

A Study on Development of the Interface for a Product with Diverse User Expectations

- Focusing on the Kimchi refrigerator in Korea

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Abstract: There is a wide range of user expectations and satisfactions of a Kimchi refrigerator in Korea. This requires a new development system that considers many involved factors such as the environment, habits and experiences of a user. This study is intended to investigate the characteristics of a Kimchi refrigerator and those of its users and to explore and develop an appropriate system for their relations. An examination will be made of usefulness of a Kimchi refrigerator, effectiveness for value, and user's expectations for the product. Further, a new system will be applied to the development of a Kimchi refrigerator interface in order to meet the new needs of users identified in the research results. This study will present an opportunity to predict the possibility to develop an interface that can satisfy the various expectations of a user.

Key words: *Kimchi refrigerator, User Expectation, Interface*

1. Introduction

The Korean Kimchi refrigerator is derived from the old custom that dug a hole and kept a jar of Kimchi in store for the winter. The 'Kimchi refrigerator' is something new one of electric home appliances and has a couple of characteristics from new target to function. Kimchi eaters have a variety of expectations for the taste. The taste of Kimchi demonstrates a housewife's right touch about cooking, and constitutes new cultures (e.g. food culture and value of kitchen culture). Overall, the Korean housewives' needs for Kimchi refrigerator form a keen competition in the domestic market. The research is conducted to understand Kimchi refrigerator and to improve it to useful and effective one at this point of time. Current products that have an interface design of control panel have a lot of limitations due to developer-oriented characteristics.

The research has several purposes: to analyze users' lifestyles, features in human engineering, recognition of interface factors, both physical and emotional characteristics, and the existing designs; to evaluate the convenience of using control panel; and to suggest the most suitable proposal for product- and user-friendly interface.

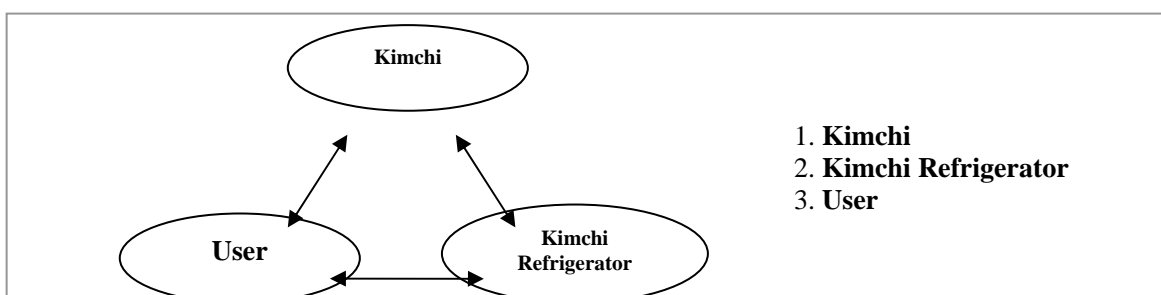


Fig.1 Point factor

2. Method

The research derives a concept model from analysis on housewives' mental model of Kimchi refrigerator and characteristics in human engineering, which is based on data that is collected by interviewing both groups of housewives with and without Kimchi refrigerators for a month.

The research is processed by the following methods: to analyze existing problems about the existing interface design and causes of it; to produce improved interface design (refer to as improved design) as a simulator; and to draw a conclusion figuring out the point of occurring problem in the interface.

