

Evaluating the Usability of Size Comparison UI for Online Clothing Shopping Malls

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Abstract

As mobile device usage time increases thanks to the development of information and communication alongside the increase in the spread of smartphones, mobile shopping has become a common trend. While mobile shopping has the advantage of saving both time and money, it may also result in dissatisfaction with product differences after purchase. For online clothing shopping malls, in particular, if the size does not match after purchase, it is difficult for customers to return or exchange the goods. To address this problem, some mobile apparel shipping malls offer a virtual fitting service and a size comparison function; however, the number of such malls remains low. In this paper, a usability evaluation was performed on a mobile apparel shopping mall that provides a size comparison function. The three apps selected for evaluation have different size input methods, and a slightly different method of providing results after comparing the user's dimensions with the dimensions of the clothes to be purchased. In this paper, the evaluators were asked to select clothes at the shopping mall and perform the task of deciding the size of the clothes to be purchased through their own measurements and comparison while also evaluating the effectiveness, meaning, and satisfaction of the apps. Based on the analysis of the results, this paper aims to produce an improvement plan and help design the size comparison UI (User Interface) in the future.

Keywords: *Usability Test, Clothing Shopping Malls, User Interface, HCI*

1. Introduction

With the development of information and communication technology, online shopping continues to increase [1]. According to trends in online shopping reported by the National Statistical Office in July 2020, total transactions exceeded 12 trillion won, an increase of 15.8% from the previous year. The amount of mobile shopping transactions increased by 21.2%, and the amount exceeded 8 trillion won. Among the various methods of online shopping, mobile shopping accounts for a high proportion: 67.8% [2]. This shows that the online shopping environment has now moved to mobile platforms. It is believed that the growth of mobile shopping is due to the increase in the penetration rate of smartphones and the increase in mobile usage time [3].

Mobile shopping can save users' time and costs because searching for products, comparing prices, and making payments can all be performed through a mobile phone anytime and anywhere. On the other hand, since products are viewed and purchased in a virtual space, consumers' dissatisfaction with the product may occur after purchase, and in this case, this may cause issues of returning or exchanging goods [4]. For mobile apparel shopping malls, purchasing clothes based only on the screen image may result in having to return clothes because they may not fit or suit the consumer. In a study on the failure type of online clothing shopping services, the one with a high level of dissatisfaction was that in which the size or fit of the clothes did not match after purchase [5]. This is because the size of clothing products is not standardized, and different size standards are applied for each product type or company. To improve this problem, a virtual fitting service and a size comparison function can be provided in a mobile clothing shopping mall [6]. These features are important because they can help users purchase clothing that suits them and fits well, reducing the process of returns and exchanges. Currently, however, there is only a handful of shopping malls that provide the function of comparing the size of a user's clothes and the size of clothing products in a mobile clothing shopping mall.

Therefore, in this paper, we evaluated the usability of online clothing shopping malls that currently provide a size comparison function, analyzed their strengths and what needs to be improved, and helped design a size comparison function for clothing shopping malls in the future. An online clothing shopping mall that provides a size comparison function was surveyed and three different user interfaces (UIs) for size input method and result provisions were selected as evaluation targets. The usability of the app was evaluated in terms of efficiency, meaningfulness, and satisfaction of the app through which the user can input dimensions either manually or automatically by taking photos of clothes. The body dimensions can also be entered to an avatar.

Chapter 2 introduces research related to online shopping mall usability evaluation, and Chapter 3 describes the design of usability evaluation method for size comparison UI. We analyze the evaluation results in Chapter 4 and summarize the paper in Chapter 5.

2. Related Studies

No studies related to the size comparison of clothing shopping malls were found in the literature review. Thus, this study analyzed studies on the usability evaluation of online shopping malls. In "Deep learning-based product image classification system and its usability evaluation for the O2O shopping mall platform," an automatic classification system for products based on images was realized and the usability was evaluated through questionnaire tests of experimental participants [7]. For the function of automatically classifying shopping mall products, the speed and accuracy were compared and analyzed through a user questionnaire test. As for the speed, the automatic classification system was remarkably fast, and the accuracy confirmed the applicability.

