User Operate Consistency of Experience on Daily Commodities

Wen-Dih Yeh, National Taipei University of Technology-Department of Industrial Design, Taipei, Taiwan, wyeh@ntut.edu.tw.
I-Nung Huang, National Taipei University of Technology. Master Program of Innovation and Design, Taipei, Taiwan, benhuang0825@gmail.com

Abstract

This research expected to innovation designs can develop by more detail user-experience, that also reduce users unfamiliar and depressed; therefore, we investigated that people cognitive process on operated daily commodities, and we planned a tool to analyze users the area of contact and frequency. In experiment, we selected three objects whose size and shape are similar but haven't limited way of operation. After that, we excluded feature of shape and make them consistent. We studied 30 participants response to operation and affordance, and analysis that by qualitative and quantitative. The result showed the participants have consistent posture of grasp, area of contact and way of operation in the same experimental situation; in addition, even the grip are the same, but following different functional parts, users still response a corresponding way of operation. So we suggest that shape only be as one of design factors on simple design style, and not the main factor. Designer should find other design techniques to enhance the user's cognitive operation.

Keywords: Affordance, Perceived affordance, Operation process.

1.Introduction

We will contact continuously various products everyday.A great design not only provided aesthetics and function for people's need but also has to provided users with clearer and easier operation. Even so, "bad design" still full of our life(Norman, 2002). Bad designs couldn't provide users clearer and easier information to operate correctly and directly; hence, that affect users made a negative experience about wrong operation. Those experience will affect determinant in the users' selection of products in future(Slovic, Finucane, Peters, & MacGregor, 2002).Therefore, designer should understand about users habit of operation and consider more detail in operation process. In the light of this, the research based on Affordance(Gibson, 1979) and Perceived Affordance(Norman, 2004) and investigates non limited operation product in life. We aim to observing consistency or inconsistency about users posture of grasp, area of contact and way of operation, when the grips the same but have different function part .the result expected that can provide a new factor of design for improve problems.

2. Literature Review

2.1 Affordance and Perceived Affordance

Design is a creative process that through product, environment and information to satisfy consumer(Cooper & press, 1995). In the process, we need to study the interaction between object and users, and that include designer and users how Interpret "the object". therefore, first of all we have to understand users how to operate product, cognitive processes and possible behavior. And now, also many research studied the topic by affordance(Gibson, 1979) and

perceived Affordance(Norman, 1999, 2004) to developed different perspective. The concept of Affordance was explained people how is way of “direct” reaction on an object. The response doesn’t need to deep thinking processes; in addition, the response of everyone has different result on the same object(Bingham, 2000). But Norman(1999) came up with a different affordance perspective that people’s reaction will according to their experience, culture and skill. Although everyone has different perspective; but they claim have the same result that can help us to improve users process of operation (Gaver, 1991), and related researches confirmed that could effectively connected people’s behavior of cognitive by Affordance (Albrechtsen, Andersen, Bødker, & Pejtersen, 2001; Bingham, 2000). Affordance could explain the process which both user and design object interacted. When user’s aims and object’s affordance come to consistency, user will operate directly and achieve function of the product. But, not only affordance was existence or not, also important thing, the affordance was perceived possibly from people, and how to think the affordance. What is our next step? Most previous researches according either affordance or perceived affordance to studies, but in the case that will combine both to explore cognitive processes that users interact with “experience” and “situation”.

2.2 Operation behavior

Operation behavior was a action which user operated product to achieve function, for example, people grasp the pen to write words, grasp the toothbrush to brush teeths and rotate the cover of bottle to open. We observed behavior can distinguish for three part: (1) posture and area whose people grasp, (2) operation after grasp and (3) the result of operation; however, different the posture of grasp will affect to operation, but correctly grip could assist people to operation more easy. For example, chopsticks was used usually in Asia, but it hasn't consistency the way of operation. Everyone depended on their experience and habit, so have many different way, as fig 1. Although they also can caught food, but strange way will affect their success rate and fluency on operation.

Figure 1: Different posture of grasp about chopsticks

3. Research methods

3.1. Product selection

The research hoped innovative design that can according detail user-experience on operation in daily commodities; therefore, we selected knife, spoon and wrench that have similar size and shape grasp, but have different operation. After than, we exclude feature of shape and make then consistent; as fig 2.

