

# Interactive Design of the Shopping Process Using User Experience in the Food Section of Supermarket

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**Abstract** - The design of supermarkets in Korea is uniform, and the competition between supermarkets is mainly a price war. The purpose of this study is to combine interaction design concepts to suggest improvements to supermarkets and create a better user experience. Firstly, the theory of supermarkets, the current situation of hypermarkets, interaction design, and persona is summarized through literature research. Then an observational survey was conducted on the user characteristics and behaviors of supermarkets, etc., and a 5-point Likert scale was used to analyze the user experience satisfaction at each behavioral stage. Based on the observation results, a middle-aged female teacher was set as a persona, and the user experience analysis was conducted for each of the three cases through the six elements of interaction design to find out the inconvenience and problems of the users in the food section of the supermarket. In the conclusion section, a proposal is made based on the results of the analysis through the six elements of interaction design. In future research, the interaction design study will include the analysis of relevant aspects of the self-checkout system. We have high hopes for the application and development of interaction design in supermarkets.

**Keywords:** Interactive Design, Food Section, Supermarket, Shopping Process

## 1. Introduction

Today, with the development of online shopping, supermarkets are facing a crisis. Supermarkets, which once occupied the strongest position in the distribution industry, had a crisis two years ago. Although shopping at hypermarkets allows customers to visualize the quality of products, from the consumer's point of view, shopping at hypermarkets requires more time and physical effort than shopping online.

The design of Supermarkets in Korea is still the same as before, especially the design of the top 3 supermarkets in Korea is uniform. The competition among them is more of a price war and not concerned with user-centered design. Supermarkets should identify problems from the perspective of interaction design through user experience and develop supermarket design solutions that meet modern user preferences. Therefore, the purpose of this study is to make suggestions for improving the user experience of supermarkets, combined with the concept of interaction design to improve hypermarkets so that customers feel more convenient and satisfied when shopping in the food section of supermarkets. The food section with the largest proportion of sales (60.5%) in each product group in the supermarket was selected using June 2020 as the base year. [1] The entrances and exits and food sections of E-Mart, Homeplus, and Lotte Mart were used for this study. The script was written using Persona's method to analyze the user experience of the assembled users in each case space, discover the problems in the experience, and propose directions for improvement.

## 2. Theoretical Background

### 2.1. Concept of Supermarket

As a store with a total floor area of more than 3,000 m<sup>2</sup>, the legal term is a large-scale store. If the total floor area is less than 3,000 m<sup>2</sup>, it is called a semi-large store. In 1993, Shinsegae opened its first store in Chang-dong, Dobong-gu,

Seoul, E-Mart decorated the store atmosphere close to that of a department store with the slogan of a Korean-style supermarket, unlike other foreign discount stores, and presented a model of a Korean-type supermarket.

The food section is mainly composed of food items, and includes daily necessities such as daily groceries. In terms of its form, compared with the form of independent stores, it is mainly in the form of sales. The order of commodity composition is the first batch of food (green fruits, vegetables, fresh fish, refined meat), ordinary food (grains, noodles, processed food, etc.), cookies etc.

## 2.2. The Current State of Supermarket

In recent years, the sales volume of hypermarkets has continued to decrease. In a situation where online shopping is developing rapidly, hypermarkets are facing a crisis.

Table 1: Sales composition ratio (%) of each company in 2019 and the first half of 2020.

Year	Large Mart	Department Store	Convenience store	SSM	Online circulation	Total operating revenues
2019	20.0%	17.9%	16.9%	4.4%	40.9%	100.0%
2020	18.2%	14.8%	16.6%	4.0%	4.0%	100.0%

Sales at large supermarkets have been decreasing in recent years. With the rapid development of online shopping, large supermarkets are facing a crisis. As shown in Table 1[2], the current sales composition ratio of large supermarkets is decreasing, and the crisis of large supermarkets is also reflected in the performance.

E-Mart (2018) hit an "earnings shock" level of performance in the fourth quarter of last year. Both sales and operating profit decreased. Operating profit was KRW 61.5 billion, down 58.9% from the fourth quarter of 2017. Among offline stores, sales at existing stores that can be compared with the previous year (2018) decreased by 7.4%. This isn't just a crisis of availability. The performance of Homeplus and Lotte Mart, which ranked second and third, also languished. Lotte Mart plans to organize 16 stores this year. The number of Lotte Mart domestic stores, which were 125 at the end of last year, will be reduced to 109 by the end of the year. Homeplus also began to sell stores, etc., and began to downsize.[3]

Table 2: Proportion of sales of supermarkets by age group in 2019 (%).