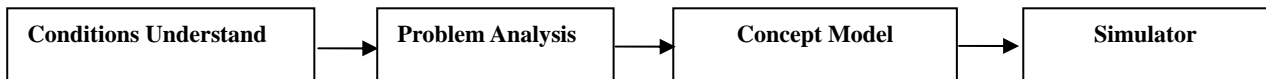


Fig.2 The research is processed by the following methods

3. Understanding of Kimchi, Kimchi Refrigerator, and the User

3.1. Understanding of Kimchi

History

Given the facts that Koreans have been using vegetables and making salt from ancient times, and the era of making fermented foods, such as pickled fishes and soy pastes, we can assume that some kinds of Kimchi have been made since the period of the Three States. Kimchi, Korean traditional fermented food, is stemmed from natural environment, such as distinctive four seasons and long-term winter as well as ancestors' wisdom. Since agriculture has been settled and grain has been a staple food, the Korean has started to eat salty vegetables for nutritional balance. Also, the distinctive four seasons have made Kimchi as one way of storing vegetables in order to prepare for environmental condition. Around the mid of Chosun era when the red pepper became one of spices for Kimchi, the taste of Kimchi became even hotter and the kinds of it were diversified.

Principle

In process of fermentation, the microorganism changes diverse ingredients in Kimchi so that it has its unique taste and nutrition. Once a fermentation of Kimchi is started, its ingredients, including sugar, amino acids, vitamins, and inorganic matters and salt melted in these ingredients react one another. Overall, it helps the microorganism, which is in charge of fermentation in both direct and indirect ways. Various kinds of microorganism use the energy, which is generated from resolving diverse organic matters, including sugar to ferment Kimchi. When the fermentation is under way, the number of general germs and saprogenous bacilli in Kimchi are plummeted but useful lactic ferments that can bear salt without air increase sharply. Consequently, results from lactic ferments' function, including lactic acid, acetic acid, carbon dioxide, and a small amount of alcohol make the distinctive as well as sour taste and flavor. Fermented food Kimchi has the best condition in nutrition aspect, containing a large amount of vitamins when it is matured at the right temperature.

Description

- Seasonal Kimchi

The Korean who live under distinctive four seasons can taste various kinds of Kimchi using diverse vegetables season by season. During long wintertime, the Korean can enjoy eating Baechu (cabbage) Kimchi, Baek (white)

Kimchi, Dongchimi (radish watery Kimchi), and Tongmu (whole-radish) Kimchi. The Korean is used to eating

Hatbaechu (young green cabbage) Kimchi, Minari (parsley) Kimchi, Gat (leaf mustard) Kimchi, Ulgary (winter-grown vegetables) Kimchi during spring; Yeolmu (young radish) Kimchi, cucumber Kimchi, leek Kimchi in summer; and Chonggak (radish) Kimchi, Gaji (eggplant) Kimchi, Gul Kkakdugi (oyster diced-radish Kimchi) in autumn. As what mentioned above, the variety of Kimchi according to seasons is a strong point of Korean Kimchi.

- Regional Kimchi

The temperature between the North and South in Korean peninsula is rather different and further north has longer wintertime than southern part. This climate condition has affected on vegetable growing and marine products so that it has enabled to develop unique Kimchi according to provinces.

9. Jeju Island – Seafood Kimchi, Ear Shell Kimchi

3.2. Understanding of Product (Kimchi Refrigerator)

Principle of Kimchi Refrigerator

The existing refrigerator also can keep Kimchi but it has a limit to turn taste of Kimchi sour in the long term. Together with this, the feature of Kimchi to lay up large stocks at a time brought the necessity of container only for keeping Kimchi. Though Korean eating habits haven't been much changed comparing with the past, Korean residential life has completely changed, including disappearance of garden and occupation of apartment buildings. Therefore, we face the situation that the traditional way of storing Kimchi doesn't work any longer. Because a common refrigerator repeats a process of cooling in a certain time, it causes rather different temperature between inside and outside of refrigerator. Consequently, it usually turns Kimchi sour within a week. The Kimchi refrigerator has developed to solve such a problem. In the case of opening a general refrigerator, it streams down heavy cold air and flows a large amount of warm air in. Accordingly, it takes some time to reach the original temperature by cooling when the door is closed. However, the Kimchi refrigerator prohibits streaming cold air down by consisting of drawer-typed door or opening and shutting of the upper part of it. It is applied a simple principle that the cold air doesn't flow out for it is heavier than warm air.

