

Ergonomics and Lifestyle: The Future Roles of Television Sets in the Chinese Family

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Abstract. With the gradual popularity of television (TV) sets in China in the 1980s. TV sets have become the entertainment center in almost every Chinese family. However, as time changed, intelligent electronics such as smartphones, tablets, laptops provide people with more flexible interaction because of the difference in ergonomics. People are spending more leisure time on these new devices instead of TV sets. For exploring this phenomenon, the paper applied a mixed method. Firstly, a literature review was conducted to understand the development history of the TV set and Chinese family's lifestyle changes over time. Secondly, the questionnaire survey was conducted to collect data about Chinese people's motivations to buy TV sets nowadays. The results aim to define television sets' future roles in the Chinese family and offer reference to TV design based on the ergonomics theory.

Keywords: Ergonomics · Human Factors · Television set · Product semantics · Chinese family · Affordance · Affective design

1 Introduction

Television (TV) sets started to populate in China in the 1980s. It replaced the radio, and the film became the primary source of news and entertainment in every Chinese family [1] [2]. The scene where the whole family gathered to watch TV became a remarkable memory of those generations. With the development of technology, TV set manufacturers never stop fulfilling people's desires. From offering linear viewing to nonlinear viewing to the concept of "custom TV" which means to watch "whatever show you want, at whenever you want, on whatever screen you want" [3]. Digital video recorder (DVR), video on demand (VOD), and videocassette are examples of the attempts on that period. However, the race of pursuing the ultimate goal-"custom TV" has never changed [3].

Time flies; after entering the 21st century, the fourth industrial revolution (Industry 4.0) brought the rapid development of the internet and artificial intelligence [4]. Despite many generations of innovation, the TV program customization dream has long been realized; the invention of many more categories of devices such as the mobile phone and tablet has significantly weakened Chinese families' TV sets' status. What followed is a new way of life [5]. Start from the advent of MP3, MP4. These portable devices became a "third place" between home and the travel destination [6]. Then,

they gradually penetrated into all aspects of people's lives. Family members can enjoy their video by using a tablet or smartphone respectively and sitting in the same room without interrupting each other; they also can work from home and have meetings with colleges everywhere they want. People's communication has changed from face to face to online, and some people even chat online when they are in the same room [6]. However, according to the research "Survey on user behavior and lifestyle of new media video platform" of the Information and Communication Research Center of Fudan University, although people spent more time on these portable devices, TV sets still were essential for every Chinese family [7]. This phenomenon shows that TV sets have become something people firmly believed should be in a family even though they might not use it. The phenomenon is an excellent example for the researcher to study the relationship between function and form.

For exploring the phenomenon, the following question is raised: What is the motivation for people to buy TV sets nowadays? This paper focuses on what elements in these products changed people's lifestyles. The result discussed in the paper intends to offer reference to the future TV design, including the contents of TV and the form of TV sets.

2 Methods

A questionnaire survey was conducted to test the phenomenon discovered from the literature review, and the main motivations of people buying TV sets nowadays were explored. Because the content and TV broadcast methods in different countries are quite different, the study's geographical scope is mainland China and the time scope is November 2020. The Chinese people born and grew up in mainland China had relatively similar education experiences and lived in a relatively steady cultural background; they also watched similar TV programs in the same period.

2.1 Questionnaire Survey

Four hypotheses were constituted to answer the questions: (1) Older people have a higher demand for TV sets than younger people; (2) Married people have a higher demand for TV sets; (3) The closer the relationship with the people one lives with, the higher the demand for TV sets; (4) People are spending more leisure time on portable devices instead of TV sets nowadays; and (5) Although the frequency of people using TV sets is decreasing, people still buying TV sets.

