A qualitative research for enhancing kitchen work experience of family members in Smart Kitchen environment
- Focused on the information inequality between housewife and other family members -

스마트 키친 환경에서의 가족 구성원들의 주방 가사 경험 향상을 위한 질적 연구
- 주부와 가족 구성원 간의 불평등한 정보의 관점에서 -

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Abstract

This study focuses on the kitchen work experiences and its effects on family members, and analyzes the phenomenon 'information inequality' between family members and housewives. In order to approach the phenomenon more systematically, information has been collected and analyzed using the Grounded Theory, one of the qualitative research methods. As a result, three problem factors 'lack of proficiency', 'invisible information', and 'absence of communication' have been drawn. The results of this study suggest that these three problem factors are main predictors of frustrating the participation will of family members, which causes indirect inconveniences for housewives and these have also been found to sustain the information inequality in the kitchen work. Therefore, further research on this issue is necessary for the improvement of kitchen life of the whole family. This study provides a meaningful implications into the neglected area of the kitchen work of family members. The study is based on the in-depth analysis of the 'information inequality' phenomenon between family members and housewives, and reveals the components that can be used in Smart kitchen design in the future.

논문요약

본 연구는 가족 구성원들의 주방 가사 경험에 초점을 맞추어 진행되었다. 가족 구성원과 주부 간에 존재하는 정보 불평등(information inequality) 현상이 현재 가족들의 가사 경험에 어떠한 영향을 미치는지 탐구하고, 장차 실현 될 스마트 키친 환경에서 그들의 경험을 어떻게 개선할 수 있을지 논의하였다. 현상에 체계적으로 접근하기 위해서 질적 연구 방법 중 한가지인 근거이론을 사용하여 정보를 수집, 분석하였으며 그 결과로 정보 불평등을 유발하는 세 가지 문제 요인으로 '경험 미숙', '보이지 않는 정보', '소통 부재'를 도출하였다. 이러한 요인들은 가족 구성원의 참여 의지를 저하하고 주부에게까지 간접적인 불편함을 야기할 뿐 아니라 주방가사에서 정보 불평등을 지속시키며 가족의 가사경험에 부정적인 영향을 미치는 것으로 밝혀졌다. 본 연구는 그 동안 연구 주제로는 등한시되어왔던 가족 구성원의 주방 가사 생활을 조명하였으며, 현상에 대한 심층적인 이해를 바탕으로 향후 스마트 키친 디자인 연구에서 활용될 수 있는 요소들을 발굴해내었다는 점에서 연구의 의의가 있다.

1. Introduction

1-1. Background and Purpose

Today, a kitchen has been recognized as 'a secondary living room', breaking away from an independent space of housewives in the past, and accordingly researches on Smart Kitchen, as a trend for the future kitchens, have been actively conducted(Lee. E., 2004). Although these researches are based upon the premise of 'Open kitchens for the family', there are only few studies on kitchen work experiences of actual family members. According to the social change, family members should be considered as those who participate in kitchen work. and it needs to be taken into account that thorough investigations aiming to provide a sufficient understanding of actual family members' kitchen work experiences and their implicit needs should precede. In this study, family members' kitchen work experience was explored from the perspective of information. Because main people in kitchens are housewives, kitchen work has been activities mainly led by housewives, and thereby kitchen work information inequality between housewives and family members has been taken for granted. From the perspective of a social science field, a negative ripple effect is inherent in the concept of information inequality. As information inequality gets larger, disadvantages taken by alienated groups get bigger, which not only leads to information usage inequality but affects the level of participation of people(Kim, T., 2004). Because family members are information poor and alienated groups for kitchen work, they would be targets of these disadvantages. The information inequality that deteriorates kitchen work experiences of family members, is worth considering as a matter that should be improved in the kitchen that is changing into a central space of families.

This study used a qualitative research method to analyze and understand the phenomenon in depth. Through this analysis, more fundamental understanding of kitchen work experiences of family members who are information poor for kitchen work could be realized, and if this understanding comes to be the basis, opportunity factors that can raise the quality of kitchen work experiences of family members may be excavated.

Existing Smart Kitchen related studies have a weakness in suggesting their design or idea with insufficient understanding of a user's actual experience. Thorough understanding of the user's experience would enable more realistic design and suggest reasonable places where the high technology can be properly used. In this regard, this study intends to add a rich understanding of user experience to draw meaningful implication for future Smart Kitchen design.