Age	Under 20s	20s	30s	40s	50s	60s of age or older	Total
The proportion of	0.1%	5.8%	24.3%	32.8%	24.8%	12.2%	100.0%

Consumers using hypermarkets are getting older, according to the Chain Store Association. The proportion of customers in their 20s and 40s is decreasing, and the proportion of customers over 50 is increasing. The average age of hypermarket customers is rising. As can be seen in Table 2[4], the majority of customers in supermarkets are middle-aged adults.

## 2.3. Concepts and Components of Interaction Design

Interaction design is the interaction between people and products, people and people, and people and the environment. That is, the user sends a signal to the service or product, and after the product receives the signal, feedback is given to the user. It values the experience achieved when users interact with products or services and aims for users to use products or services efficiently and happily. Interaction design in space refers to designing a space where humans and spaces interact and various technologies lead to user reactions and various situations according to specific purposes, thereby becoming one with the space and allowing users to immerse themselves in the environment. [5]

Dan Saffer defined six elements of interaction design: time, space, texture, appearance, movement, and sound. [6] He correlated this with user experience in space and wrote it as shown in Table 3.

Table 3: Interaction Design Components.

Components	Contents	Classification of spaces according to interaction design components	
Motion	Moving, Moving line	-The flow and movement of the shopping process	
Space	Space arrangement	-Space arrangement of the entrance area -Space arrangement of the exit area	-Spatial arrangement of the burial area
Time	Convenience, Speed	-Speed of finding products	-Speed of finding destination
Appearance	Visual interaction	-Visual interaction of the entrance area -Visual interaction of the exit area	-Visual interaction of the burial area
Texture	Tactile interaction	-Push the shopping cart.	-Pick up the product -When counting
Sound	Auditory interaction	-Music	-Sounds of salespeople

This research uses ‘user experience’ and ‘interaction design’ as keywords and conducts related analysis and research.


Kim Se-young(2012) published ‘A Study on Interaction Spatial Design Expression for User Experience-Focused on Digital Media’, about digital media proposing interactive representation features in spaces and spatial plans that create user experiences. Hwang Chae-hyun(2014) published ‘Study on Interaction design for user experience-centered residential space’, and proposed a residential space design that takes user experience as the center and realizes the interaction between users and space. Kim Kyung-tae(2016) published ‘Space Production Characteristics that Reflects Interaction Design Type - Focusing on Digital Media Exhibition Space in Seoul City’. Taking the digital media exhibition space in Seoul as the center, he analyzed how interactive design is expressed in the exhibition space and proposed effective spatial deduction characteristics through application solutions. Seok Ki-won(2018) published ‘A Study on the Characteristics of User Experience through Interaction Behavior in Media Art Space’, by observing examples of interactive exhibition spaces, and analyzing the applicable parts of the exhibition space as experience elements. Jong Ji-Ae(2019) published ‘Visitors' Experience Design Satisfaction in Experience Exhibition Space Based on Interaction Design’, and proposed the investigation of the experience-based exhibition space based on interactive design and the future development direction.

### 3. Methodology

#### 3.1.Site Surveys And Setting Persona Through User Observation Studies

This research adopts Persona methodology. Persona is virtual representatives of real users and are virtual users created based on real data. It is a method of inferring a relationship with a product or service in the form of a scenario by setting a value by combining elements related to the value of a product or service, such as personality or lifestyle, and substituting it for a virtual person. Details are shown in Table 4.

Table 4: Persona.

Name	Kim Nayeon	Work	Teacher	
Gender	Female	Height	160cm	
Age	50	Character	Acute	
Family	Husband, two children, a dog			
Physical Features	I often feel tired and have mild presbyopia, knee pain, and back pain.			
Purpose	Weekend: Go to the supermarket with my husband to buy groceries.			
Background	Because of the move, I have never been to the supermarket near my new home			
Behavior (Script)	Entrance	①Go to the parking lot and then go to the store. ②Push the shopping cart into the supermarket.		
	Shop	③Buy carrots. ④Buy lettuce. ⑤Buy meat. ⑥Buy frozen blueberries. ⑦Buy frozen chicken nuggets. ⑧Going to the bathroom. ⑨Use the tasting corner. ⑩Buy sushi. ⑪Buy soju. ⑫Buy ice cream. ⑬Buy pet treats.		
	Exit	⑭Go to calculate. ⑮Go to the parking lot.		