- Temperature of Storage:

It enables to store fresh Kimchi for about four months, maintains 5 to 7 degrees in the maturing period, and keeps them at the degree of zero for the long run. It can keep fruits and vegetables for more than ten days, maintaining 3 degrees. In case of meat, it keeps up non-frozen condition for more than fifteen days when maintaining the best temperature, which is lower than minus 3 degrees.

- Expansion of Function in the Kimchi Refrigerator

Users prefer to keep vegetables or meat as well as Kimchi and to have a large capacity of Kimchi refrigerator. A variety of functions includes storage and maturation; diversified taste stimulations; system of rhythmical fermentation and taste upkeep (LG 1124); scientific fermentation course (Mando Dimchae); Fermentation of Kimchi at two levels (Samsung Da Mat); and three days cold and four warm fermentation system (Daewoo).

- Trend of large capacity
- Trend of multi functions
- Trend of exclusive design

The Kimchi refrigerator is reflected by the current situation that problem in storing Kimchi became an issue because apartment houses are the most common residential form these days. Moreover, it has been backed by housewives so that it has formed W400 billion-scaled-market by selling 0.6 million units in the year of 2000 that is only two years passed since its introduction. The Kimchi refrigerator is not only an electric home appliance for keeping Kimchi but also becoming an essential part of home appliances.

Comprehension of Market for the Kimchi Refrigerator

Target: Changing from the 30s-40s to the 50s-60s because of maturing period of the Kimchi refrigerator.

Purchasing season: The sales of Kimchi refrigerators reached 1.4 million units this year, increased from 1.2 million units the previous year. Seventy percent of the total sales were attained in November and December (There is another analysis that sales in the fourth-quarter occupied more than 40 percent of the whole).

The Kimchi refrigerator is the best idea item in the end of 1990s and it is still marketable due to 40 percent of rate of use.

Differentiation strategy in three companies:

1. Samsung: Launched an expensive brand named Hauzen and proceed so called luxury strategy, maintaining 30 percent more expensive than the existing products.
2. Mando: Claim its exclusive technology, resulted from 10-year-long research on 1 million cabbages by the Winia Kimchi laboratory and produce 100 percent for itself.
3. LG: After establishing a research institute for Kimchi, Conduct research and develop technology on natural taste of Kimchi, affiliating with 'Chonggazip' Kimchi.

3.3. Understanding of Consumers' Characteristics

Consumers' purpose (people want to eat tasty Kimchi) to use the product forms various expectations. Furthermore, the Kimchi refrigerator, resulted from cultural cause is so complicate and various than the old simple jar of Kimchi that just needed to be buried under the ground. Also, it makes users (most of them are housewives) difficult to catch the way to operate because its model isn't that flexible.

4. Discussion

To figure out the problem which is contained in the existing Kimchi refrigerator's UI (ORC Korea research based).

Sensible Attribute

- Research on feeling of operation (feedback, action, reaction)

Feel uncomfortable because it seems uneasy to use operation buttons and complicate LCD panel.

It seems likely to drop some degrees during summer due to there isn't any mention about automatic control of temperature.

It is doubtful whether a variety of contents can be stored simultaneously or not.

- Sensitivity from the external factor and environmental condition

It seems good to have a Kimchi refrigerator even if buying some Kimchi on the market.

There is a possibility that users feel anxious about whether setting an appropriate function or not due to the lack of confirmation.

- Level of satisfaction at the expectation for taste

There is no way to measure the maturity rate of Kimchi.

It would be great if it has an antibiotic function.

It's difficult to use a function of maturity, but it would be perfect that it enhances the level of vitamins, inorganic matters, and lactic ferments.

It is unreliable because a result of maturity function cannot be estimated.

Recognizable Attribute

- How often or do you use the product with confidence?

It is hard to predict the time difference for maturing according to each kind of Kimchi.

It is difficult to estimate the rate of maturity unless to use a function of maturity at first hand.

It is tough to set up the rate of maturity for a certain condition, such as quantity, level of fermentation, and kind of Kimchi.

e.g. In case that maturing Kimchi again when it is taken out in the process of maturity. In case that putting Kimchi that is bought at the market in.