1-2. Scope and Methods

This study is conducted by going through five stages, a literature review, pre-interview, in-depth interview, data analysis, and discussion. Things carried out by stages are as follows. First, through a literature review, the information inequality that occurs in the kitchen and the concept of typical information inequality are grasped. Second, in order to set the criteria for selecting research subjects and directions for in-depth interviews, pre-interview is performed targeting family members and housewives. Third, experience data surrounding the information inequality phenomenon is collected by interviewing selected research subjects in depth, and fourth, a systematic analysis is conducted by using collected data through three coding stages. Finally, discussion about implications of this study is conducted comparing it with current Smart Kitchen studies.

2. Theoretical Background

2-1. Smart Kitchen Environment

The kitchen is becoming smarter. The concept of "Smart Kitchen" is basically an environment that allows users to carry out kitchen work conveniently with the support of advanced technology, not just improving the usability of the kitchen from a physical perspective(Ko, Y. et al., 2008). Smart Kitchen covers various technological components such as Networking, Embodied Computing, Context Awareness and Smart Sensor, etc.(Lee, Y., Jung, C.

& Kim, Y., 2005). Using high technology, a number of concepts giving the user enhanced convenience have been accomplished. Although the primary purpose of these smart kitchens is food preparation, they also make the consumer able to perform various other tasks. Computer technology in a kitchen revitalizes the kitchen as a place of learning, communication, and also recreation.(Siio, I., Hamada, R., & Mima, N., 2007; Mechling, L. C., 2008).

The studies related to Smart Kitchen have suggested increasingly varied services focusing on supplying those high technology-based functions.

If the understanding of user experience is preceded, technology will be used more properly in reasonable places.

2-2. Information inequality in kitchen work

The need to investigate family members' experiences from the perspective of the availability of information has been reported in few researches. Sang-ok(2005) indicates that family members frequently lack appropriate information related to kitchen work and, thus, experience inconveniences; one of the most commonly voiced concerns is that they are not aware of the locations of things placed by housewives.

Because kitchens have been considered as spaces of housewives who are housework managers,(Chang, H. & Kim Y., 1998) they have distinctiveness that locational information of things cannot but be produced and managed by housewives who mostly work in there. The spatial aspects. In spite of social changes, housewives still take charge of general housework, and in this structure, relationships between housewives and family members basically make forms of information rich and information poor. In order to deeply understand this information inequality that takes place between housewives and family members, this study tries to consider preceding information inequality researches conducted in other fields.

2-3. Theoretical Concept of Information Inequality

In the information society, the term "Information inequality" means a phenomenon that due to inequality of information access and possession, the social structure gets polarized into information rich and information poor(Schiller, H., 1996). Information poor gets gradually alienated from information more, which brings about bigger information gap(Tichenor, P., Donohue, G. & Olien, C., 1970). The major issues that commonly appeared in most studies were information access, information usage and participation. Min Young(2011) indicates that the gap of information access leads to that of information usage, and in turn, decides the level of participation in the digital economy.(Haywood, T., 1998) Approaching from these three categories is considered useful in that it provides a view to explore information gap or inequality phenomenon of users generally and multi-dimensionally. This study, based on these literatures, considers "Information Access", "Information Usage" and "Participation" (A-U-P stages) as lower dimensions of information inequality, and focusing on these three concepts, tries to examine the information inequality phenomenon in kitchen work.

3. Research Methods

3-1. Purpose and Scope

Because kitchen-related information such as locational information, know-how or knowledge information is difficult to quantify, an empirical study has limitations in analyzing it. Because kitchen related information such as locational information, know-how or knowledge information are difficult to quantify, an empirical study has limitations to analyze them. Thus, this study intends to grasp the phenomenon with an interpretive method through in-depth interviews. The Grounded Theory was used to understand research subjects in depth and analyze the phenomenon systematically, and conclusively, the purpose of this is to determine problem factors and their effects on kitchen work experiences of family members.

3-2. Methodology

The Grounded Theory is a qualitative and inductive methodology developed by Strauss & Corbin, and its purpose is to produce theories related to specific phenomena through a series of systematic processes based on symbolic interactionism. The Grounded Theory is used when concepts appropriate for phenomena are still not identified or incomplete for developing theories(Strauss, A.,& Corbin. J. M., 2000), and it can be considered as a proper approach in this study in that there has been minimal research regarding kitchen work experience of family members, and very little has been done in the direction of information perspective.