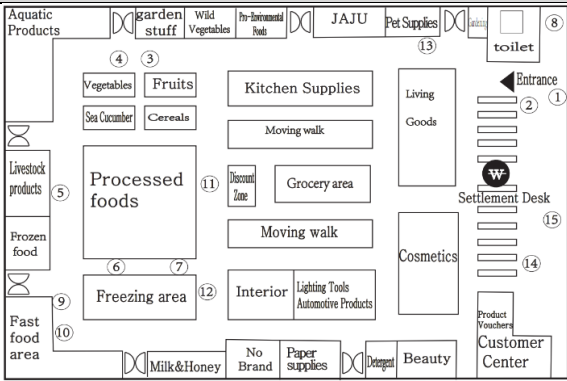
The observations are as follows. Middle-aged women account for the most users in the food section of large supermarkets. Middle-aged women often go shopping with their families in the food section of large supermarkets.

Through the behavior survey, the author observed the various behaviors of middle-aged women in the shopping process of large supermarkets, and divided the shopping process into three stages. In this study, an observational survey was conducted on the characteristics and behaviors of users in large supermarkets from 11:00 am to 5:00 pm, and 5-point Likert scale was used to analyze user experience satisfaction in each behavioral stage. (1: very satisfied - 3: average - 5: very dissatisfied)

### 3.2. Case Analysis




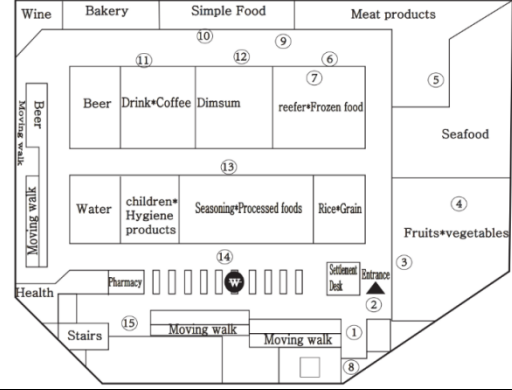
The case analysis results are as follows.(Table 5, Table 6, Table 7)

Table 5: Case-A: E-Mart .

		Case-A: E-Mart (1: Very Satisfactory - 3: Average - 5: Very Unsatisfactory)																				
Analysis Content				Plan- F2																		
	Entrance	Shop	Exit																			
	Building Scale	Mart Scale	Target Space																			
	B1-F7	F2-F3	F2																			
	Location	17 E-Mart Wangsimni Branch, Wangsimni Square, Seongdong-gu, Seoul, Korea																				
		①	②		③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮					
	Very Satisfactory						■															
	Satisfactory		■									■										
Average			■	■									■									
Unsatisfactory						■	■		■		■	■					■		■	■		
Very Unsatisfactory	■							■														
Average	1	4	3	3	5	2	2	1	2	4	2	2	3	2	2							
		Entrance				Shop					Exit											
Interaction Design Characteristics	Motion	-The distance from the car park to the entrance is long and complex.				-The distance from the entrance to the food area is long. -Trouble trying to go to the bathroom during shopping.					-The distance from the food area to the exit is long.											
	Space	-Shopping trolleys and hand-held shopping baskets are displayed on both sides of the entrance. -The shopping trolleys are of a single size. -There is no direct escalator or lift from the parking area to the entrance.				-No space to rest. -There are no shopping carts or hand-held shopping baskets inside the store. -Frozen foods are placed far from the checkout counter and can melt. -The aisles are narrow and can touch other customers.					-When queuing for the checkout, it can be particularly tiring due to the constant standing. -The markings guiding the route are not conspicuous.											
	Time	-Shopping trolleys and baskets can be quickly and easily found at the entrance of the supermarket.				-Some items are not easily accessible when placed at a particularly high or low level. -The font is too small when selecting products,					-Push carts can be stored in the car park but not trolleys.											