In "A Study on the Service Improvement for Active Senior Customers in the Fourth Industrial Revolution of Fashion -Focused on Usability Evaluation of Home and Shopping Application," usability evaluation was conducted through literature research, user surveys, and in-depth user interviews. Usefulness, usability, and accessibility were evaluated for active senior users. During the in-depth interview, a task providing a usability evaluation was performed, and usability, usability, accessibility, searchability, attractiveness, and flexibility were all then evaluated [8]. The results of the study showed that the usability and flexibility of mobile payments were low.

In "Usability Test of Interaction between Consumers and Seller on SNS Shopping Mall-Focusing on Usefulness, Efficiency and Satisfaction", usability, efficiency, and satisfaction were evaluated [9]. In SNS shopping malls, interactions with sellers play an important role, and it was confirmed that there were

differences by age. In the shopping environment, it was confirmed that the services via direct communication with the seller could be useful and that they provided an efficient shopping environment.

3. Design of an Evaluation Method for Size Comparison UI Usability in Online Clothing Shopping Malls

3.1 Targets for Usability Evaluation

The study surveyed apps that support a size comparison service between the user's body size or clothing size and the online clothing shopping malls. There were a few apps that only measured the user's body or clothing dimensions, but few apps supported the size comparison function in clothing shopping malls. Usability evaluation was conducted for three apps among those which offered size comparison services with different size input methods and UI by which the size data could be entered. The results were provided to the users.

1) Virtusize

Virtusize provides a service that allows customers to compare the size of clothes they already own with the size of clothes they want to buy online[10]. Figure 1 shows the size comparison method of the Virtusize app. The size input is a method of directly entering the length of the top, chest, and arms of clothing that they own, as shown in Figure 1 (a). Next, the users select the clothes they want to purchase at the shopping mall and select the size comparison menu. (c) shows the size comparison result screen. It recommends the size that best fits the customer and shows the difference between the customer's clothing and shopping mall products in 2D images. In the example provided of the top, the difference between the length, chest, and arms is indicated by numbers.

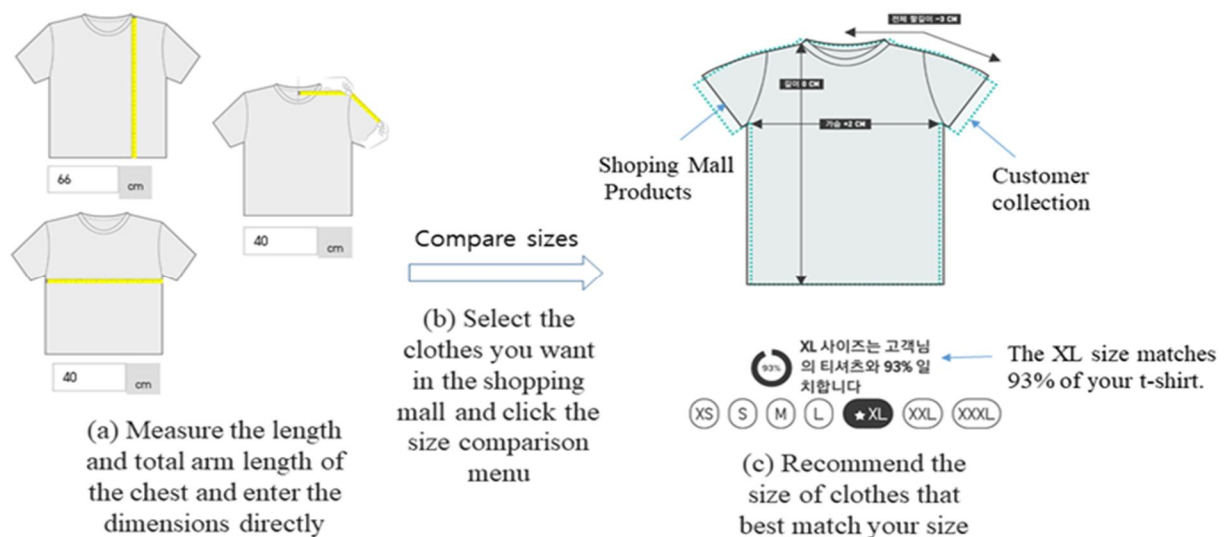


Figure 1. Size comparison service in Virtusize

2) Fitco

Figure 2 shows how Fitco compares the sizes[11]. Figure 2(a) shows fitco's size input method. If the customers take pictures of clothes they usually wear, the size of their clothes is automatically measured. When taking photos of clothes, they need to place a piece of A4 paper next to the clothes. It also provides a function of directly inputting the clothing size as a numerical value. When the size is entered, the customers can shop

for clothes that fit the registered size, and if they click the size comparison menu in (b) after selecting the clothes to purchase, they can see the size comparison results as shown in (c). In the case of the top, the 2D image shows the difference in shoulder width, chest section, total length, and sleeve length.