It is hard to predict about setting an appropriate temperature and time of storage according to high, mid, and low levels.

It seems to give a bad influence on the taste of Kimchi in case of stopping a maturity function while using the function.

- First impression of a product and recognition of icons and buttons

In case of lock/unlock button, it is hard to notice its function from the icon.

It is difficult to aware of pushing the lock/unlock button or waiting for 10 seconds in order to set a blinking option in the process of setting up storeroom condition.

It is tough to know that on/off function is operated when pushing the "select storeroom/power" button.

Small and detailed icons are uneasy to distinguish in the long distance.

In case of selecting storage, "high/mid/low" button means the level of cool air, but it is more effective to indicate by length of storage time given the property of storage.

Physical Attribute

- Concern about posture and eyesight while operating

Both movement line and visual moving distance are lengthen and interrupted while operating functions.

It causes an uncomfortable posture while operating, because the LCD is placed on the front.

A picture angle of LCD is too narrow for user to see in an operating posture: Especially the lower part is scarcely to see so that it causes a misconception as if the power is off.

- Luminosity of lighting and diffused reflection

To stare at a LCD panel in the dark for a while makes eyes tired.

If there is a lighting reflection in a LCD panel, it is hard to read the display.

- Feeling to push buttons and feedback while operating

In case of pushing buttons, "tick tick" sound of a tact switch as well as feeling to push are easy.

It doesn't contain a certain function to remind of situation that the door doesn't completely shut.

- Problems on size, height, depth, and plastic container

Feel inconvenient to open a lid of container to check its contents of Kimchi container.
Wish to know the temperature inside.

5. Solution

The Kimchi refrigerator needs to design a certain menu structure for beginners and experts by using a mental model, which meets both eating habits and consumers' needs.

There are beginners in the machine called Kimchi refrigerator, but there are also people who don't know much about the content called Kimchi. Therefore, a simple structure that is easy to understand is suitable for beginners and a one with more diverse functions and operations is fit for experienced people in using a Kimchi refrigerator.

Function Key:

It needs a structural improvement in function that enables users to customize.

Need a concern for beginners and experts

) People who have a lot of knowledge on Kimchi and experience in pickling it

People who have few knowledge on Kimchi and experience in pickling it

) People who have a lot of information on appliance and experience in using it

People who have few information on appliance and experience in using it

Customized

) Based on appliance: automatization and shortcut function

) Based on user: set up in accordance with consumer's preference (condition of Kimchi, storage type of Kimchi, regional Kimchi, seasonal Kimchi, and so on)

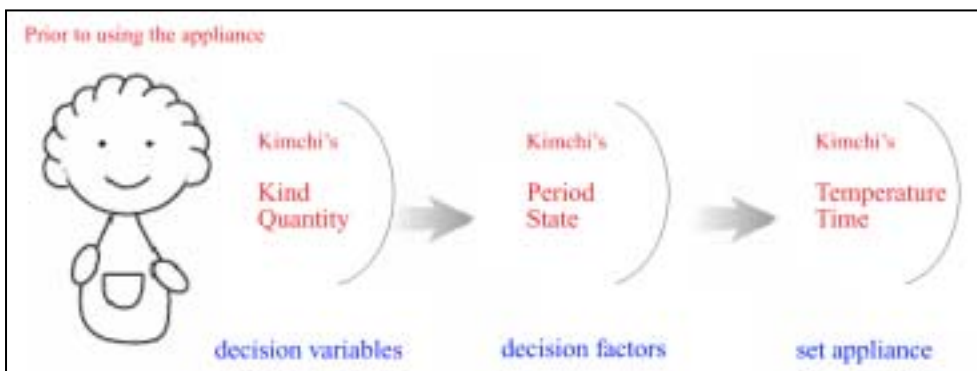


Fig.3 Prior to using the appliance - user's set-up-factors

Prior to using the appliance, several variables and set-up-factors are set through the appliance by user's decision. And a result of it doesn't come immediately, but it takes minimum of 3 days to maximum of 6 months to check it. Thus, it is inevitable to amplify users' anxiety and burden. In case of beginners, such anxiety and uneasiness can be even more magnified so that recommending to use shortcut buttons can be a guide for them.