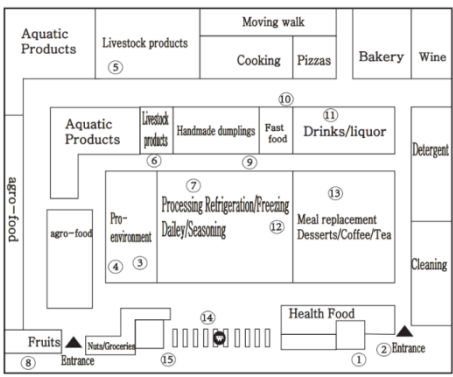
		-There are no signs on the way from the car park to the entrance.	resulting in slow selection.	
Appearance	-The entrance is well-lit and has a good view.	-The height of the floor is appropriate but there are too many posters advertising the products. -The placement of the fake trees creates the impression that the fruit and vegetables are fresh.		-Clean, spacious and bright.
Texture	-The shopping baskets are made of opaque plastic, which is light and protects privacy.	-There are no gloves or clips for selecting frozen goods.		-It is very difficult to put the items purchased one by one at the checkout counter.
Sound	-A friendly greeting from the staff at the entrance of the supermarket will warm you up.	-Overly enthusiastic sales staff can be a burden to the consumer. -Music is played in the store to cheer consumers up.		-The staff is very friendly and helpful when you are being introduced and guided through the checkout.

Table 6: Case-B: Homeplus.

Case-B: Homeplus (1: Very Satisfactory - 3: Average - 5: Very Unsatisfactory)																
Analysis Content																
	Entrance	Shop	Exit													
	Building Scale	Mart Scale	Target Space													
	B2-F9	B1-B2	B2													
	Location	Homeplus Dongdaemun Branch, 133, Cheonho-daero, Dongdaemun-gu, Seoul, Korea														
		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
	Very Satisfactory															
Satisfactory	■	■	■	■					■	■					■	
Average								■			■	■	■			
Unsatisfactory					■	■	■					■				
Very Unsatisfactory																
Average	4	1	4	4	2	2	2	3	4	4	3	2	3	3	4	
Interaction Design Characteristics	Entrance			Shop						Exit						
	Motion	-The path from the car park to the entrance is very short.			-A short distance from the entrance to the food area. -It is a long way to the toilet while shopping.						-It's a short walk from the food area to the exit.					
Space	-Only baskets are placed at the entrance. -The shopping cart is only available in one size. -The lift goes directly from the car park to the entrance.			-No place to rest in the middle of shopping. -Shopping carts and carts were not placed in the outlet. -Frozen food items may melt when paying for them as they are located						-It was tiring to stand while waiting for checkout, but there were no facilities to rely on. -The elevator goes directly to the parking lot. -Pushcarts can be stored in the						

	-There are places to rest while waiting for the lift.	away from the payment area. -Wide aisles.	parking lot but not trolleys.
Time	-It is easy to find the information board on the way to the shop from the car park.	-Some products are placed at the bottom or top and are difficult to find. -When comparing products, the text is small and difficult to identify.	-The signs leading to the parking lot are visible.
Appearance	-The path from the car park to the entrance is dirty and dimly lit.	-The lighting in the corner of the livestock area was a little dim and gave the impression that the meat was not of good quality. -High ceilings and not many posters advertising products give the space a neat feel. -The design of the logo is not conspicuous.	-Clean, spacious, and well-lit.
Texture	-The shopping cart is very transparent and does not allow for privacy.	-No insulated gloves or clips were provided next to the frozen products.	-It is very troublesome and laborious to put the purchased items one by one at the checkout counter.
Sound	-	-Exciting music was played in the shop to increase interest.	-It is very convenient and friendly to be guided by the staff when checking out.

Table 7: Case-C: Lotte Mart.

Case-C: Lotte Mart (1: Very Satisfactory - 3: Average - 5: Very Unsatisfactory)																
Analysis Content				Plan-F4												
	Entrance	Shop	Exit													
	Building Scale	Mart Scale	Target Space													
	B2 - F14	F4-F6	F4													
	Location	214, Wangsan-ro, Dongdaemun-gu, Seoul, Korea														
		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
	Very Satisfactory															
	Satisfactory			■	■											
	Average	■	■							■	■	■		■	■	■
	Unsatisfactory					■	■	■	■				■			
Very Unsatisfactory																
Average	3	3	4	4	2	2	2	2	3	3	3	2	3	3	3	
n Design Character		Entrance			Shop				Exit							
	Motion	-The road from the parking lot to the entrance is very short.			-It is a short walk from the entrance to the food area. -It is far to go to the restroom while shopping.				-It's a short walk from the food area to the exit.							

