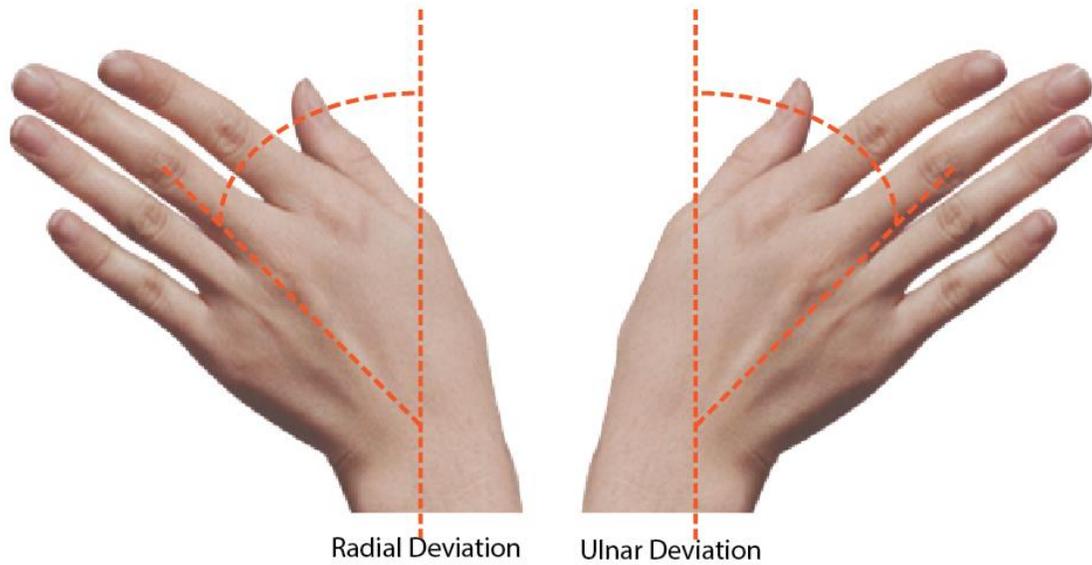


Figure 14, Radial and Ulnar deviation

Here is a good example of using the cutting product in the kitchen. Keeping the wrist straight will make cutting so much easier. The key rule in hand tool using is to avoid ulnar deviation. The greater the deviation, the greater the loss of strength. And also if the index finger is used excessively for operating triggering, a condition known as trigger finger (a form of tenosynovitis) can develop (Patient, n.d.).

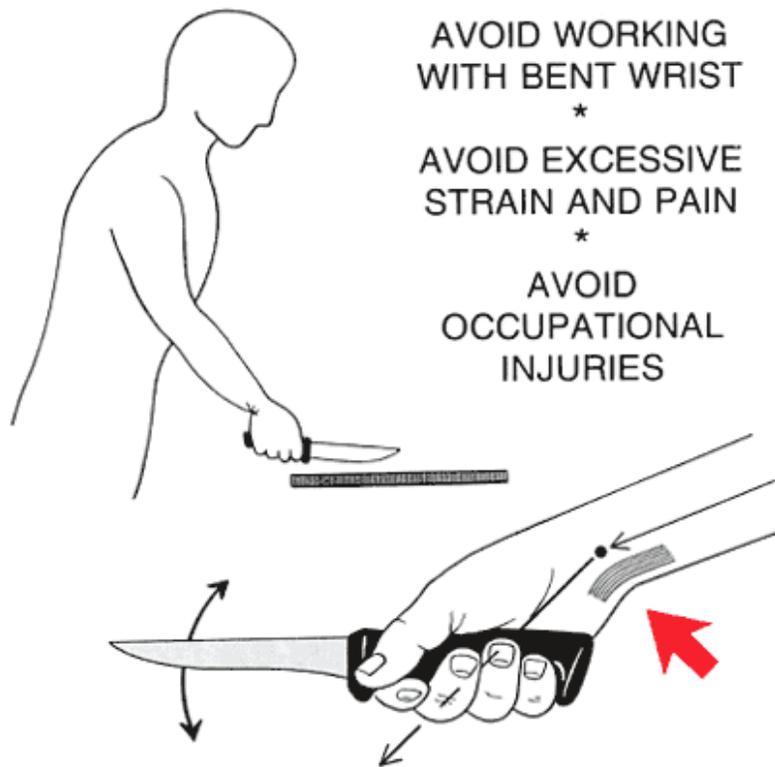


Figure 15, Example of using a knife. (Intercodev, n.d.)

Avoid Hyperextension

Hyperextension of the thumb should be avoided (Figure 16-a). This can cause pain and inflammation. Preferable to thumb controls is the incorporation of a finger strip control, as shown in Figure 16-b, which allows several fingers to share the load and frees the thumb to grip and guide.

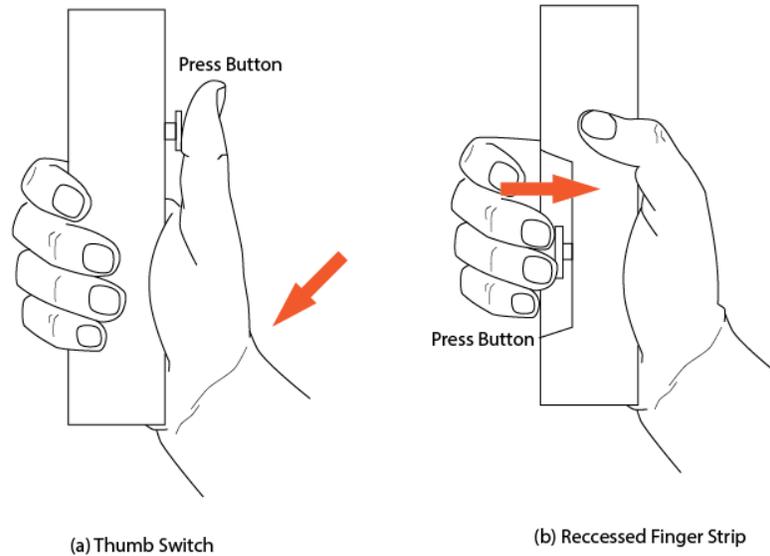


Figure 16, Thumb control in hand tool

Grip Strength and Handles

The grip strength of the hand is related to the size of the object being gripped. Maximum grip strength, for both males and females, occurs with a grip axis between 2.5 and 3.5 in (Greenberg & Chaffin, 1977). But strongest squeeze does not mean the best grip.

Avoid Tissue Compression Stress

Many actions, such as squeezing pliers or using a paint scraper, concentrate considerable compressive force in the palm of the hand. Areas that overlay critical blood vessels and nerves, especially the ulnar and radial arteries, are particularly pressure-sensitive. For example, the handle in Figure 17-a digs into the palm and obstructs blood flow through the ulnar artery. This obstruction of blood flow leads to numbness and tingling of the fingers. When possible, the handles should be designed to have large contact surfaces to distribute the force over a large area and direct it to less-sensitive areas, such as the tough tissue between thumb and index finger. The

handle in Figure 17-b rests on the tissue between the thumb and finger, thus preventing pressure on the critical areas of the palm.

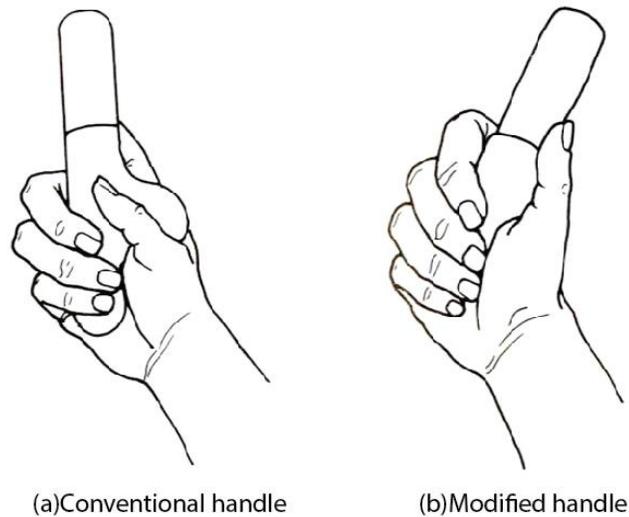


Figure 17, Avoid Tissue Compression Stress.

Remember Women and left-hand users

Globally speaking, women make up slightly over 50% of the population. The average female hand length is about 2cm (8. in) shorter than the average male. Female grip strength is only about two-thirds that of men (Dunning, 2012). And for the left-hand users, globally speaking, left-handed people make up 8-10% of the population. Tools should be designed to be used in the operator's preferred hand (Dunning, 2012).

2.4.3. Human factors with manual kitchen tools

The visual domain in product design

The product's appearance significantly contributes to affecting customers' purchase choice and using experience. Many customers may choose to try a new product simply based on

the product appearance design alone. When faced with what seems to be a never-ending stream of essentially the same products on the shelf at the grocery store, a consumer is most likely to choose the product that attracts them the most. So what makes a product stand out? Studying principles with the human visual and product aesthetic can make designers have a better understanding of designing pleasurable product because most purchase choices are emotionally made by consumers.

The human brain is inclined to categorize everything. When customers are faced with hundreds of products, all of which are quite similar, they categorize them based on the product appearance design and packaging. These two elements affect customers' emotions, and they make judgments: this product is elegant; that product is tacky; this product looks cheap, but this one looks expensive and well-made. The judgments customers make about the products then affect their perceptions of the brands.

The visual appearance of products is a critical determinant of consumer response and product success. Judgments are often made on the elegance, functionality and social significance of products based largely on visual information. These judgments relate to the perceived attributes of products to the satisfaction of consumer wants and desires, rather than their needs (Crilly, 2004). Once issues of utility, safety and comfort have been satisfied, the importance of the product's appearance rises to the top, and that is mostly based on the user's visual sense of it.

“The visual appearance of products is a critical determinant of consumer response and product success. Judgments are often made on the elegance, functionality, and social significance of products based largely on visual information. These judgements relate to the perceived attributes of products and frequently centre on the satisfaction of consumer wants and desires, rather than their needs” (Crilly, Moultrie, & Clarkson, 2004). Product appearance is so

important that users consider it the value of a product, and it affects their purchase choice. Also, The method that the product communicates with users is necessary to understand. A system of communication that is comprising five elements has been developed by Shannon (1948). They are source, transmitter, channel, receiver, and destination. In this system, the five senses are considered the “Receiver”. The signal transmitted by the product is received by the physical senses. The visual sense is one of the most important receiver.



Figure 18, Basic model of communication, (Shannon, 1948)

The aesthetic curves of product design

“The ‘Aesthetic’ refers to sensory perception and understanding or sensuous knowledge.”
(Hekkert, 2006)

Product aesthetic is devoted to affect user’s feelings. It explains why users experience certain products as gratifying to their senses. In product design, curves of the basic form always create the impressions of aesthetic. “...beautiful curves are appeared in their curvature distribution. If the changes of curvature are constant, the second derivative of the curve is beautiful.” Otherwise, if the changes are not constant, the curve is rarely beautiful.” (Farin, 2006) Basically, smooth curves make people feel pleased, and rough curve brings displeasure feelings. The impressions of different curves are classified into following three groups (Kanaya, Nakano, Sato, 2007) :

- Divergent curves: give users sharp impression.