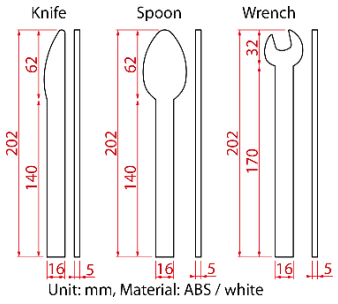


Figure 2: Experimental props dimensions

3.2 Contact frequency

We planned a tool for record users grip area and frequency in operation process in order to explore they have consistent or not, as fig.3. Before users hold props, we have pasted Record Contact Frequency Paper on props, and we used marker pen to markup users grip area in experiment. Finally summed up all of data to analysis.

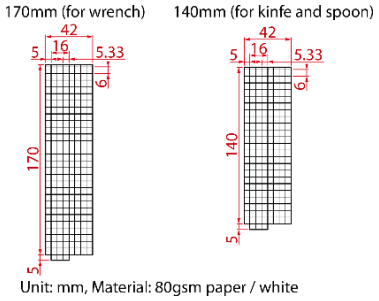
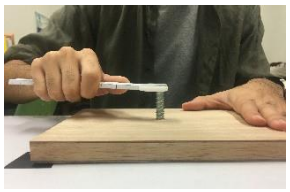


Figure 3: Record contact frequency paper

3.3. Experimental situation

We planned the props that can enhance authenticity of experiment in order to make participants to produce close to real result, as fig 4, we also planned standardized process, as fig 5.

(1) Cutting area (for knife)



(2) Bowl (for spoon)

(3) screw (for wrench)

Figure 4: increase props of situational feeling

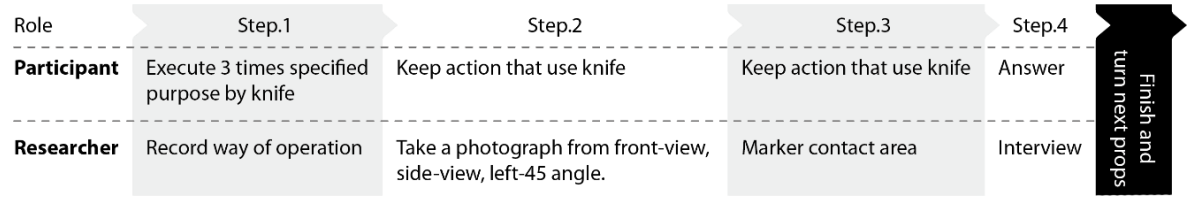


Figure 5: Experimental process

4. Result

We recruited 15 male and 15 female participants by convenience sampling and purposive sampling, and they have to use right-handed; in addition, they have experience by knife, spoon and wrench, but No.11, 17 participants seldom use experience of knife , it lead they have different way of operation with other participants.

We through "Binomial test" to analyze the response of participants were according to "experience" or "situation". Table 1 shows the participants operated knife and spoon mainly according to experience significant more than situation($p<0.01$) that stand for most participants will follow their habit for use knife and spoon. On the contrary, the participants have different decision in operation of wrench, but most people according to situation more than experience. After that, We further analyze detail that users were according "experience" or "situation" in the process of operation by Qualitative analysis. Table 2 show the participants were in grasp posture and operation of knife and spoon, they according to experience more than situation. especially, they were in knife, wrench and spoon of grasp position, and they most according to situation; in addition, they operate knife and spoon according to experience more than situation, but wrench was opposite. The result of table 2 were consistent with the result of table 1. Most participants used knife and spoon according to experience, On the contrary, wrench were according to situation.

Table 1: Participants according to experience or situation to operate, analysis by Binomial test

	According	N	Mean rank	*p*
Knife	Experience	29	49.50	.001*
	Situation	21	5.50	
Wrench	Experience	20	40.00	.197
	Situation	25	80.00	
Spoon	Experience	29	31.50	.034*
	Situation	23	4.50	

*=$p<0.05$

Table2: Participants according to experience or situation to operate, analysis by Qualitative

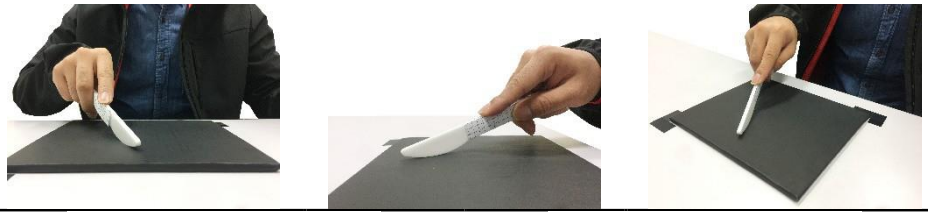
		Grasp posture	Grasp position	Operation
Knife	Z cores	AQE=67.14@	AQE=45.97	AQE=59.00@
		AQS=33.76	AQS=54.93@	AQS=41.90
Wrench		AQE=54.12@	AQE=37.83	AQE=45.97
		AQS=46.79	AQS=63.07@	AQS=54.93@
Spoon		AQE=64.70@	AQE=43.53	AQE=50.86@
		AQS=36.21	AQS=57.37@	AQS=41.90