Space	-Shopping carts and shopping baskets are placed on both sides of the entrance. -The elevator goes from the parking space to the entrance. -There are no chairs to rest while waiting for the elevator.	-There is no resting place during shopping. -Frozen foods do not melt at checkout because they are located close to the payment area. -The aisles are very narrow.	-It was tiring to stand while waiting for the checkout, and there were no facilities to rely on. -The elevator leads directly to the parking lot.
Time	-It is convenient to have shopping carts and shopping baskets in front of the supermarket. -It is difficult to find the guide sign on the way to the entrance from the parking lot to get to the entrance quickly.	-Some products are hard to find because they are placed at the bottom or the top. -When comparing products, the text is small and difficult to identify (slow).	-The sign leading to the parking lot is not obvious.
Appearance	-The path from the parking lot to the store is clean, but the lighting is dim.	-The lighting in the livestock corner is dark, giving the impression that the quality of the meat has dropped. -The lower floor height gives the space a constricted feel. -The design of the logo is not conspicuous. -Lack of signage to help you find your products.	-Clean and well-lit, but the aisle next to the checkout counter is narrow.
Texture	-The shopping cart is transparent to protect privacy.	-No insulated gloves or clips are provided next to frozen products.	-It is very troublesome and laborious to put the purchased items one by one at the checkout counter.
Sound	-	-Play cicadas in the watermelon section to give users a sense of summer and generate interest. -Play moving music in the store.	-It is very convenient and friendly to be guided by the staff during checkout.

User experience satisfaction in each behavioral stage was analyzed by Likert Scale 5. The deviation values of each behavior are as follows. Overall, ①2.67, ②2.67, ③3.67, ④3.67, ⑤3, ⑥2, ⑦2, ⑧2, ⑨3, ⑩3.67, ⑪2.67, ⑫2, ⑬3, ⑭4.67, ⑮5. Satisfaction in the order of exit (2.8) > outlet (2.79) > entrance (2.67) > user satisfaction with exit (2.8).

Table 8: Brief Summary.

	Entrance		Shop										Exit		
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
Total	8	8	11	11	9	6	6	6	9	11	8	6	9	8	9
Average	2.67	2.67	3.67	3.67	3	2	2	2	3	3.67	2.67	2	3	2.67	3
	2.67		2.79										2.8		

#### 4. Conclusion

This study uses Persona to create scenarios to analyze user experience through six interaction design elements to identify the inconvenience and needs felt by users during the supermarket cafeteria shopping process and to make proposals in the direction of improving the interaction design of hypermarkets. The analysis results are summarized as follows.

First, From the "Motion" element, it is important to plan the user's movement line in the space. Reasonable arrangement of the parking lot, entrance, food area, and exit position planning makes the consumer's movement line in the space more fluent. Second, From the element of "Space", it is important to arrange the objects and implementation in the space. For example. The elevator from the parking area directly to the entrance. More than two types of shopping carts are placed in the parking lot, at the entrance, and on the sales floor. Frozen food should be placed near the checkout counter. Set aisle width according to customer flow. The checkout area provides facilities for customers in line to rely on. An

automatic checkout system needs to be developed. Third, The placement of the space in terms of the "time" element affects the speed of arrival and selection of products. Shopping baskets should be prominently placed, signage should be prominent, font size should be adjusted or magnifying glasses should be provided around products, and products should not be placed too high or too low. Fourth, From the "Appearance" element, the visual interaction makes the customer's experience of the space have an important impact. Bright lighting, open space, not too much poster placement. Fifth, Tactile interaction is important from the "Texture" element. Shopping carts can be made of hard plastic, and gloves or clips can be provided near the products. Sixth, The "Sound" element is an auditory interaction that affects the customer experience. Staff greetings and directions at the entrance and exit. The sound of the robins playing in the store, the upbeat music, and the summer atmosphere.

With the development of the information technology era, many large supermarkets are gradually using self-checkout systems, and in the future research, we will add interaction design research and analysis on the aspects related to self-checkout systems. In the future, we will add the interaction design research and analysis on the self-service checkout system. We have high expectation on the application and development of interaction design in supermarkets.

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