- Neutral curves: bring literally neutral impression.
- Convergent curves: give users centripetal impression.

The visual appearance of products plays a significant role in determining consumer response. Judgments on whether a product is attractive include not only consideration of whether the product looks good, but also whether it appears functional and says the right things about the owner.

Color Psychology

Color plays an important role in product appearance. It draws consumers to products, stirs emotions and has an impact on creating pleasure feelings.

Colors can either positively or negatively affect users' feelings. Users could feel hungry or relaxed, happy or angry... As a designer, it is important to understand the psychological effects colors might have on an average person, or the target audience.

There are well known psychological effects of color as it relates to three main categories: warm color, neutral color, and cool color. Warm colors are commonly considered as red, yellow and orange, and can spark a variety of emotions ranging from comfort and warmth to hostility and anger. Cool colors, such as green, blue and purple, often spark feelings of calmness as well as sadness.

- **Psychological Effects of Warm Colors:** Most studies commonly noted that warm colors (long wavelength colors) are more arousing colors than cool colors (Valdez & Mehrabian, 1994). Warm colors often evoke happiness, energy, and optimism. For kitchen tool design, warm colors are good choices to be considered, because warm colors could increase hunger (Berman, 2007). Thinking about fast food restaurants like

McDonald's or KFC, most of these places incorporate the color yellow and red.

- **Psychological Effects of Cool Colors:** Cool colors include green, blue, and purple. Cool colors are usually calming and relaxing but can also express sadness. Cool colors are commonly accepted by a wider range of people (Crozier, 1999). Blue is a popular choice for serveware design in traditional restaurants because it relaxes customers and encourages them to relax, making them more likely to add to their orders (Rider, 2009). Contrary to red, blue makes objects seem lighter and time pass more quickly (Birren, 1997). Also, light blues give a more relaxing, friendly feel. Great examples are social sites like Facebook and Twitter who use lighter blues. It will be a good choice to create Socio-pleasure when designing kitchen tools. Purple is often used to help spark creativity as it's a mixture of blue (calm) and red (intense). If a product wants to display health, beauty or security, it should incorporate these colors.

- **Psychological Effects of Neutral Colors:** Neutral colors include black, gray, white, tan and brown. These colors are often used as a background colors in design (99designs, 2011). When designing kitchen tools, these colors would easily blend in the kitchen (big environment). In this way, manufactures can increase the sales volume by avoiding most of the variations of different consumer groups.

Visual color perception

Perception or sensation is not a 1:1 replica of our world, especially the color constancy. It is important to have a basic understanding of human vision and the physiology of color.

Proper use of color can enhance a viewer's ability to interpret data while the improper use of color can result in eyestrain. Text, data, or visual symbols should be presented applying a

background using a complementary color. Avoiding strained/intense color combination can help reduce displeasute when designing kitchen tools (Extron Electronics, n.d.).

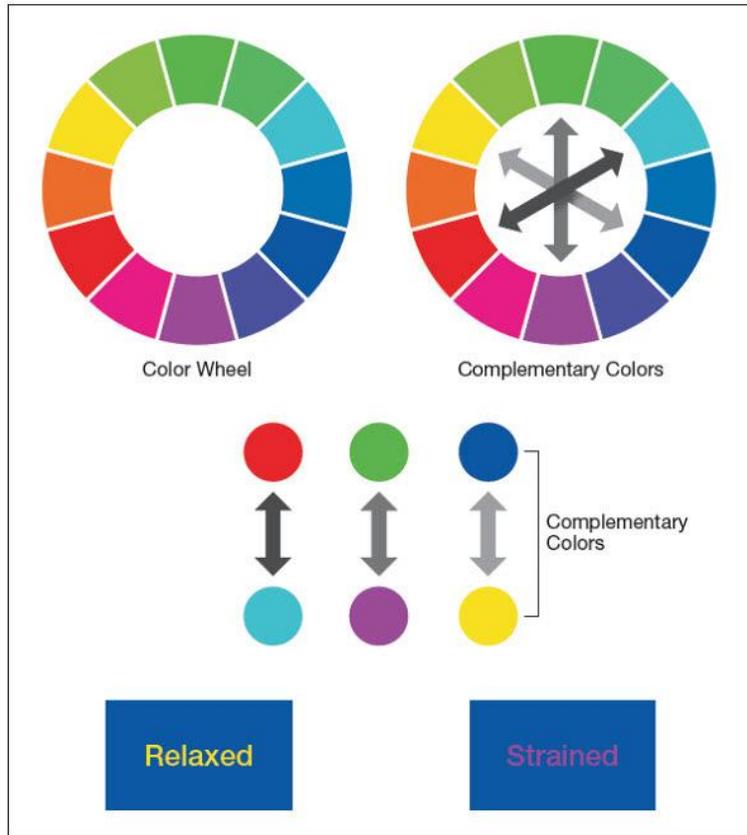


Figure 19, Complementary color (Extron Electronics, n.d)

“Color context refers to the environment in which colors are seen. Color context has to do with surrounding colors and how they impact the use of color” (Color context, n.d.) The small squares (Figure 20) in each of the four vertical columns have the same chromaticity, but their color appearances are very different. The differences arise because of the surrounding areas, which induce complementary color changes in the appearance of the central squares. In the first column, the bottom red small square looks more brilliant against the green background than the top one.

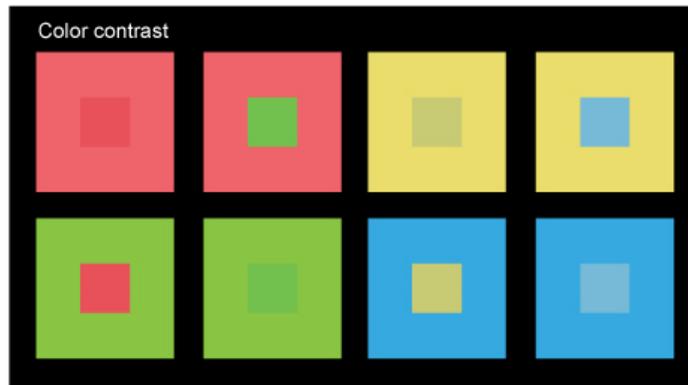


Figure 20, Color context (Color context, n.d.)

By considering the most up-to-date color trend of kitchen, and understanding the basic rules of complementary color and color context, it would be easier to design a kitchen tool that better fit in the kitchen environment. The 2016 kitchen appliance color trends will be studied as below.

Color Trends

Choosing color is an important decision in kitchen tools design. “Selecting a color that will appear for years to come has far-reaching consequences and may either bolster or damage sales in the future” (Rider, 2009). Color trends can to make the decision for designing pleasurable kitchen products. The most popular colors could remain so for about 3 years (Toufecis, 1983). It will bring pleasure feelings if the product appearance can well blend well in to the layout of the kitchen.

For choosing the color of designing pleasurable kitchen products, the most up-to-date color trend in kitchen should be considered. Stainless steel used to take lots of space in kitchen. However, white kitchen cabinets have started to commonly used in modern kitchen design. According to Houzz’s 2014 Kitchen Remodeling Survey, 49% of their 3,500 users said they

currently own white kitchen cabinets (Houzz, 2014). White is the dominant color for kitchen cabinets in 2015 and most likely, will remain in 2016.

However, “gray is quickly climbing the color ranks as some opt for a more neutral look that can match the rest of the home. Don’t be surprised if you see white shy away in 2017 and beyond” (Hurwith, 2016).

Also, the combination of black and white for kitchen design is always a classic one (Figure 21). “Black and white kitchens tend to offset each other and give the kitchen a clean, sleek and visually appealing design. It also benefits from the tension between country and modern” (Hurwith, 2016). According to this, the color black or white used in kitchen tools design would fit most kitchens.



Figure 21, Black and white used in kitchen

Under these kitchen design trends, colorful kitchen tools would be more and more popular because colorful kitchen tools will bring vitality elements when the whole environment/background is neutral colors.

Color preference

Studies of color preference have found significant variations in different age groups. Three months old infants consistently stared longest at red, then yellow, blue, and green. They stared at these four colors longer than others (Crozier, 1999). Color preference changes with age grown up. Five years old children began to prefer purple, orange, green, as well as red. Most significant shift in color preference with age occur with adulthood, they start to prefer green and blue, while beginning to dislike yellow (Crozier, 1999).

There are several slight variations in adults' color preference. Most extroverts prefer brighter colors, while introverts generally prefer lighter tones (Crozier, 1999). Also, women are more sensitive to the variations of colors than men are (Valdez & Mehrabian, 1994). However, the colors blue, red, green, violet, orange, and yellow have been declared as “the eternal and international ranking” by Birren (1997).

In order to design pleasurable kitchen product, it is very important to identify the target client group. Then figuring out their color preference would help to create pleasurable feelings.

2.4.4. Basic requirements for materials used for kitchen tools

Classify manual kitchen tools

The manual kitchen tools can be divided into three catalogs. Classifying the manual kitchen tools can help to better study the material that been used in each catalogs of kitchen products.

- **Cookware:** such as dividers, pots...
- **Tools for preparing food:** such as cutting board, knife and knife sharpener...
- **Serve-ware:** such as containers, spoons, chopsticks...

For all three groups, safety and durability should be considered most when choosing a material to make the kitchen product. For example, for pans or pots, the heat resistance, and weight must be considered.

Principles of materials used for kitchen tools

- **Sanitation:** Kitchen tools often directly contact the foods we eat every day. The material used in kitchen tools need to be antibacterial and nontoxic.
- **Durability:** Materials used in kitchen products should function properly for the intended purpose and perform properly for the designated period of time (Jordan, 1996).
- **Safety:** Materials used for designing kitchen tools must be stable even under high temperature water or heat.

These three principles are very basic requirements for designing pleasing kitchen tools. The lack of these three principles would cause displeased feelings. Designers must evaluate their concepts with these principles in each category, to develop better product.

2.4.5 Materials used for designing manual kitchen tools

Metals used in kitchen tools

Metals are often used in cookware and cutting tools. For designing high quality and pleasurable cookware, the material used should not only be durable and safe, but also take the energy from the heat evenly and effectively. There are two important factors that are related to designing a cookware: the thermal conductivity and heat capacity (Chu, 2005). For metals used in cutting tools, the weight and antibacterial property are important.

For example, these two (Figure 22 and figure 23) are thermal figures of different material when being heated. Figure 22 is heated unevenly, and it is easy to see that the Figure 23 is much better (Chu, 2005).