According to the hypotheses, variables were identified to test them. The main variables were: people's age, marital status, living status (live alone, live with others, live with relatives, live with boy/girlfriends); with/without TV sets in residence; the average number of days per week that people using TV set in residence (include watching, playing games, screen mirroring, etc. all the behaviors that using the TV set as a screen for entertaining or accessing information). The questionnaire was conducted to test them. The structure of the question is shown in Fig. 1:

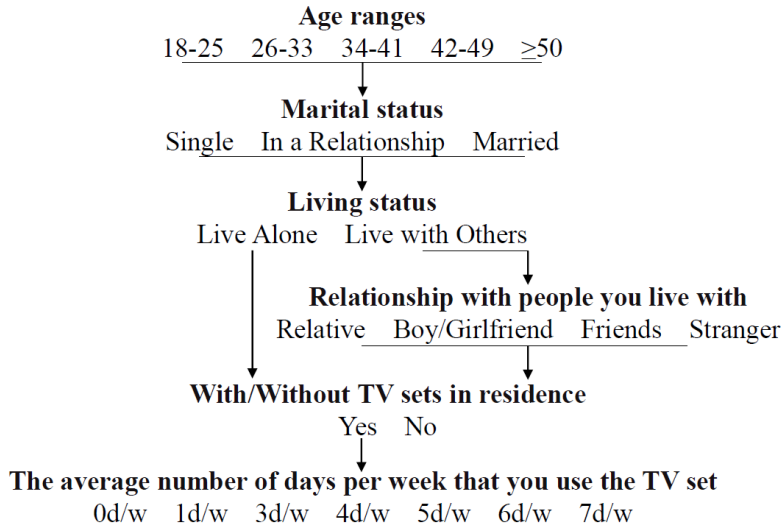


Fig. 1. The structure of questions

The sample people were split into five groups according to their life status in Chinese society. Group 1 to group 4 was equally split. The younger than 18 years old were not considered in this study because they were underage and lacked independent decision-making ability. The ages were classified as Group 1 (18-25 years old), Group 2 (26-33 years old), Group 3 (34-41 years old), Group 4 (42-49 years old), Group 5 (≥ 50 years old). Based on the classified age groups and main variables, the questionnaire survey was passed to 202 participants to test if these groups corresponded to the hypothesis about the variables (essential elements) that influenced people's need for the TV sets.

2.2 Data Analysis

Pearson Chi-Square test was used to test the difference between age groups and with/without TV sets in residence; between age groups and marital status. Fisher's exact test was used to test the difference between living statuses and with/without TV sets in residence; between age groups (0~3 years old, 4~7 years old) and the average number of days per week people use TV sets. All statistical analyses were performed with SPSS V.25, with 2-sided $p < 0.05$ considered statistically significant.

2.3 Results

The basic characteristics of the sample are presented in Table 1. The first insight of table 2 shows that people's rate of has TV sets increases as people's age level increases. It proves hypothesis one: Older people had a higher demand for television than younger people. The second insight shows that age group 2's demanding for TV sets increased by 40.3% from Group 1. Besides this dramatic increase, the demand rate of other age groups was flattening. Table 3 shows that in Group 2, the marriage rate had

improved by 54.4% compared to Group 1, which means Group 2 represented the people who just started their families and were ready to live a stable life. The combination of these two tests' results proved hypothesis two: Married people have a higher demand for TV sets. Table 4 proves hypothesis 3: The closer the relationship with the people one lived with, the higher the demand for TV. Table 5 and 1 show that people having TV sets average spent 0-3 days per week to use TV sets, which was 30.8% higher than people who have TV sets average spent 4-7 days per week to use TV sets. It proved hypothesis 4: People are spending less time on TV sets nowadays.