3-2. Participants

In this study, according to the theoretical sampling method used in the Grounded Theory, 'family members who have kitchen work participation experiences' and 'full-time housewives' were selected as study subjects. In order to conceive criteria of study subjects and the direction of in-depth interviews, pre-interviews and survey were performed. Although family members showed differences in the level of participation, they tended to commonly sympathize the inconvenience caused by absence of information. It could be found that family members with a high level of participation have a high ability of information acquisition and low frequency of absence of information, but they still experience absence of information compared to housewives. This result shows that although frequency and the degree of absence of information vary with family members, they have no choice but to stay in the position of information poor. Thus, in order to grasp more common phenomena, this study selected family members by intentionally diversifying their ages and level of participation. By conceiving questionnaires based on the pre-interview, in-depth interviews were performed targeting 12 family members and their 12 housewives aged 20s-60s, living in Cheongju-si and Sejong-si.

3-3. Data Collection and Analysis

In this study, in-depth interviews were used to collect data, and the researcher performed face-to-face interviews with 24 participants (12 families) by visiting their houses. For contents that raised doubts during the analysis process after the interview or needed additional data, they were recollected through secondary interviews until theoretical saturation was realized. The recorded data was used as basis data after being transcribed into texts, and it was analyzed and conceptualized by using Strauss & Corbin's constant comparative analysis, and coding. The point of the Grounded Theory is to extract meaningful concepts from the basis data, and analyze and conceptualize it in order, going through open coding, axial coding, and selective coding.

First, during open coding, recorded contents are reviewed by sentence, and meaningful concepts are labeled and categorized. And during axial coding, explanations about phenomena are drawn by recombining the data separated during open coding and examining the relationship. During the process to find out what kind of phenomena took place how, when, why, and where, and what they caused, relationships among categories gradually appear. And the next stage, selective coding, is a process to integrate and elaborate the categories, and during this process, a type analysis on relationships that repeatedly appear among categories based on the core one is conducted.

4. Research Results

4-1. Coding

The in-depth interview data was categorized through decoding and encoding, and the part of open coding is shown in [Table 1]
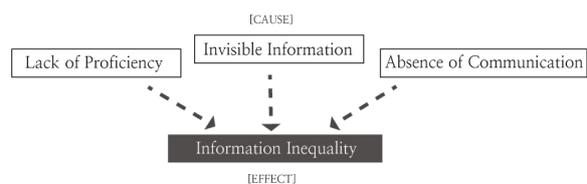
[Table 1] Data Classification and Analysis

Data Classification and Analysis		
Category	Sub category	Concept
Information search	Family member-centered searching	Family members have to explore information by themselves because housewives rarely share information.
	Passive attitude	Family members feel the burden of asking the housewife many times.
		Family members are

Category	Subcategory	Description
		likely to cook within the limits they already know rather than challenge new recipe.
	Information through the media	Family members are not sure whether ingredients or goods are available in their kitchen, which is the actual context.
Invisible information	inherent information of housewife	There is no way to access the housewife's own information without asking.
		Even housewives can forget their own information.
	Spatial characteristics	It is hard to find kitchen items due to the depth of storage spaces.
	Efforts to make items visible	Housewives take out kitchen items that family members often need and put them in open places where they can be easily seen.
Housewife's arrangement	Categorization	Housewives organize and arrange kitchen items by grouping and categorizing them in their own way.
	Preparation for the next kitchen tasks	Housewives believe that they can work more efficiently if things are arranged in a neat and tidy manner.
expert's kitchen work	technical terms	Experienced housewives are likely to use jargon.
	Flexible way of thinking	Housewives use alternatives if they do not find the proper goods.
		Housewives depend on their 'sense' when they do housework and try something they have not handled before.
Amateur's kitchen work	Lack of knowledge	Family members are likely to describe the shape or purpose of items that they need rather than use the proper terms.
	Fear of failure	Family members prefer specific and accurate information.
Communication about kitchen work	Limits of communication	Housewives rarely bring up the topic of housework.
		Housewives consider that family members are not interested in kitchen work.
	Passing on knowledge	Housewives worry about family members' ignorance of kitchen
		work in the case of their absence.
		There is no opportunity to share information because the family doesn't have much time together.
Psychological obstacles	Discouraged will toward participation	Family members are discouraged if they do not know how to do a task or where to find items.
	Anxiety about family members' participation	Housewives consider that family members put the kitchen in disorder.
		housewives have a prejudice that family members 'mess up the kitchen'
Recording information	Record for housewife	Housewives attach memos on the surface that can be seen easily to remind themselves of tasks.
	Record for family	Housewives use labels on items to help the family find easily.

During axial coding, through works to examine causal relationships among categories by recombining keywords, three problem factors causing information inequality were drawn, which are 'lack of proficiency', 'invisible information', and 'absence of communication.' These three factors not only cause information inequality but constantly affect kitchen work experiences of family members and form negative experiences.