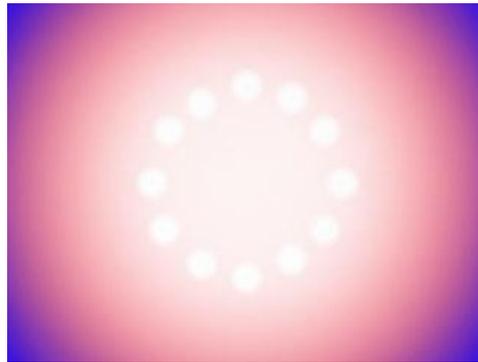


Figure 22, Uneven heated pot (Chu, 2005)

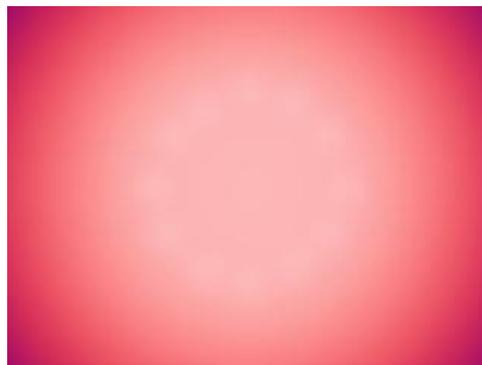


Figure 23, Even heated pot (Chu, 2005).

Here is a list of some common materials used in cookware and their respective thermal conductivity (Chu, 2005):

Material	Thermal conductivity
Copper	401 W/m*K (watts)
Aluminum	237 W/m*K
Cast Iron	80 W/m*K
Carbon steel	51 W/m*K
Stainless steel	16 W/m*K

“Materials with high thermal conductivity fulfill our needs because they transmit heat quickly resulting in fast response to thermal changes and even distribution of the internal kinetic energy” (Chu, 2005). The cookware would work efficiently and bring pleasure feelings when using high thermal conductivity materials. The most recommended materials by for cookware are stainless steel clad aluminum or copper and cast iron (Chu, 2005). The stainless steel clad utensils perform well, are easy to clean, and look beautiful (Chu, 2005).

For materials used with the kitchen tools when preparing food, metals are often used in cutting tools. For example, the blade of a knife can be made from a variety of materials, the most common being carbon steel, stainless steel, tool steel and alloy steel. Other less common materials used in knife blades includes cobalt and titanium alloys, ceramics, obsidian (Wikipedia, n.d.).

For making serve-wares, metals are often used in containers and tableware. When used for making serve-wares, materials used should be stable and non-toxic, even under high temperature water wash.

Plastics

Safety, cost, weight, touch, texture and finish are some elements to be considered to design kitchen product. Another material that has been used a lot in designing a kitchen product is plastic. People can imagine our kitchens without a lot of things, but plastic is not one of them. There are three kinds of plastic that have been used very commonly in the kitchen (Foodmaster, n.d.).

1. PET or PETE (polyethylene terephthalate ethylene) is a common plastic used to package a variety of foods and drinks. PETE is considered a safe, non-leaching

plastic

2. PS (polystyrene) is often found in foamed food containers. It can reach a number of chemicals into foods and is not recommended for the kitchen.
3. HDPE is another common plastic used for milk and water jugs, dairy product tubs, and plastic bags. HDPE is not known to leach toxins

2.4.6. Conclusion

It seems like usability is the main factor in whether products are pleasurable to use. However, the pleasure in product use is not just the usability. The emotions felt when using pleasurable/dis-pleasurable products are potentially more wide-ranging than just satisfaction/dissatisfaction (Jordan, 1995), and the properties of a product which influence how pleasurable/dis-pleasurable it will be to use do not only include the property of usability. In order to fully represent the user in the product creation process, the human factors should be looked both at and beyond usability in order to create products that are a positive pleasure to use. According to the researches and studies in this chapter, pleasurable kitchen product checklist will be developing in next chapter.

Chapter 3

Pleasurable, manual kitchen tools design checklist

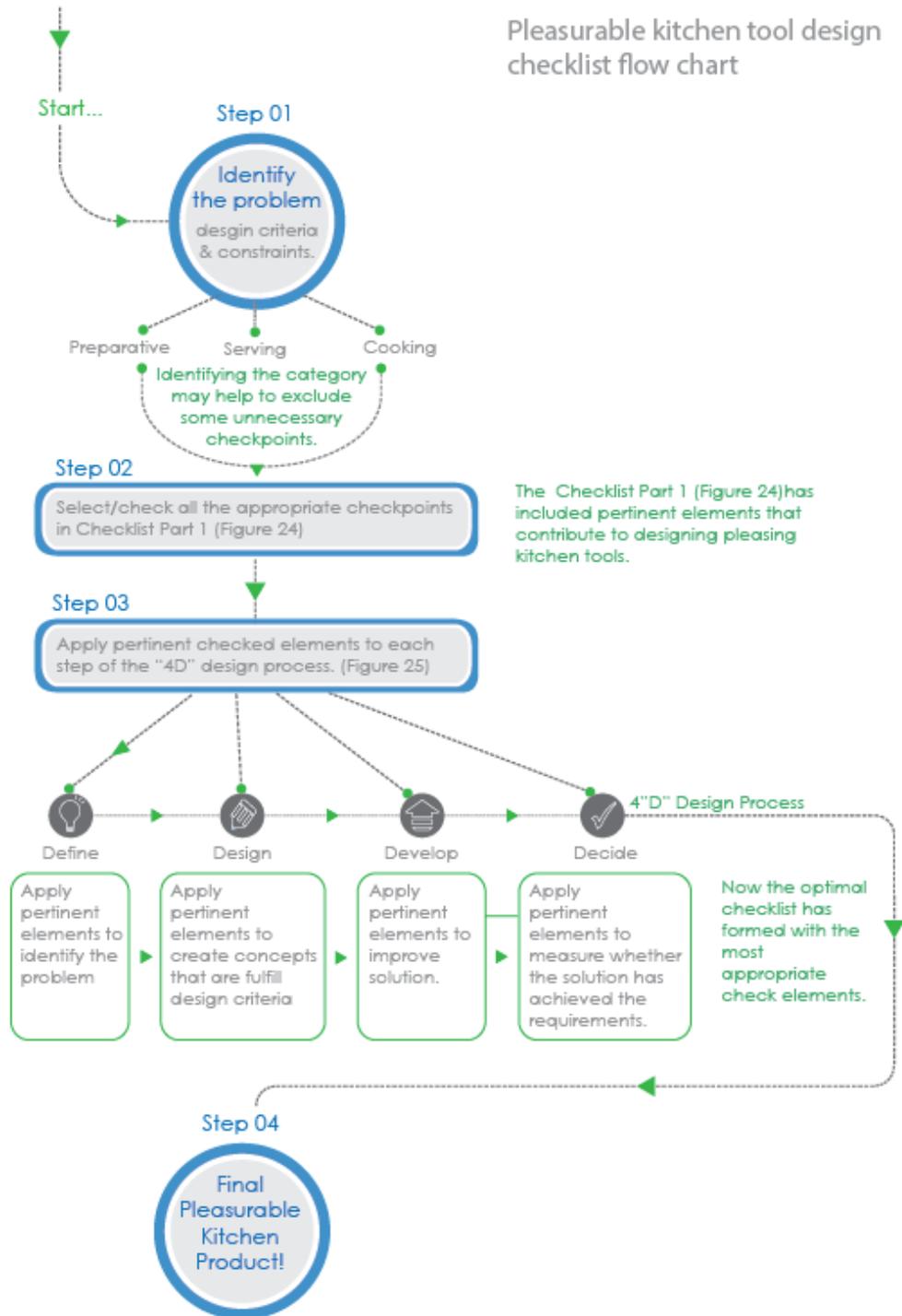


Figure 24, Flow chart of using the Pleasurable Checklist.

3.1 Introduction

This Pleasure Design Checklist (Figure 25 & Figure 26) is a checklist of designing gratifying manual kitchen product. It provides relevant elements to promote the user experience into a higher emotion level.

3.1.1 Procedure

- Step 1: Identify the design problem/task. Manual kitchen tools can be divided into two parts: preparative tools and cooking tools. Identifying the category may help to exclude some unnecessary checkpoints and get to the main design task succinctly.
- Step 2: Carefully consider the design criteria and select appropriate checkpoints/elements in Checklist Part 1 (Figure 25). Unnecessary elements should not be checked. For example, for designing a cutting board, the major function is to provide a stable and durable surface for cutting task. So the checkpoint “Multifunction” under the first column “Customer Needs” in the Checklist Part 1 (Figure 25) may not be necessary to select.
- Step 3: Take the checkpoints that are needed from the checklist, and then apply them under section of the “4D” Design Process (Top part in Figure 26).
- Step 4: Create the specific design process for different design purposes. Follow all these checkpoints to create the pleasurable kitchen tools.

Design Checklist Part 1

Customer Needs

Functionality

- ☐ Major features work efficiently
- ☐ Operability
- ☐ Multifunction

Usability

- ☐ Efficient to use
- ☐ Effective to use
- ☐ Communicate
- ☐ Storage
- ☐ Cleaning
- ☐ Safety
- ☐ Durability

Human Factors

Ergonomics with kitchen tools

- ☐ Ergonomic factors with hand
- ☐ Ergonomic factors with thumb
- ☐ Ergonomic factors with wrist
- ☐ Ergonomic factors with handles
- ☐ Avoid tissue compress stress

Human factors with kitchen tools

- ☐ Visual domain
- ☐ Aesthetic curves
- ☐ Visual color perception
- ☐ Materials

Pleasure Feelings

Four Pleasures (Jordan, 1992)

- ☐ Physio-pleasure
- ☐ Psycho-pleasure
- ☐ Social-pleasure
- ☐ Ideo-pleasure

Design Checklist
for Pleasurable kitchen tools

Figure 25, Design Checklist Part1



Figure 26, Design Checklist Part 2

3.1.2. Pleasurable, manual kitchen tools design checklist

This checklist for designing pleasurable manual kitchen products has two parts:

1. The Checklist Part 1(Figure 25).

Checklist Part 1(Figure 25) has provided all the key elements/checkpoints that are needed for designing gratify kitchen product. Based on the research and study in Chapter 2, these checkpoints have been divided into three sections: Customer Needs, Human Factors, and Pleasure Feelings that were developed from the research and study in Chapter 2.

2. The Checklist Part 2 (Figure 26).

Checklist Part 2 (Figure 26) has provide the “4D” Design Process. Designers can apply the checked elements (from Checklist Part 1) under each each step in this design process. For instance, if designing a manual coffee pot, there are several checkpoints that can be applied: operability, efficient to use, storage, cleaning, durability, materials, socio-pleasure, ideo-pleasure, physio-pleasure (Figure 27).