Table 1. Basic characteristics of the sample

Variables	Frequency (%)
Age (years)	
18-25	54 (26.7%)
26-33	48 (23.8%)
34-41	42 (20.8%)
42-49	24 (11.9%)
≥50	34 (16.9%)
Marital status	
Single	61 (30.2%)
In a relationship	20 (9.9%)
Married	121 (59.9%)
Living status	
Live alone	65 (32.2%)
Live with relatives	86 (42.6%)
Live with boy/girlfriend	13 (6.4%)
Live with friends	35 (17.3%)
Live with strangers	3 (1.5%)
With/without TV sets in residence	
Yes	133 (65.9%)
No	69 (34.2%)
The average number of days per week that people (who has TV set) use the TV set	
0 days/week	32 (15.8%)
1 days/week	24 (11.9%)
2 days/week	16 (7.9%)
3 days/week	15 (7.4%)
4 days/week	8 (4.0%)
5 days/week	9 (4.5%)
6 days/week	2 (1.0%)
7 days/week	27 (13.4%)
Missing	69 (34.2%)
The average number of days per week that people (who has TV set) use the TV set	
0~3 days/week	87 (65.4%)
4~7 days/week	46 (34.6%)

Table 2. The Chi-Square test of age groups and with/without TV sets in residence

Variables	With/without TV sets in residence (%)		Pearson Chi-Square	
	Yes	No	Value	p Value
Age (years)				

18-25	12 (22.2%)	42(77.8%)	77.423 ^a	< 0.001
26-33	30 (62.5%)	18 (37.5%)		
34-41	34 (81.0%)	8 (19.1%)		
42-49	23 (95.8%)	1 (4.2%)		
≥50	34 (100.0%)	0 (0.0%)		

Table 3. The Chi-Square test of the age groups and the marital status

Variables	Marital status			Pearson Chi-Square	
	Single	In a relationship	Married	Value	p Value
Age (years)					
18-25	43 (79.6%)	10 (18.5%)	1 (1.9%)	128.404 ^a	< 0.001
26-33	12 (25.0%)	9 (18.8%)	27 (56.3%)		
34-41	3 (7.1%)	1 (2.4%)	38 (90.5%)		
42-49	1 (4.2%)	0 (0.0%)	23 (95.8%)		
≥50	2 (5.9%)	0 (0.0%)	32 (94.1%)		

Table 4. The Fisher's exact test of living statuses and with/without TV sets in residence

Variables	With/without TV sets in residence (%)		Fisher's exact test	
	Yes	No	Value	p Value
Living status				
Live alone	46 (70.8%)	19 (29.2%)	93.757	< 0.001
Live with relatives	77 (89.5%)	9 (10.5%)		
Live with boy/girlfriends	9 (69.2%)	4 (30.8%)		
Live with friends	1 (2.9%)	34 (97.1%)		
Live with strangers	0 (0.0%)	3 (10.0%)		

Table 5. The Fisher's exact test of the age groups and the average number of days per week people use TV sets (0~3days/week, 4~7days/week)

Variables	The average number of days per week people use TV sets		Fisher's exact test	
	0~3 days/week	4~7 days/week	Value	p Value
Age (years)				
18-25	8 (66.7%)	4 (33.3%)	20.272	< 0.001
26-33	19 (63.3%)	11 (36.7%)		
34-41	25 (73.5%)	9 (26.5%)		
42-49	17(73.9%)	6 (26.1%)		
≥50	18 (52.9%)	16 (47.1%)		

3 Findings and Discussions

3.1 Explore the Lifestyle of Contemporary Chinese from Their Demand for TV Sets

The result of the data and a follow-up interview showed that people's lifestyle was very different according to their age. Group 1 represents the people who have just reached a legal adult's age in China and started their independent life. Some of them were in the university or vocational school; some were new in the work. They grew up in an era with many entertainment choices and accessing news other than TV; compared with other groups, the TV sets had the least affection to them [8]. TV sets had a significant influence during Group 2's and Group 3's entire childhood, and these new devices (smartphones, tablets, and laptops) appeared in their prime life of most receptive to new things. Although they had already adapted to these portable devices, TV sets were still a product that had been considered a must-have in their homes, especially when they established their own families. Groups 4 and 5 were also strongly influenced by TV sets, but they did not very well accept these new devices. Especially people in Group 5 about or already retired from work. They usually had a hard time using these new devices because of aging problems.