@=more than other option, AQE=According Quantity of Experience, AQS=According Quantity of Situation

After that, we through Binomial test to analyze frequency which participants contact area of grip, and the statistical results are visualized and combine video data to analysis. As fig6 showed, the darker the color of the square grid, the higher the contact frequency; in addition, the white number was the area of high-frequency($p<0.05$ / significant higher than 50% participants have contact), the black number was the area of medium-frequency($p>0.05$), the red number was the area of low frequency($p<0.05$ / significant lower than 50% participants have contact) and the gray number was the area of non-contact. Fig 7~11 was 3D visual results which analyze participants contact frequency, area and posture about knife, wrench and spoon.

Figure 6: 2D visual result of contact frequency

Posture three view



3D visual result of contact frequency

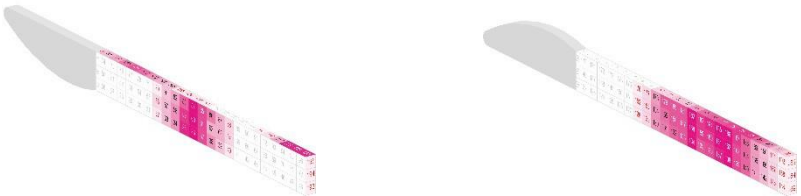


Figure 7: 3D visual result of contact frequency and posture that participants grasp the posture-1 of knife

Posture three view

3D visual result of contact frequency

Figure 8: 3D visual result of contact frequency and posture that participants grasp the posture-2 of knife

Posture three view

3D visual result of contact frequency

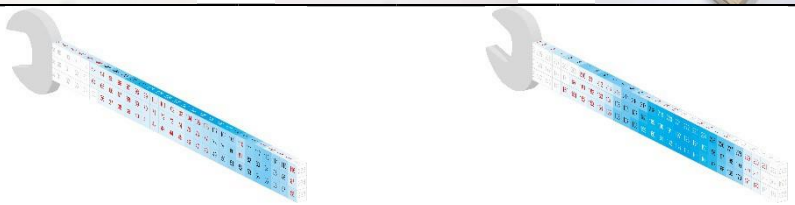


Figure 9: 3D visual result of contact frequency and posture that participants grasp the posture-1 of wrench

Posture three view

3D visual result of contact frequency

Figure 10: 3D visual result of contact frequency and posture that participants grasp the posture-2 of wrench

Posture three view

3D visual result of contact frequency

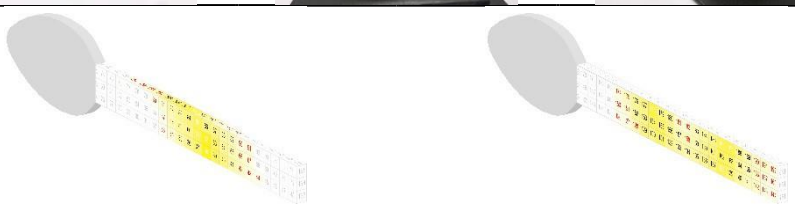


Figure 11: 3D visual result of contact frequency and posture that participants grasp the posture-1 of spoon

5. Conclusion and recommendations

According to analysis results showed participant operated product will rely on interaction both experience and situation, and not only depend on either. But participants rely on the degree with experience or situation, that will be difference with different product. For example, they operated knife and spoon refer to according to experience more than situation, but they operated wrench refer to according to situation more than experience. However, more interesting discovery Even participants have different gender, background, the size of hand, product of non-limited operation, but they operation and the area of grasp come to consistency in the same experimental situation. We suggest that shape only be as one of design factors on simple design style, and not the main factor, because we considered aims more important than shape, it effectively affect their perceived process. Therefore, designer except metaphorical design, the cue of shape, printing icon to create the cue, they can try to a new way. For example, pattern design in product surface, before pattern most use to increase non-slip function. Current productive technique better and better, designer could create many complex patterns on product surface, that can provide great visual effect. But that only focus on aesthtic, we could combine more cue to improve that get more information.

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