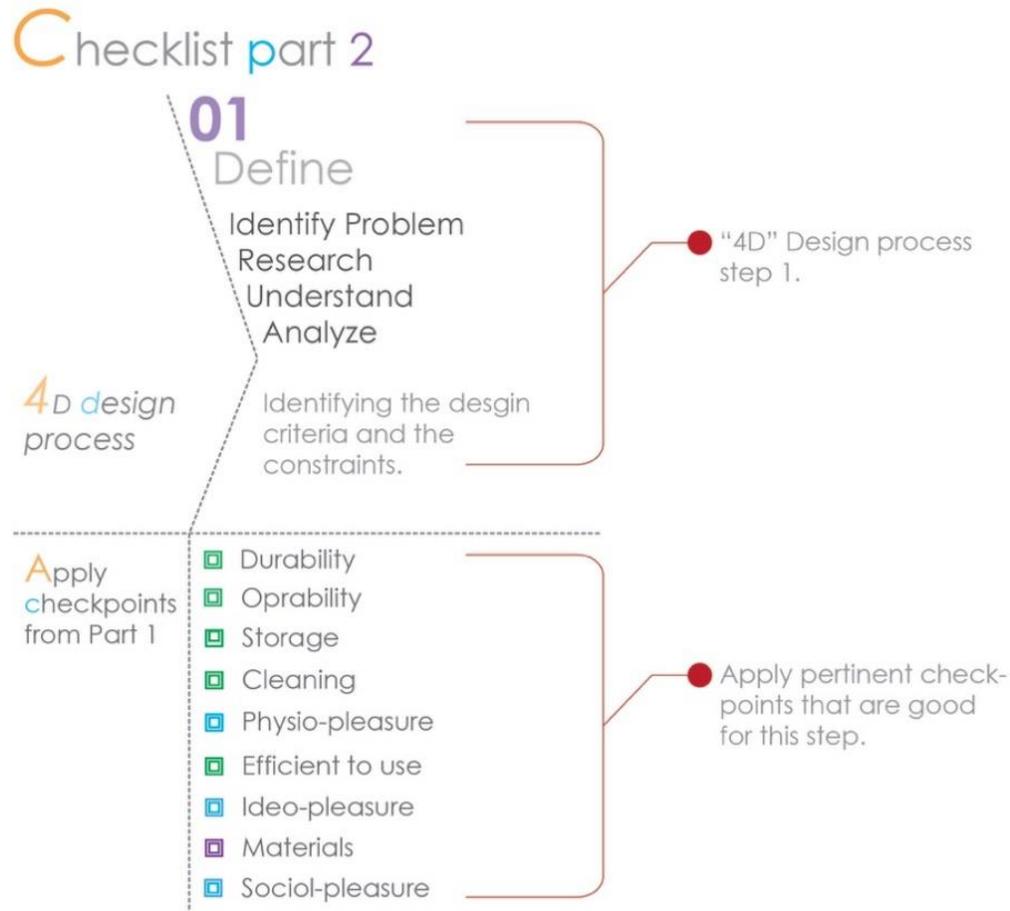


Figure 27, Example for applying pertinent checkpoints to “4D” Design Process

The main idea of this design checklist is that it allows designers to create their own design process by applying checkpoints to the specific design tasks. In this way, the whole design process is flexible and better services different design tasks. Figure 24 is the approach to use this design checklist.

3.2 Checklist for designing pleasurable kitchen tools

“Checklist for designing pleasurable kitchen tools” is constituted by Checklist Part 1 (Figure 25) and Checklist Part 2 (Figure 26). Figure 25 (Checklist Part 1) includes checkpoints

that were developed from the research and study in Chapter 2. Figure 26 (Checklist Part 2) is composed from the existing design process.

3.2.1 Design checklist for designing pleasurable, manual kitchen tools

Customer needs

The first section of Checklist Part 1 is about customer needs. Checkpoints under this section can help with determining the main target of the design project. The function of creating a pleasing product often relates to product features and operability (Jordan, 1996). A product with an efficient feature can be both pleasurable and operable. Also, additional functions/features could lead the user experience into higher levels.

Products with a high level of usability can bring satisfaction in a product's use. According to the previous study and research, seven domains have been developed and listed out:

1. **Efficient to use:** this refers to the speed and the quality in which consumers can achieve the particular aim/task by using the product.



Figure 28, Rice cooker (Amazon. com)

Figure 28 shows a rice cooker sold on Amazon. According to the reviews on Amazon, some customers mentioned this product took about 45 to 50 minutes to cook 3 cups of rice. But its instruction says it should only take 20 to 25 minutes. This is an example of a product that is not efficient to use and causes displeasing feelings.

2. **Effective use:** this refers to the performance and completeness in order to complete the task.



Figure 29, Lemon squeezer (Amazon.com)

Figure 29 is a good example of a product that is effective to use. This lemon squeezer is the best seller on Amazon, and had 90% 5-star reviews. The customers are satisfied with its effortless squeeze that still can get every bit of juice out of the fruit.

3. **Communicate:** the product is easy to understand how to use.



Figure 30, Hand blender (Amzon.com)

Figure 30 is a good example for explaining the “communication”. The black part on the product’s handle is easy for user to notice, and easy to understand that they should hold on this part.

4. **Storage:** The kitchen is a happening place, with great amount of tools users can create so many delicious foods. But no one would like disorder in kitchen. Kitchen tools with gratifying designs should be easy to store.
5. **Cleaning:** A pleasurable kitchen product should be easy to clean. This point is related to the material (whether it is safe for dishwasher) and the shape (whether it has some special feature that is not easily cleaned) of the product.
6. **Safety:** Unsafe kitchen products will cause not only unpleasing feelings but also very serious result. For example, if designing a cutting board without considering the antiskid problem, users may cut their hands while doing cutting job with it. In order to design pleasing kitchen tools, safety must be considered.

- 7. Durability:** Pleasurable kitchen products should provide users an appropriate period of time for using. This part is related to the material used and the usage condition.

Human factors

The first part of this section is ergonomic factors in manual kitchen tools design. This part is very important for designing kitchen tools. These areas of hands, thumbs, wrists, and handles must be considered while designing manual kitchen tools. Designers should also avoid tissue compression stress.

The second part in this section is the human factors for creating pleasurable kitchen tools. It includes:

- Visual domain and aesthetic curves: both are related to the appearance of products. The product appearance significantly contributes to creating pleasure feelings.
- Color perception: it is also related to the product appearance. Color could directly affect people's feeling and that must be considered.
- Materials: this is very important for designing kitchen tools. The appropriate materials should be durable and safe, in order to give users years of good service.

Pleasure feelings

The theory – “four pleasures” – can be used to set the design aims and evaluate the final solution. When applying it to the design process, four different pleasure feelings can be placed in different steps.

3.2.2 Apply checkpoints to the “4D” Design Process.

When a designer has finished the first two steps, the checkpoints in the Checklist Part 1 (Figure 25) can be applied to the design process. Based on the different purposes of design, only the necessary checkpoints should be chosen. Unnecessary checkpoints can be ignored in certain cases. For example, the ergonomic factors with handles may not be necessary when designing a cutting board. Also, repeated use is allowed with each checkpoint.

3.3. Conclusion

This design checklist will provide designers the flexibility to create a unique checklist exactly for their project. This checklist is always adjustable; designers can add or delete any checkpoint during the design process.

The redesign project uses this set of checklist will be provided in Chapter 4. There are several benefits that can be expected when using this checklist:

- Flexible: Only choosing the necessary/best-fit checkpoints to apply to the design process. In this way, designers can have their own design processes for better serving different purposes of design projects.
- Focus on creating pleasurable manual kitchen products.
- Good for other purpose of design projects.
- Good for redesigning existing kitchen products or designing completely new kitchen products.

Chapter 4

Design project by application of checklist

4.1 Introduction

This chapter will focus on redesigning an existing manual kitchen product. By analyzing the aspects of the target product, an improved result that better fulfills pleasurable product requirements can be expected. This redesign development process will follow the “Pleasurable, manual kitchen tools checklist” that was created according to previous research in this thesis.

4.2 Manual Teapot set redesign

4.2.1. Design opportunity



Figure 31, Teapot set (West elm, n.d.)

The teapot set is a beverage serving kitchen tool that is used for either dessert time or entertaining at social events. Not just for creating social opportunity, it also appears beautiful from the kitchen to the tabletop, although several unpleasing features can still be improved.

According to the “Pleasurable kitchen tool design checklist” and the customer reviews on Amazon, the weak parts of this product are listed below:

- **Appearance features:** A product with a good aesthetic appearance would bring Ideo-pleasure (Jordan, 2006). While this teapot (Figure 31) has a good appearance, it does not share similar features with the tea mug in this collection. As a teapot set, the teapot, mugs, or other accessories should share similar appearance features.
- **Infuser:** The infuser allows the boiling water to take up the flavor from the leaves, but keeps the tea leaves out of the drinking vessel, or prevents tea leaves passing out through the teapot into the cups when pouring out the tea. In this case (Figure 31), after using the infuser, it can either stay in the teapot, or simply be lifted out and placed on the tabletop (Figure 32).



Figure 32, Problems with the tea infuser

For most kinds of tea leaves, long times in the boiling water gives rise to over-cooking. Over-boiling tea leaves will cause a very heavy flavors and a high caffeine content. “If you boil the tea for too long, tea polyphenols and essential oils begin to oxidize spontaneously -- which not only decreases the tea clarity and aroma, but also reduces the nutritional value. If tea has been stewing in warm water for too long, the quantity of microorganisms (bacterium and fungi) greatly increases.” (Womanknows, n.d.) Because of this, users will not be pleased with the lack of Physio-pleasure.

According to customer reviews on Amazon, the infuser in this teapot (Figure 31) can only be cleaned by hand. This feature may cause displeasing feelings according to previous research due to the lack of convenience in cleaning.

- **Handle:** According to previous research, features that support and enhance the operation of the product will cause pleasing feelings (Jordan, 1996). This teapot handle does not provide a space for the palm, and only allows two or three fingers to hold the teapot. This puts all the pressure on only three fingers and the thumb. It can be improved with ergonomic factors. A more specific handle analysis will be provided following the general analysis.



Figure 33, Holding the teapot when pouring.

- **Heat preservation:** This teapot is made of a single layer of glass, which is not good enough to preserve heat. In addition, some customer reviews on Amazon also mentioned that the decorative metal parts get hot too easily while pouring boiling water into the teapot. Double layered glass with a vacuum space in between would better solve this problem.

By applying the design checklist developed from previous research, the above issues should be solved and a pleasurable redesigned product can be expected.

4.3 Applying “Pleasurable, manual kitchen tools design checklist”

4.3.1 Step 1: Identify the problem.

In this teapot set redesign project, the main target is to create a pleasing teapot set with pleasurable features by applying the pleasurable design checklist, so that a pleasing product may be created. The most important problem is to solve several issues that have been listed above. Identifying the product category may help to exclude some unnecessary checkpoints. This manual teapot set is a serving tool set which can provide good service for social events.

4.3.2 Step 2: Select all the appropriate checkpoints in the Checklist Part 1

By using the Checklist Part 1 (Figure 25), all the relevant checkpoints have been checked as Figure 28. These chosen checkpoints will be applied to the Checklist Part 2 in order to finish the “4D Design process” (Figure 25).

Several checkpoints are excluded from this Checklist Part 1. Reasons are listed below:

- **Un-selected checkpoint: Multifunction.**

According to earlier research, the appropriate additional function can enhance the user experience and bring positive emotions. In this case, for a teapot, no other necessary function is needed. The unnecessary function may increase the product weight and negatively affect the holding experience.