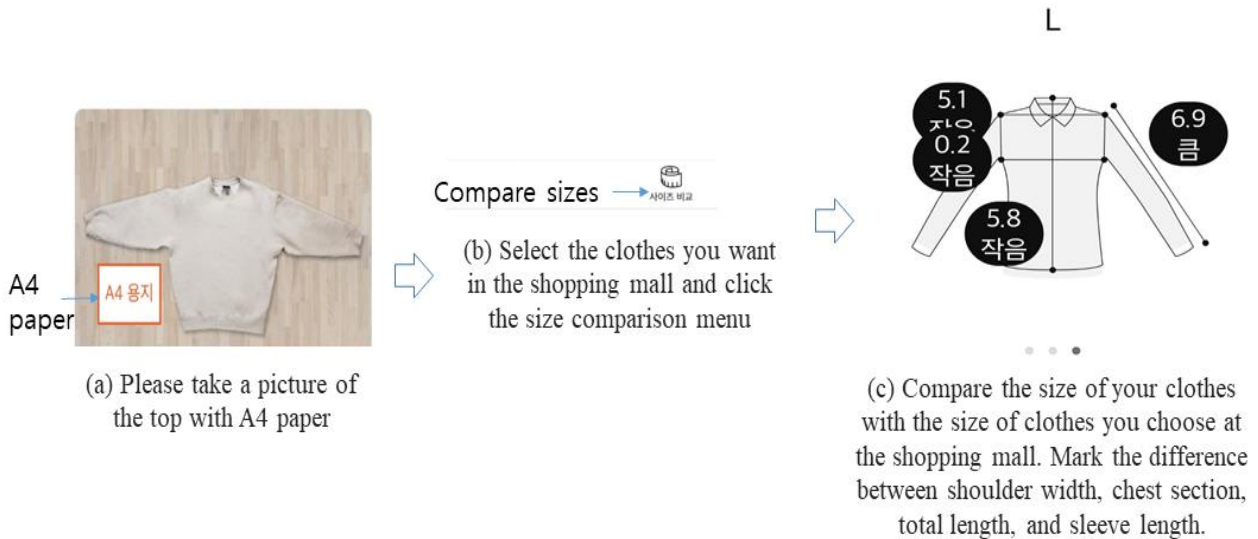


Figure 2. Size comparison service in Fitco

3) Fit'n shop

Fit'n Shop provides a virtual fitting apparel shopping service[12]. Figure 3 shows the size comparison method of Fit'n shop. It provides a service for creating 3D avatars or putting clothes on the image of a customer who has taken a picture. In the (a) screen of Figure 3, the user directly inputs their body size. The user can enter their height, shoulder width, chest circumference, waist circumference, arm length, and leg length. (b) is an example of applying the clothes to be purchased to the avatar. (c) shows the result when a large size is applied.