6. Results and Conclusions

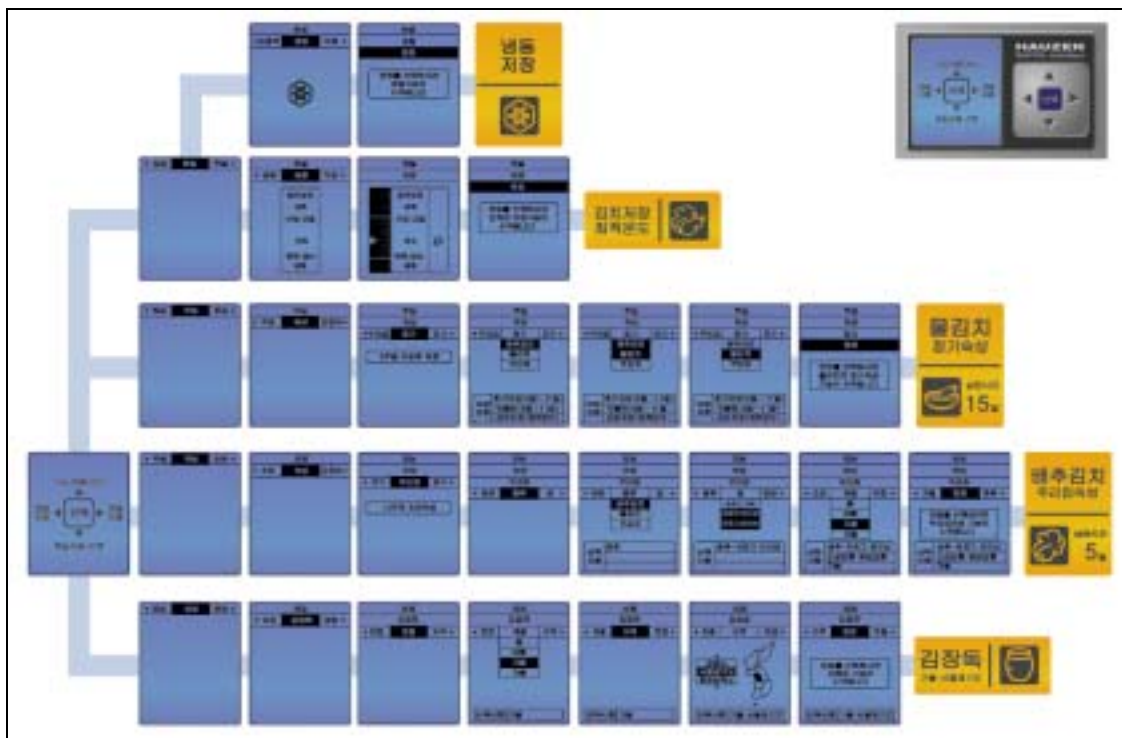
The study modularizes a way of using Kimchi refrigerator into two modes (beginner and expert) with the function structure that enables users to customize. Also, it maps out the usage according to level of users' experience and learning. The modularizing is originated from the viewpoint of variety in electronics. However, consumers have a variety of expectations for contents of electric home appliances instead of machine itself so that

there is a limitation to adjust to a certain category in reality. To customize a setting in accordance with individual taste is for users familiar with the appliance to some extent as well as don't have a burden to it. On the other hand, automatization and shortcut setting based on appliance is for users who are inexperienced in both appliance and Kimchi. The study has advanced only up to the process of producing simulator due to some realistic difficulties (such as availability of controlling temperature variably, required time to conduct a research, and so on) in mass-production. The study makes a conclusion with an expectation that prospective study will introduce many other viewpoints.

Simulator



[Dual Mode- One Touch Mode / Customize Mode]



[Customized Mode - Control Process]

References

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