Design Checklist Part 1 for Pleasurable Teapot redesign

Customer Needs

Functionality

- ✓ Major features works efficiently
- ✓ Operability
- Multifunction

Usability

- Efficient to use
- ✓ Effective to use
- ✓ Communicate
- ✓ Storage
- ✓ Cleaning
- ✓ Safety
- ✓ Durability

Human Factors

Ergonomic with kitchen tools

- ✓ Ergonomic factors with hand
- ✓ Ergonomic factors with thumb
- ✓ Ergonomic factors with wrist
- ✓ Ergonomic factors with handles
- ✓ Avoid tissue compress stress

Human factors with kitchen tools

- ✓ Visual domain
- ✓ Aesthetic curves
- ✓ Visual color perception
- ✓ Materials

Pleasure Feelings

Four Pleasures (Jordan, 1992)

- ✓ Physio-pleasure
- Psycho-pleasure
- ✓ Sociot-pleasure
- ✓ Ideo-pleasure

Figure 34 Checklist Part 1 --Teapot redesign

- **Un-selected checkpoint: Efficient to use.**

This refers to the speed the consumers can achieve the aim by using the product. For teapot redesign, it is unnecessary because the teapot set should let users enjoy the social time with friends. There is no need to rush.

- **Un-selected checkpoint: Psycho-pleasure.**

Psycho-pleasure has to do with thoughts and mind. This can be created by intellectual games such as Sudoku or Scrabble that stimulate thinking and give the pleasure of winning. Since this teapot design is more about creating a pleasing social time, this kind of pleasure will not be considered during the design process.

After selecting all the other pertinent checkpoints, the project design criteria (Figure 35) were created by analyzing the design opportunity and the “Checklist Part 1 for teapot redesign” (Figure 34).

Relevant Checkpoints	Design Criteria
Major features works efficiently	<ul style="list-style-type: none"> • Be able to brew and serve tea properly. • Good for tea or similar beverage.
Operability	<ul style="list-style-type: none"> • To maintain the tea at a proper temperature for serving for a reasonable period of time.
Effective to use	<ul style="list-style-type: none"> • Great performance and completeness in order to serve tea
Storage	<ul style="list-style-type: none"> • Take reasonable place for storage.
Cleaning	<ul style="list-style-type: none"> • Dishwasher safe, easy to cleaning completely
Safety, Durability	<ul style="list-style-type: none"> • All parts will not make users feel too hot to touch. All joint parts should be durable.
Ergonomic Factors	<ul style="list-style-type: none"> • Allows pressure on both palm and thumb. • When pouring water, keep the wrist straight. • The handle can provide comfortable holding position.
Visual Aspects	<ul style="list-style-type: none"> • Using neutral curves • Good looking style • Warm color preferred
Material	<ul style="list-style-type: none"> • Stainless steel, Glass, ABS
Physio-pleasure	<ul style="list-style-type: none"> • Appropriate weight: 0.8lb ~1.5lb; Comfortable handle; Good quality.
Social-pleasure	<ul style="list-style-type: none"> • Good for 2~3 users to use. Multiple color choice. Good finishing look.
Ideo-pleasure	<ul style="list-style-type: none"> • Good aesthetics looking. High quality finishing.

Figure 35, Teapot set design criteria

4.3.3 Step 3: Apply pertinent checked checkpoints to each step of the “4D” Design Process.

- **The “1st D”: Define and research.**

After identifying design criteria, pertinent research can contribute to improving design quality. The 1st step of the Checklist Part 2 with applied related checkpoints is shown below (Figure 32).

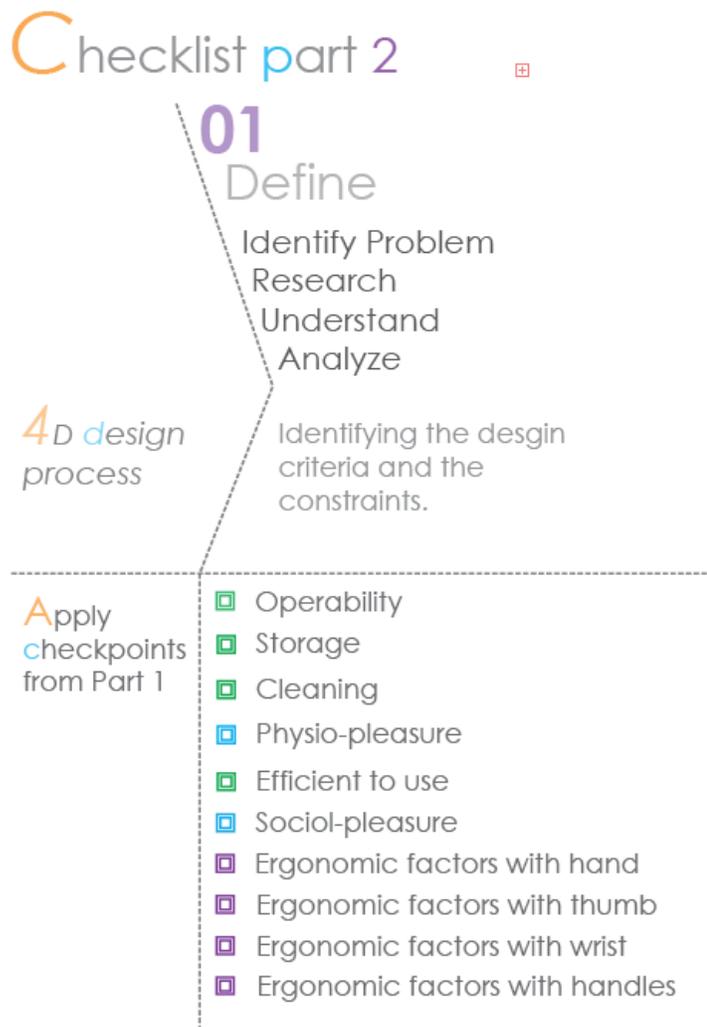


Figure 36, Checklist Part 2 – Step 1

For a teapot, the handle sustains the most pressure when holding the teapot or pouring water. It relates to many elements: operability, effectiveness, ergonomic factors with the hand, the thumb, the wrist, handles, and physio-pleasure. All these checkpoints have been applied to the 1st step. A well designed handle can positively affect the operation of the teapot. A weak operation part could contribute to displeasing feelings. Figure 37 is the comparison chart for five different existing products.

	<p>Pros:</p> <ol style="list-style-type: none"> 1. Allows the palm to provide support while prouing water. 2. Allows the wrist to maintain naturally straight.
	<p>Cons:</p> <ol style="list-style-type: none"> 1. Single layer glass, not good for maintaining temperature. Could be too hot to touch. 2. It is better to avoid thumb press. Preferable to thumb controls is the incorporation of a finger strip control
	<p>Pros:</p> <ol style="list-style-type: none"> 1. Allows the wrist to maintain naturally straight. 2. Allows the palm to provide support while prouing water.
	<p>Cons:</p> <ol style="list-style-type: none"> 1. It is better to avoid thumb press. Preferable to thumb controls is the incorporation of a finger strip control 2. Too much space between the upper palm and the handle.

	<p>Pros:</p> <ol style="list-style-type: none"> 1. Allows the wrist to maintain naturally straight. 2. Allows both the upper and lower palm to provide support while pouring water.
	<p>Cons:</p> <ol style="list-style-type: none"> 1. It is better to avoid thumb pressure. Preferable to thumb controls is the incorporation of a finger strip control

	<p>Pros:</p> <ol style="list-style-type: none"> 1. A comfortable position for the thumb.
	<p>Cons:</p> <ol style="list-style-type: none"> 1. Angled to keep the wrist straight. 2. Fingers are touching the body of the pot. May cause unpleasant result because of the hot water.

	<p>Pros:</p> <ol style="list-style-type: none"> 1. A comfortable position for the thumb.
	<p>Cons:</p> <ol style="list-style-type: none"> 1. Angled to keep the wrist straight. 2. Neither the upper palm and the lower palm can provide support.

Figure 37, Existing product handles analysis

According to the analysis of the existing product, several pleasure elements can be extracted:

1. A curved handle works better than a straight handle. The curved handle allows both the upper and lower part of the palm to provide support to the teapot.
2. It is best to avoid the thumb press. According the research, a comfortable position for the thumb can create a pleasing feature.
3. Keeping the wrist naturally straight can create a better user experience.

A well designed handle can create social-pleasure and physio-pleasure with the teapot. All the checkpoints in Figure 36 are related to the handle design. This existing product analysis can help to complete these checkpoints of step 1.

- **The 2nd “D”: Design**

The 2nd step is to start the design process with concepts. Figure 38 is step 2 of the Checklist Part 2, with applied checkpoints. When designing concepts, designers should consider all of the checkpoints that have been applied to the “4D Design Process Step 2” (Figure 38).

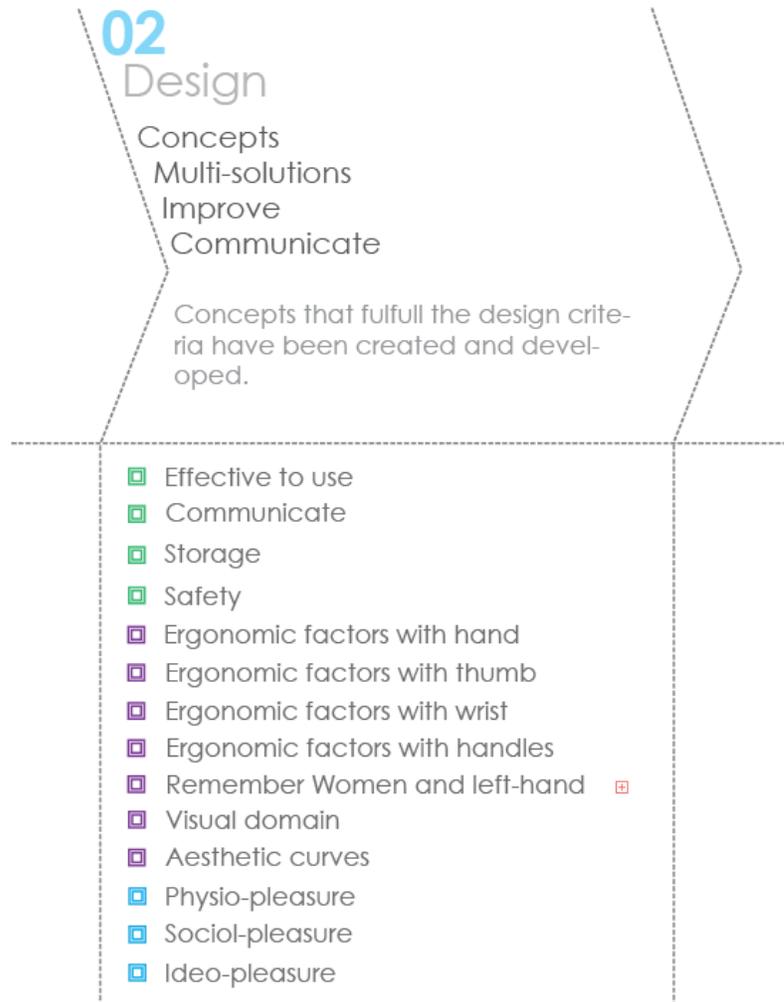


Figure 38, Checklist Part 2 – Step 2

When concepts have achieved most of the checkpoints in figure 38, the remaining checkpoints may still need to be worked on and evaluated in the next step. According to these checkpoints, sketches of idea development are shown in Figure 39 to Figure 44.