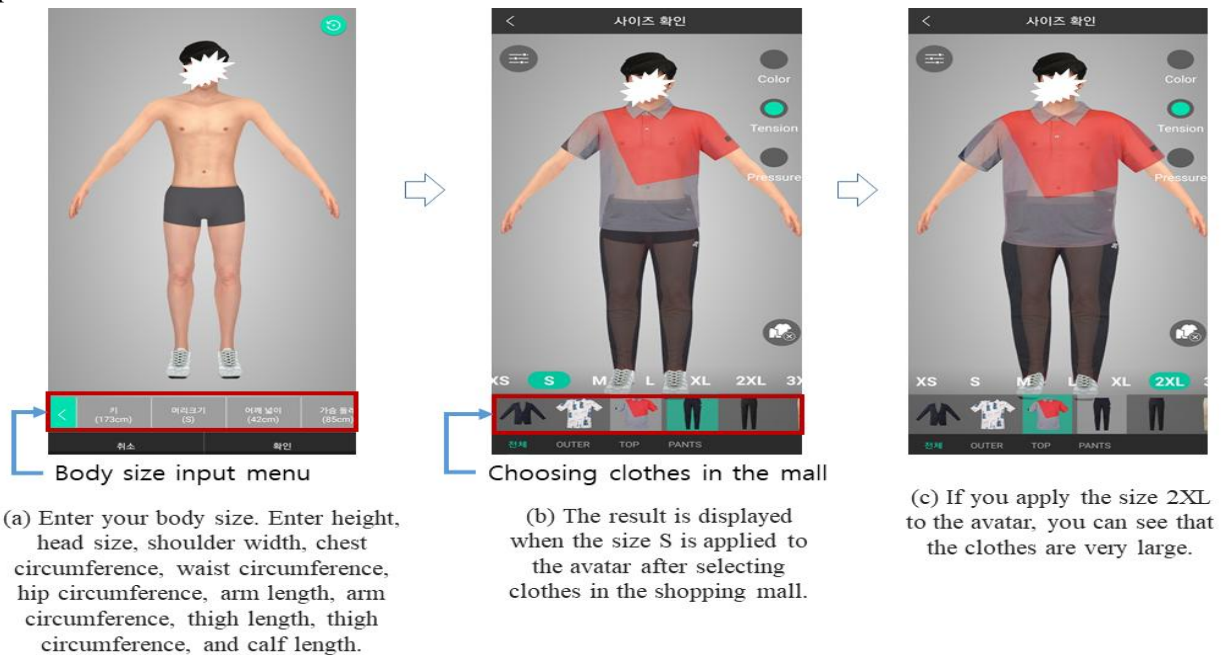


Figure 3. Size comparison service in Fit'n shop

3.2 Design of Usability Evaluation Elements

Table 1 shows the tasks that app users should perform for usability evaluation. The usability evaluation in Table 2 was conducted for the three apps as the usability evaluation was performed in the order shown in Table 1 below. Before the usability evaluation, the customers install three target apps on the smartphone and log-in. Before evaluating the usability, they need to prepare one short-sleeved T-shirt that fits them well, a tape measure for measuring, and a piece of A4 paper. As they progress through the tasks in Table 1, they measure the task execution time. Since the method of entering the size of their body or clothes is different, it requires them to record the time it takes to enter the sizes. After launching the app, the size comparison function allows them to record the time it took to determine the most appropriate size to purchase.

Table 1. Tasks for usability evaluation

- | |
|---|
| 1. Choose an item to purchase at the shopping mall |
| 2. Select size comparison function |
| 3. Enter the customer's clothing size or body size |
| 4. Check the size comparison result and decide which size to purchase |

Table 2 shows the usability evaluation items that users should examine while performing the tasks in Table 1. To evaluate the usability of the size comparison service, efficiency and meaningfulness satisfaction were selected as evaluation factors.

Table 2. Usability evaluation items

Usability evaluation factor	Evaluation item
Efficiency	1. Do you think the time it takes to enter your body size or your clothing size is appropriate?
	2. Do you think the time taken to determine the size to purchase through the size comparison function after running the app is appropriate?
	3. Are you provided the appropriate reaction rate to perform the task?
	4. If a delay of more than a reasonable amount of time is expected, is the user notified of the current speed of progress?
	5. Does the size comparison feature shorten the time it takes to determine the dimensions of the garment you are buying?
Meaningfulness	1. When you first launched the app, was it easy to know which menu to open to enter your body size or your clothes?
	2. Did you easily understand which menu to run to compare your size with the clothes you selected at the shopping mall?
	3. While performing the task, did you spend a lot of time finding the function you wanted?
	4. Was it easy to know how to use the app without a manual or other help in performing the task?
	5. Was it easy to understand the order of menu usage in performing tasks?
	6. When one step of the user's work is done, do they provide feedback so that the next step can be started?
	7. Can you clearly understand the meaning of all the menus and icons?

	8. On the size comparison results screen, did you clearly understand the difference between the clothes you are buying and your dimensions?
Satisfaction	<ol style="list-style-type: none"> 1. Are you generally satisfied with the ability to enter your body size or your clothes? 2. Are you satisfied with the screen after selecting clothes at the shopping mall and comparing them with the size of your body or clothes? 3. Do you think the size comparison feature will help you choose the dimensions of the clothing you are buying? 4. Does the size recommended by the app match the actual dimensions of the clothes you wear? 5. After performing the task, describe the best functions, inconveniences, and points to be improved ()

Efficiency is a factor that evaluates how quickly and simply a user can perform the task he or she wants to carry out. It allows for recording the time it takes to perform the task and evaluate whether it provides an appropriate response speed while performing the task. It also ascertains whether the overall size comparison function shortens the time for users to decide the size of clothing to purchase.