[Figure 1] Three problem factors causing information inequality between family members and housewife

'Lack of proficiency' means that family members are poor at housework compared to housewives because they lack of experiences. 'Invisible information' means that it is difficult for family members to reach things hidden in the cupboard or access know-how or knowledge information related to kitchen work because they are housewives' inherent information. 'Absence of communication' means that housewives and family members have no or limited opportunities to communicate each other regarding kitchen work.

Experiential Characteristics of Family members			
	Access	Usage	Participation
Lack of Proficiency	[Descriptive search] -describe shape/purpose -prefer numerical/specific Information	[Inefficient working process] -hard to manage multiple works -feel burden of doubled time	[loss of will to participate] -hesitate about time investment
Invisible information	[Passive Search] -feel lost or bothered -passive in asking questions	[Passive kitchen work] -avoid challenges -rarely progress in kitchen work	[Loss of will to participate] -avoid searching for hidden information
Absence of Communication	[Family member centered search] -explore limitedly -hardly share information	[Kitchen in disorder] -lack of awareness about housewife's arrangement -cause housewife's information absence	[Loss of will to participate] -conflict with housewife

[Table 2] Experiential Characteristics of Family members

4-2. Experiential Characteristics of Family Members

Considering the effects of the three problem factors examined from the A-U-P aspect on information experiences of family members, experiential characteristics of family members can be explained as follows.

4-2-1. "Information Access" Stage

Because family members lack of housework experiences, their information access method is different from that of housewives. It could be found that generally family members have little knowledge about technical terms related to cooking, ingredient or kitchen utensil names, and they tend to describe the shapes or uses of tools rather than use their names during the process of exploring information. And because they do not have a 'sense' that housewives have by experiences, they seek numerical and specific information rather than ambiguous one.

What family members with a low level of participation commonly mentioned was 'feeling lost'. They have to find out from what they should start and where the needed information is. Although they can gain recipes from the internet or books, they need to know locational information of things to cook in the kitchen, but this kind of information is hidden from family members because only housewives produce and manage it. It was shown that family members are 'bothered' by the process of searching this invisible information, and tend to be passive in asking housewives.

Due to absence of communication, information acquisition of family members is limited. Usually housewives have almost no opportunity to communicate with family members about kitchen work, and because housewives can rarely share their tacit information, family members, information poor, have to explore information by themselves. Therefore the opportunities for learning information are so limited although there exist needs for sharing housewife's tacit information such as know-hows or accumulated knowledge, and actual information such as situational or locational information.

4-2-2. "Information Usage" Stage

Family members lack of information such as know-hows because they lack of experiences, which makes housework inefficient. The difficulties appear especially when there are multiple works. While housewives know well about the sequence of works to be done, family members lack of considering that sequence, so it is hard to carry out the works systematically. So they come to do the works inefficiently, and the delayed time intensifies the burden of family members.

Because most of the kitchen information is produced and managed by housewives and invisible, even the family members with a high level of participation tend to feel bothered to ask housewives and try to 'do only things that they have done before', showing passive attitudes. And because things that can be done through passive information searching are limited, development of their experiences cannot be realized much.

Moreover, because locational information produced by housewives is not shared well, family members lack of the order of housewives. Thus,

they easily break order of housewives, and this disorder causes absence of information for housewives, all the more. It could be learned that many housewives have a prejudice that family members just 'mess up the kitchen'.

4-2-3. "Participation" Stage

These elements examined from the aspects of information access and usage drastically deteriorate wills of family members. Most of all, delay of time taken for kitchen work due to lack of proficiency works as a huge burden for family members and thereby becomes a cause that makes them avoid participating in the kitchen. 'Invisible information' makes family members passive in accessing information, because they lose their wills to participate when they get in the kitchen, feeling 'lost' and 'bothered'. 'Absence of communication' not only brings about information gap for family members but causes absence of information for housewives due to corresponding disorder in the kitchen. Thus, housewives come to have a negative recognition on kitchen participation of family members, which again has a negative effect on kitchen participation of family members.