Figure 39, Idea collection

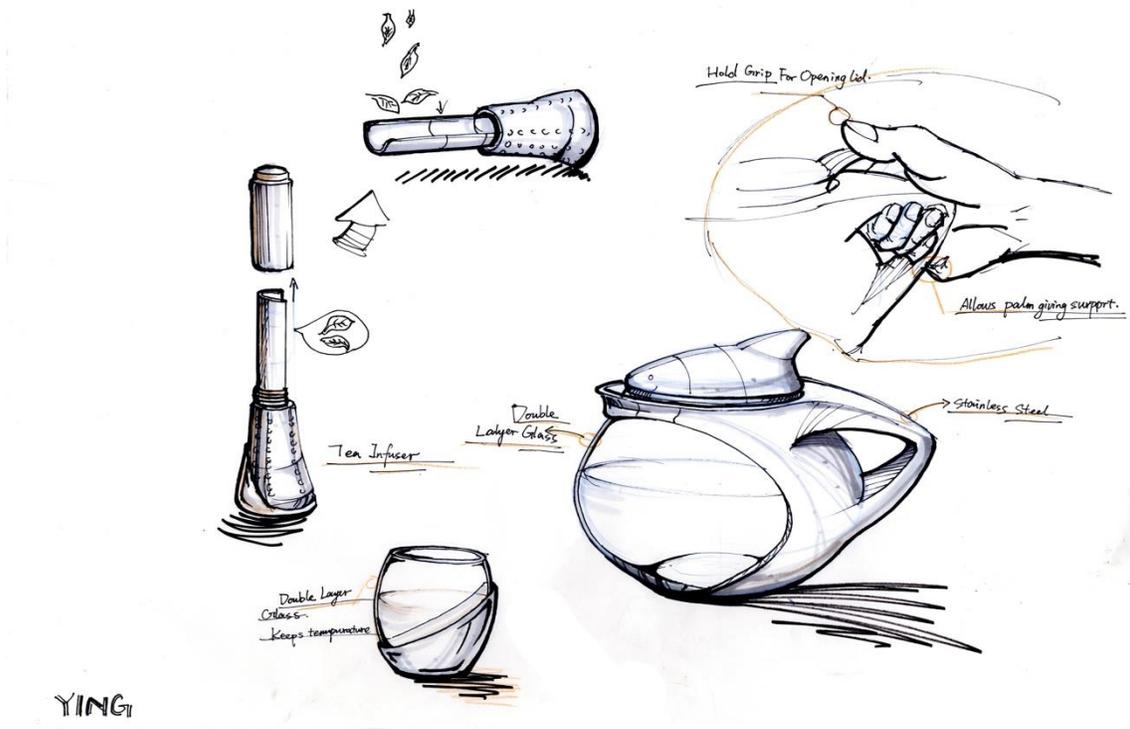


Figure 40, The teapot set concept 1

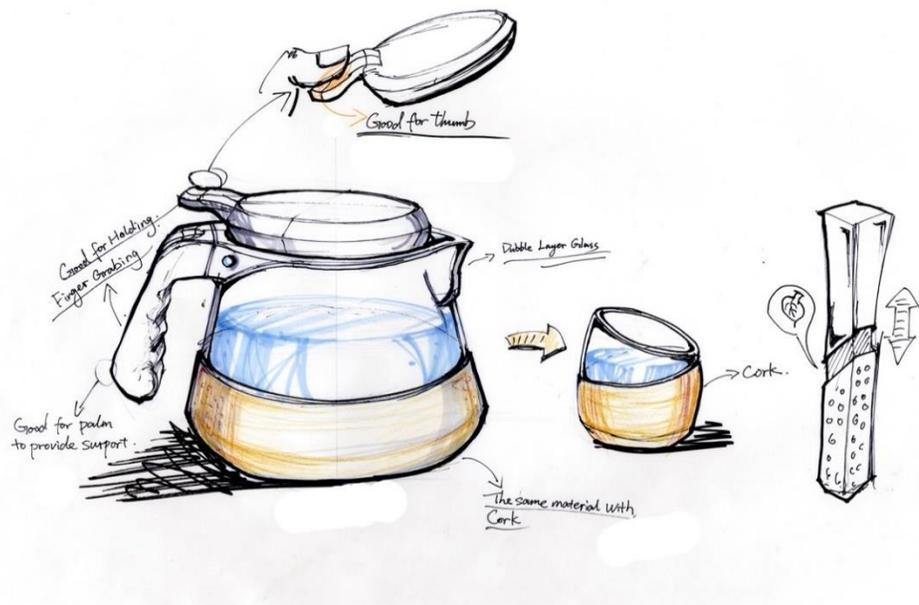


Figure 41, The teapot set concept 2

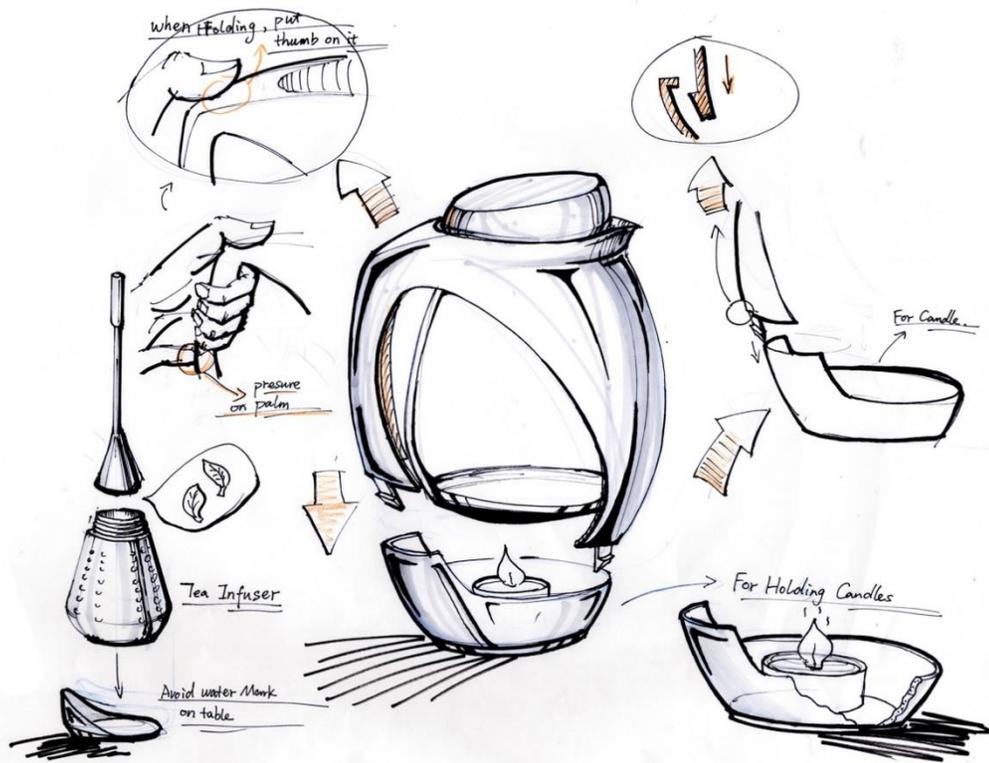


Figure 42, The teapot set concept 3

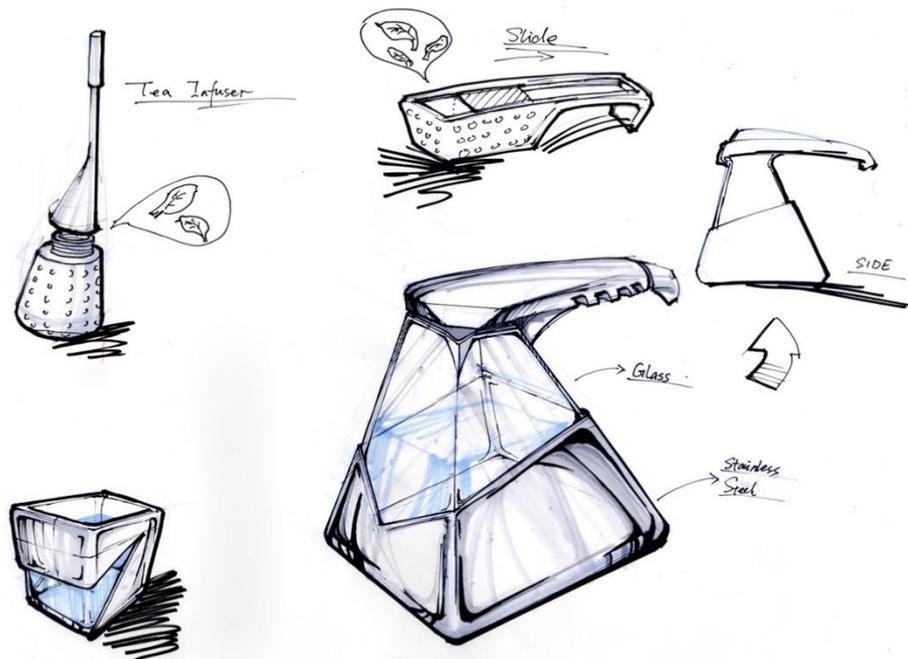


Figure 43, The teapot set concept 4

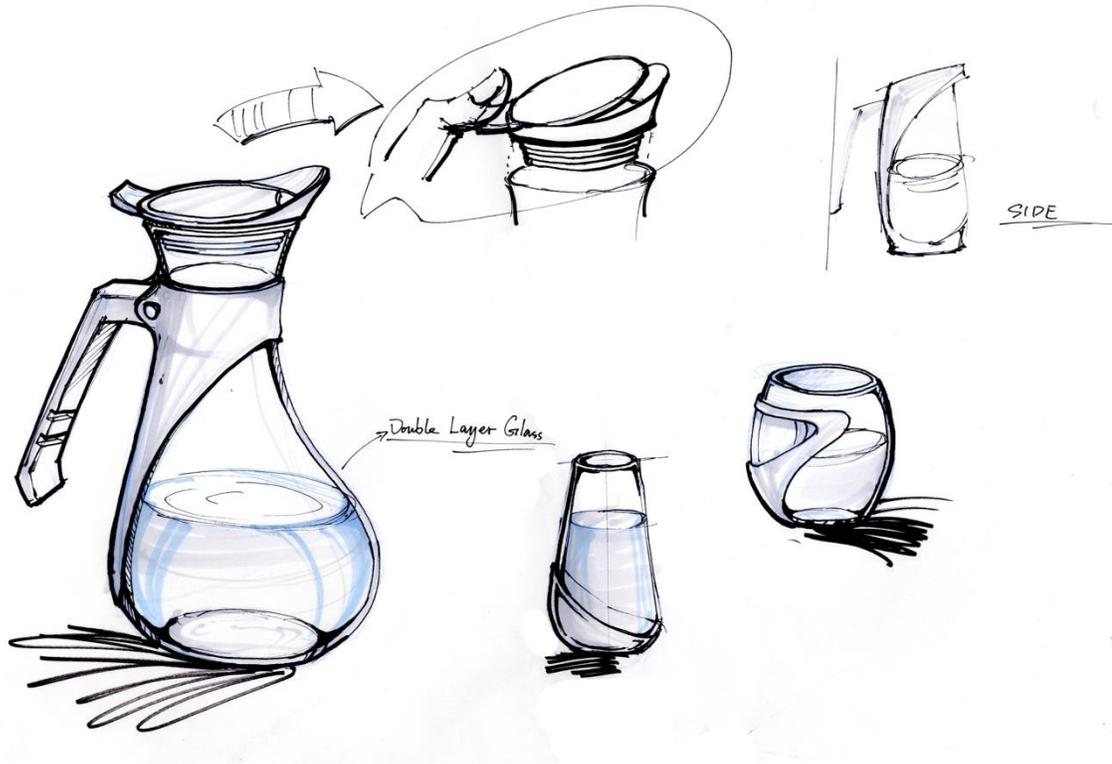


Figure 44, The teapot set concept 5

Figure 39 to figure 44 are concept developments. In order to select the final solution, each concept will be evaluated according to Figure 38, and results are show in figure 45. After analyzing these concepts with the checkpoints, the final concept will fulfill all the requirements in Figure 38 can be expected.