Another insight from the research is people's potential needs for interaction, especially when living with those close relatives. In other words, the interaction is a rigid demand for a Chinese family. Therefore, hypothesis 5 that although people's frequency of using TV sets decreased, people (especially those who have families) still buying TV sets were proved.

To further analyze the result of the questionnaire, two concepts must be identified, the TV as the contents (TV programs) and the TV as the physical form. In the big background of digitizing, the development of technology brought humans a more convenient life; on the other hand, this so-called "convenient life" significantly speed up human's life pace. Fragmented information fills in every second of spared time. People get excited by the stimulus of the short videos, articles, microblogs, and much other instant information media [5]. It is impossible to slow down people who already adapt to the pace of this fast world. Therefore the form of portable devices is taking advantage of this era. People can access information immediately. More important is they can watch it without interrupt others; the time of squabbling over the remote-control is long gone. With the help of habit recommendation algorithms, portable devices are much more addictive than the TV set. In this situation, it is evident that TV set no longer the main media for people to reach outside worlds.

3.2 New Perspective to See TV Sets Design

Nowadays, since the TV set, smartphone, tablet, laptop, computer, and many more smart devices share the same content, their essence trend to the same: the medium of contents. Therefore, the thing that distinguished them is their physical forms. In this case, how these forms of these devices changing their function becomes a crucial question. This question is closely related to ergonomics theory. Because the definition of ergonomics or human factors from the International Ergonomics Association is

"the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system and the profession that applies theory to optimize human well-being and overall system performance." [9], these forms can be seen as representers of many different sizes of screens. The different screen sizes can guide users' interactive behaviors when using them [10]. For instance, the smartphone is more suitable for one person to use in terms of its screen size; however, the TV sets more suit for a group of people to watch together. According to these facts above, the design strategy might shift from "form follows function" to "function follows form." At this stage, the design activity becomes to create meaning and intangible value. [11].

3.3 The Future Roles of Television Sets in the Chinese Family

As the principle mentioned above, "function follows form," instead of designing a TV set, understanding what functions should fit in a screen about 40 -70 inches big [11] is more sensible. The three future roles of TV sets in the Chinese family are analyzed below.

Multiplayer Interaction (Family, Friends, Couple). According to the affordance concept proposed by Donald Norman [12], affordance is a combination of objective features and subjective perception features, and these elements form a relationship in the subject's mind. The relatively bigger screen size decided the TV set size screen has the advantage of sharing content with more than two people. The distance between people and the TV set creates a wide range of space. This space is perfect for people to play games, singing songs, and doing other activities together. Besides, family culture is a significant characteristic of the Chinese mainland. People have a strong desire for family activity [13]. Whether the TV's content or form, multiplayer interaction-oriented, including family, friends, and couple, will be an essential design trend.

Decoration. Because TV sets have existed in Chinese families for decades, the TV set's symbolic meaning becomes another critical feature that remains in the TV set. Since the TV set is the center of every living room, and the living room is every home's face, the TV set shows a family's taste and class. Although people are not watching TV a lot lately, the decoration and aesthetic value are still qualified. How to express the target user's values and fit with the living room environment will be critical in the future's TV set design.

The Center of Smart Home. Industrial 4.0 brought many trends to people's lives. More and more products are becoming intelligent, smartphones, smart TV, smart furniture, smart city, and smart home. All these "smart" things are getting connected by which so-called concept: "internet of things." [14] Then, in every home, since the TV set has the chance to take advantage of its status as the "home's center," it might be the window for people to communicate with the smart home in the future. Accordingly, in this scenario, what function should TV sets have and how to interacting with users might increase TV set usage again.

4 Conclusion

The relationship between people and the products surrounding them is closely related. They influence each other and gradually have a deeper connection. The product's symbolic value will appear and permeate its user's lifestyle because of the long-term company. The TV set in this study is one such case. The exploration of the phenomena surrounding the TV set and human (i.e., user) will provide clues to the design of the product's intangible value. Meanwhile, the research of the product's symbolic meaning also attempts to extend the ergonomics theory for further study the relationship between products and user lifestyles.

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