5. Conclusions

5-1. Result Summary and Discussion

Through the analysis of the information inequality between housewives and family members, this study has drawn three problem factors, "lack of proficiency","invisible information" and "absence of communication". It has examined how these factors influence the kitchen work experiences of family members. The effects caused by these three problem factors can be summarized and structured, as shown in [Figure 2], according to the A-U-P stage . Information inequality is the

significant factor that should be improved for advanced kitchen experiences of both the housewife and other family members. This study indicates that the key to improvement is the "Smart Kitchen" environment. The implications were drawn based on the research result as improvement contributions for enhancing the family members' kitchen experience by relieving the absence of information.
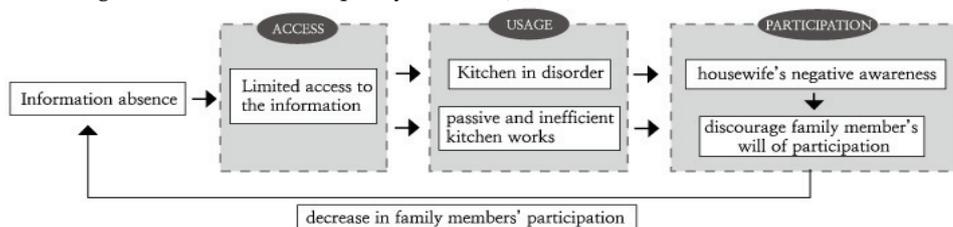
1. Information combining know-how elements:

Through research, the efficiency of kitchen work was revealed as a factor that has a tremendous effect on family members' participation. Family members' inefficiency in kitchen work comes from their lack of proficiency. The attempts of current Smart Kitchen studies would be helpful for their kitchen work because the information such as recipe or its sequence of steps is indicated in a computing-based environment. However, it is limited in that such information is just fragmentarily shown inducing user's imitating(Siio, I., Hamada, R., & Mima, N., 2007; Hashimoto, A., et al. , 2008). The key to housewives' efficient working is know-how, which is accumulated learning by experience(Garud, R., 1997). "Know-how" includes efficient skill, multitasking, practical ability and flexibility. Family members lack this know-how, but their inefficient working would be improved by acquiring the developed information combined with know-how elements.

They would be able to acquire "real skill" by experiencing know-how indirectly. This study intends user to be more conative and active in kitchen work rather than remaining passive.

2. Interfacial elements motivating user:

This study revealed the considerable proportion of family members' information absence occurs due

[Figure 2] Circular Structure of the Information inequality between family members and housewife

to hidden objects organized by housewife. Several studies are already exists in which the locations of objects in cabinets are identified and tracked using an RFID tag(Amutha, K. P., Sethukkarasi, C. & Pitchiah, R., 2012). Our research result gives further insight to awareness of location of objects. Organization has been drawn as a main factor causing conflicts between housewife and family members. Organizing after using things is profoundly linked to one's motive not only to perception of locational information. In this regard, the interfacial aspect also needs to be considered to spur users' motives. The concept of "Affordance" could be adopted here. The location-based technology combining such interfacial elements would prevent latent conflicts in an interesting way.

3. Management & sharing tacit information :

The needs of sharing housewives' tacit information were found in both groups of housewives and other family members. Current Smart Kitchen studies also covered sharing information, but those have been limited to recipe sharing."Tacit information" includes the housewife's own know-how or kitchen-related information that only she knows. Given the particularity of that information, a different method than that of recipe sharing should be considered. In particular, the contextual information, such as their own kitchen-related information, would need the assistance of contextual elements in technological ways to create better communication. Designing efficient and specific ways of management of tacit information is necessary. With management, sharing such information with family members also must be considered. Facilitating housewives' tacit information into explicit would be enable the construction of richer kitchen information by adding one's unique knowledge and hidden information, and enable other family members to feel more friendly toward kitchen work by demolishing the barrier of hidden information.

The components drawn above can be applied to contents design or system design. Through this study, the approach was attempted to identify the fundamental problem factors based on the contextual understanding. As a result, meaningful implications that could improve the problem factors by being applied to future Smart Kitchen design were drawn.

5-2. Limitations and Future Studies

The limitation of this study in the methodological aspect is that while typical researches related to information inequality analyzed and proved factors with empirical methods, this study used a qualitative method analyzing factors depending on statements of individuals, which could raise problems in the empirical aspect. The implications were also suggested in a broad way rather than specific.

Therefore as future studies, each potential implication that was suggested will be studied and examined in detail. Those implications will be more concrete and specific through application study. Specific scenarios for Smart kitchen would be suggested with application plans.

This study is valuable in that there have been no design researches on kitchen work experiences of family members in information perspective. The result of study revealed the potential of improving the fundamental problem factors causing information inequality in Smart kitchen environment and opening up the opportunity for family members to more actively participate in kitchen work. Furthermore, given that the absence of information for family members leads to the inconvenience of housewives, improving the information inequality is expected to have a positive effect on the housework lives of housewives as well.

It is expected, through this study, that more design researches focusing on family members will be conducted in the future so that the quality of housework experiences of family members as well as housewives can be improved one step further.

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