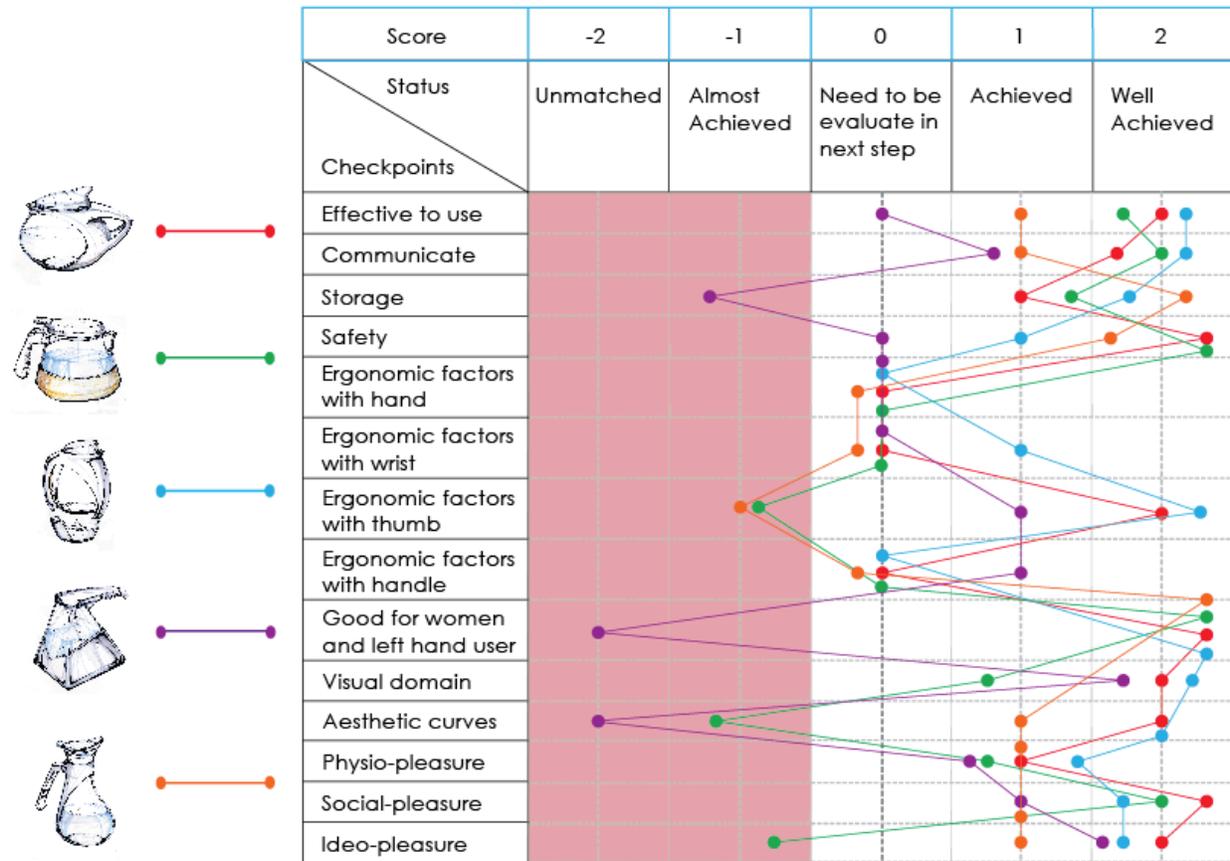


Figure 45, Concepts analyses

According to this chart, green, purple and orange, lines reach the red area. This indicates that these three concepts have several missed checkpoints. However, concept 1 (Line red) and concept 3 (Line blue) achieve most of the checkpoints. These two concepts only have 2 - 3 checkpoints that need to be evaluated later, and they do not have any unmatched checkpoints. Due to the results, generation 2 of concept 1 and 3 in more detail are shown below:



Figure 46, Concept 1 generation 2



Figure 47, Concept 3 generation 2

Compared to concept 1 (Figure 46), concept 3 (Figure 47) has an add-on feature which is the candle warmer. As researched in Chapter 2 shows, an extra appropriate feature can bring pleasing feelings (Jordan,2006). Also, concept 3 has the most amount of checklist matches on the checklist. Due to the above reasons, concept 3 has been chosen as the final solution.

- **The “3rd D” Develop**

The 3rd step in The Checklist Part 2 is “Develop”. In this step, a test model will be provided in order to improve the concept.

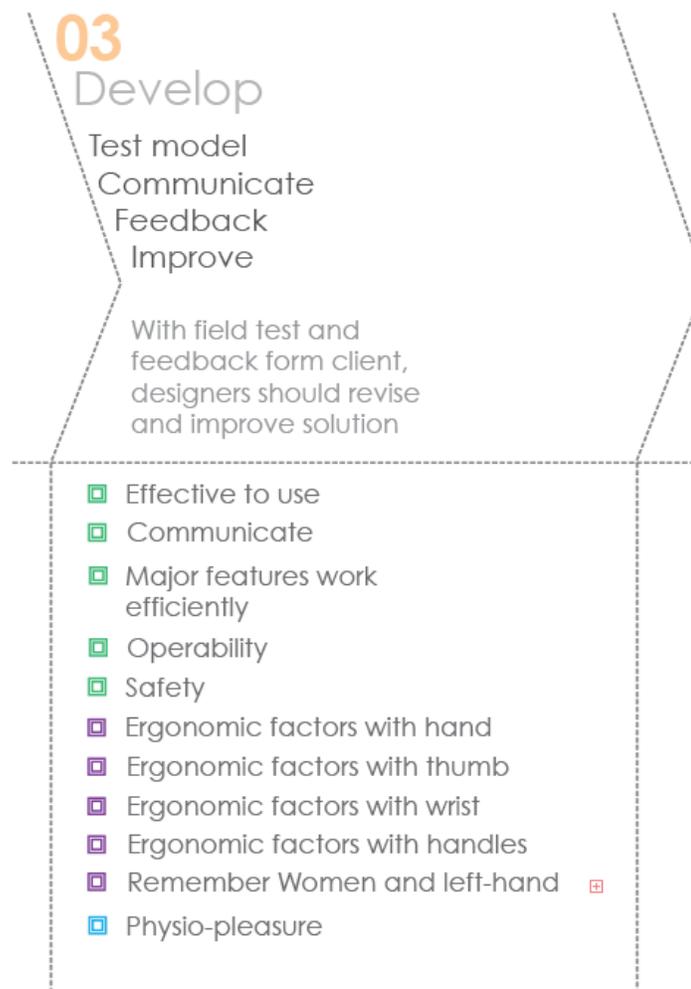


Figure 48, Checklist Part 2 – Step 3

Figure 44 is the 3rd step with applied checkpoints. The test model will be evaluated according to this checklist.

As discussed earlier, the handle sustains the most pressure while using it. This testing model will focus on evaluating the handle. Figure 49 and figure 50 show the test handle with either the female's hand or the male's hand.



Figure 49, Female's hand holding the testing handle

As shown in Figure 49, the female's hand is holding the testing handle. The user's wrist can maintain a straight position. The palm and the fingers sustain most of the pressure. The thumb is able to hold a comfortable position.



Figure 50, Male's hand holding the testing model

As shown in Figure 50, the testing handle model can also fit the male's hand. In addition, due to the bigger size hand, the male's lower palm can also provide support while using it.

For better testing results, the testing handle has been screwed onto a cylindrical object (Figure 51, Figure 52), which has the same height and width as the concept teapot. This cylindrical object can be considered the body of the teapot. In order to gain as much weight as the real 1.5L teapot, it has been tested by adding with water.

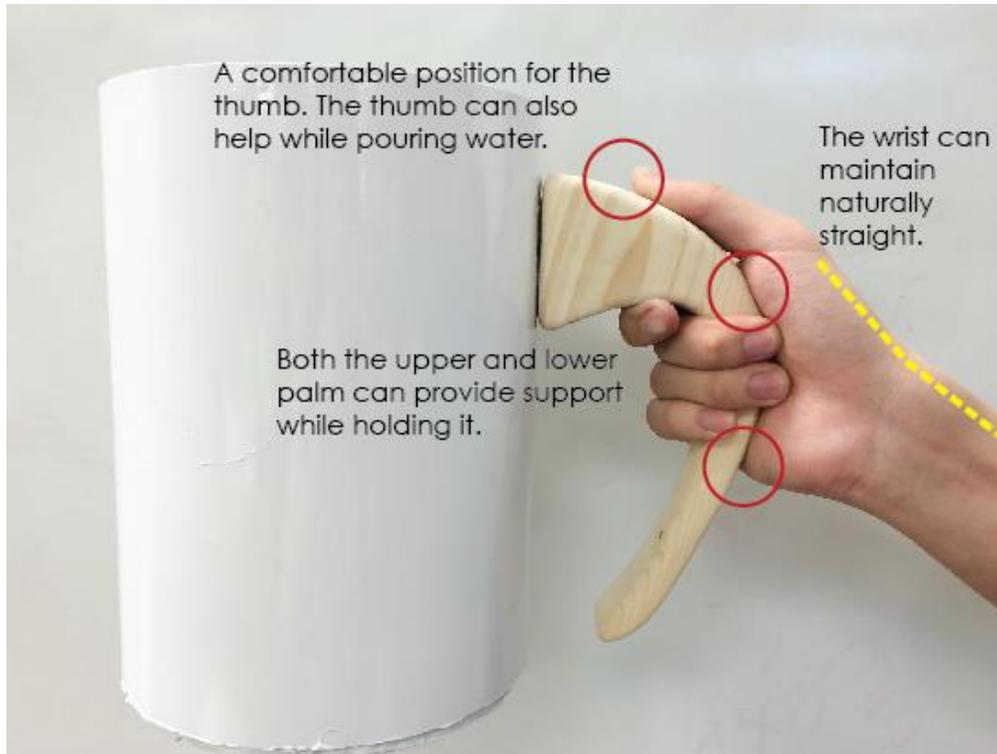


Figure 51, Holding position

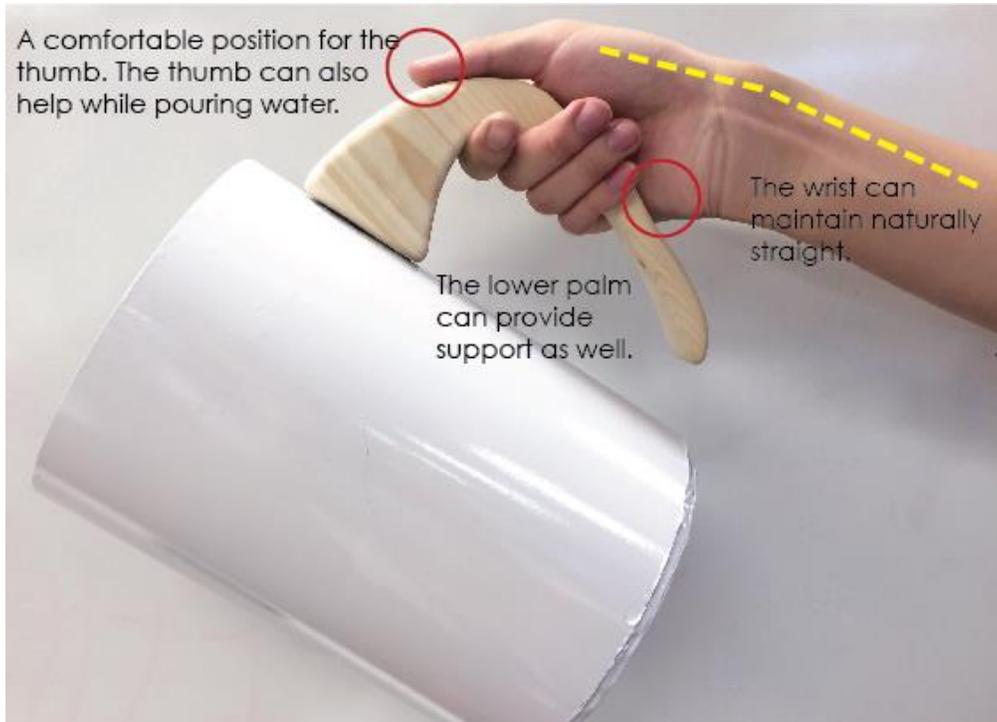


Figure 52, Pouring position

Testing results:

- **Positive:** According to the test, several positive parts have been mentioned:

1. The curve of the handle allows the palm to provide support for either holding the teapot or pouring water.

2. The thumb can also maintain a comfortable position.

3. This testing model communicates well with users.

4. The grip axis is 3.2in which is good for holding and maximizes grip strength (Greenberg & Chaffin, 1977).

- **Negative:** The testing model showed the positive part of this concept, while the testers have mentioned some points that can be improved:

1. The upper front part of the handle (as shown in figure 53) is too long, which means the distance between the body and the holding area not to be appropriate.

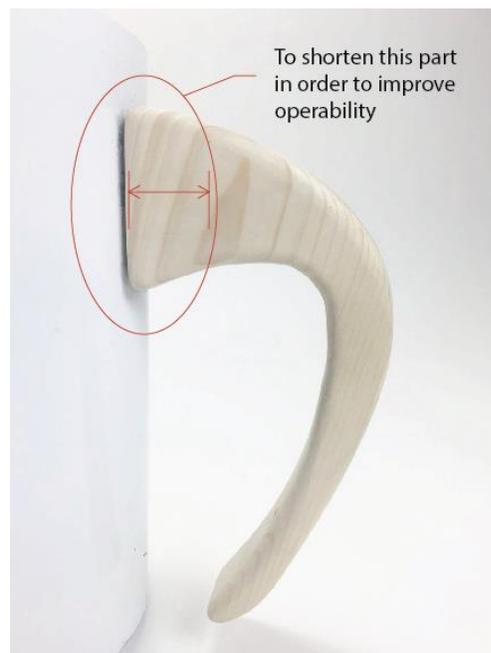


Figure 53, Negative part of the testing handle-1

2. The thumb holding area can be moved up (Figure 54), in order to create a better user experience.

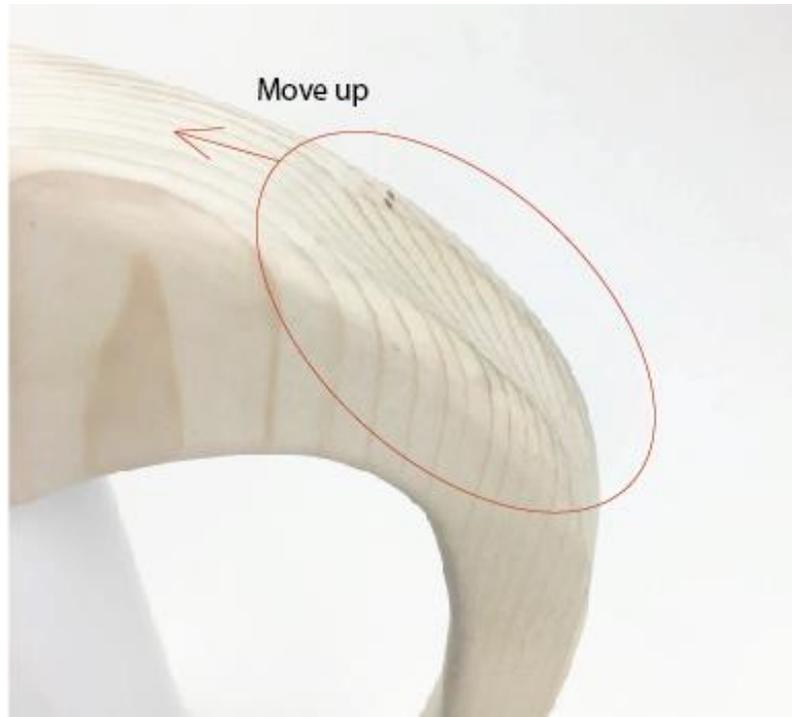


Figure 54, Negative part of the testing handle-2

- Evaluate the testing result with the checklist.

For improving the concept, the checklist is used to evaluate this test and development process (as shown below). (Figure 55)

Test modle		Scoring System
Checkpoints		
Effective to use	●	0
Communicate	●	2
Operability	●	0
Safety	●	2
Ergonomic factors with hand	●	1
Ergonomic factors with wrist	●	1
Ergonomic factors with thumb	●	2
Ergonomic factors with handle	●	2
Good for women and left hand user	●	2
Major feature works efficiently	●	2
Physio-pleasure	●	0
Amount	8 ● 3 ●	14

● Achieved
● Unmatched
● Need to be improved in next step

0 Need to be evaluate in next step
1 Achieved
2 Well Achieved

Figure 55, Checklist evaluate chart - step 3

- **The “4th D”: Decide**

The 4th step in the Checklist Part 2 is to measure how well the final solution has achieved the requirements. During this step, a final CAD model will be evaluated by the checklist step 4 (Figure 56).

04 Decide

Checklist
Meet requirements
Communicate

Measurement of how well the performance solution achieved the objectives

- Major features works efficiently
- Operability
- Effective to use
- Communicate
- Storage
- Cleaning
- Safety
- Durability
- Ergonomic factors with hand
- Ergonomic factors with thumb
- Ergonomic factors with wrist
- Ergonomic factors with handles
- Remember Women and left-hand
- Visual domain
- Aesthetic curves
- Visual color perception
- Materials
- Physio-pleasure
- Sociol-pleasure
- Ideo-pleasure

Figure 56, Checklist Part 2 – Step 4

The CAD model was developed from the final sketch (Figure 47) and has been modified according to the testing result of the mock-up model. The tea mug and tea infuser were also included in this part. (Figure 57)



Figure 57, Teapot set: teapot, tea mug, tea infuser

This final CAD model is the result of the testing model and analyzing data from the research of existing products. The modified handle should be more comfortable for holding and pouring. The tea mugs share the same design features with the teapot, as well as the tea infuser. More details are given as below (Figure 58- Figure 61). This teapot set can provide a good opportunity for a 2-3 person social event.



Figure 58, Candle warmer and the tea infuser

The candle warmer can maintain appropriate temperature for the tea in order to create the opportunity for users to better enjoy their social activity. The tea infuser can avoid the tea being over-cooked.



Figure 59, The exploded view of the teapot

The two pieces of the outside shell will be made of ABS which is light but durable. The pot will be made of double layered glass. The double layered glass can help the tea keep warm and will not be too hot for people to touch. The candle warmer will be made of ceramic. The ceramic will not melt because of heat from the candle flame.

This step of the design will also be evaluated by analyzing the checklist. The evaluation form is given below (Figure 62):

Score	-2	-1	0	1	2
Status	Unmatched	Almost Achieved	Need to be evaluate in next step	Achieved	Well Achieved
Checkpoints					
Effective to use					
Communicate					
Storage					
Safety					
Ergonomic factors with hand					
Ergonomic factors with wrist					
Ergonomic factors with thumb					
Ergonomic factors with handle					
Good for women and left hand user					
Visual domain					
Aesthetic curves					
Physio-pleasure					
Social-pleasure					
Ideo-pleasure					
Operability					
Major feature works efficiently					
Cleaning					
Durability					
Materials					
Visual color					



Figure 62, Checklist evaluate chart-step 4

According to the checklist evaluation chart (Figure 62), 17 checkpoints have been achieved (Green area in Figure 62). Due to the lack of glass making equipment in school, three checkpoints still need to be studied in the future (Yellow area in Figure 62).

Chapter 5

Conclusions and further development

5.1 Conclusion

This thesis aims to develop a checklist contributing to creating gratifying manual kitchen products. The statistics from the Bureau of Labor Statistics has shown the importance of kitchen tools in people's everyday lives. The main idea of this checklist is to improve the user experience with manual kitchen products from the physical level to the emotional level. Three aspects that have been studied and developed in order to guide and limit the whole checklist development: customer needs, human factors, and Four Pleasure Feelings.

Customer needs significantly affect user experience. They are related to both the functionality and the usability of the product. Designers need to understand the function and the using procedure of the tool. Effective understanding of customer needs can help to create a benchmark that can positively affect the user's feelings.

Human factors are one of the most important aspects of designing pleasing kitchen tools. Manual kitchen tools involve many elements of ergonomic factors with hands (thumb, wrist) and handles. Additionally, aesthetic and materials also contribute to user experience. Designers should consider these aspects while designing manual kitchen tools.

The Four Pleasure Feelings developed by Dr. Jordan, have summarized the positive emotions into four aspects. Designers should take into account these Four Pleasure Feelings while designing kitchen tools.

5.2 Further developments

This checklist provides designers another choice other than existing design processes. As time goes by, this Pleasurable Design Checklist can be improved by feedbacks from manufacturers and users. Areas of further study involve the development of electronic kitchen products. Besides the main three aspects in this checklist, the user interface should also be considered while designing for electronic kitchen products.

The scope of this study does not include a final working model due to the limitation of the glass model making equipment at school. Further development is needed with a full scale model and a working prototype of the teapot and the tea mug, in order to figure out whether improvements are needed for this design.

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