Meaningfulness concerns whether the system provides information or functions that users want to see. Inexperienced users should be able to learn the system easily, and information passed to users should be easily understood. Whether the user can clearly see what menu to operate to perform a task, what functions the menus and icons do, whether the user is not wandering too much to perform the desired function, and whether the user can clearly understand the differences in sizes between the user's own clothing and the clothing that he or she wishes to purchase from the screen that shows the size comparison results.

Satisfaction evaluates the overall user satisfaction with the service and issues to be improved. It examines the function of entering the dimensions of the clothes, the satisfaction with the results of comparing the size of the clothes of the customer with the size of the clothes in the shopping mall, and whether the size recommended by the app matches the size of the actual customer. It then determines and judges those that worked well and those that did not.

4. Analysis of the Evaluation Results

Since the apparel brands provided by the apps to be evaluated are targeting younger people, the study recruited evaluators in their 20s to 40s as these are major buyers for these brands. Ultimately, 11 evaluators performed the usability evaluation. Prior to this evaluation, a survey was conducted where those who had purchased clothing from an online shopping mall were asked to list functions they had used before and felt inconvenient or functions that they would like to add. The results of the survey showed that the size differed by brand name and that it was not easy for them to know sizes online. In addition, some replied that it would be nice to recommend clothes according to current trends. Furthermore, 100% of the evaluators declared that they had no experience in using size comparison apps in mobile clothing shopping malls. Shown in Table 3, Table 4, and Table 5 are the evaluation results on efficiency, meaning, and satisfaction, respectively. Virtusize, Pitco, and Fit'n Shop were evaluated on a 5-point scale (⑤ Strongly agree ④ Agree ③ Undecided/Neutral ② Disagree ① Strongly disagree). The figures shown in the table represent the average of the 3 apps by 11

reviewers.

Table 3 shows the evaluation results for efficiency. In Table 3, items 3 and 5 had the highest evaluation results on average for the three apps. It was shown that it provided an appropriate response speed for performing the tasks, and the size comparison function shortened the time to determine the dimensions of clothes to be purchased. The item with the lowest average value was number 4. It showed a lack of information in displaying the current progress speed in relation to the delay time.

Table 3. Results for efficiency

Efficiency	Average of the 3 apps
1. Do you think the time it takes to enter your body size or your clothing size is appropriate?	3.03
2. Do you think the time taken to determine the size to purchase through the size comparison function after running the app is appropriate?	3.40
3 Are you provided the appropriate reaction rate to perform the task?	4.03
4. If a delay of more than a reasonable amount of time is expected, is the user notified of the current speed of progress?	2.53
5. Does the size comparison feature shorten the time it takes to determine the dimensions of the garment you are buying?	3.57

Table 4 shows the evaluation results for meaningfulness. In Table 4, items 7 and 8 showed high results on average for 3 apps. It was possible to clearly identify the meaning of the menus and icons, and to clearly understand the difference between the clothes to be purchased and the user's dimensions on the size comparison result screen. The item with a low result was number 6. A few steps had to be taken to perform the task, but what was insufficient was the part that would give feedback so that the user could finish one step and start the next step.

Table 4. Results for meaningfulness

Meaningfulness	Average of the 3 apps
1. When you first launched the app, was it easy to know which menu to open to enter your body size or your clothes?	3.03
2. Did you easily understand which menu to run to compare your size with the clothes you selected at the shopping mall?	3.20
3. While performing the task, did you spend a lot of time finding the function you wanted?	2.77
4. Was it easy to know how to use the app without a manual or other help in performing the task?	3.43
5. Was it easy to understand the order of menu usage in performing tasks?	3.47

6. When one step of the user's work is done, do they provide feedback so that the next step can be started?	2.90
7. Can you clearly understand the meaning of all the menus and icons?	3.50
8. On the size comparison results screen, did you clearly understand the difference between the clothes you are buying and your dimensions?	3.77

Table 5 shows the satisfaction evaluation. In Table 5, responses suggested that the size comparison function No. 3 was helpful in selecting the size of clothes to be purchased was high at 3.83. However, since the satisfaction with item 1 is somewhat low, it is necessary to improve the UI for inputting the user's body and clothes dimensions.

Table 5. Results for satisfaction

Satisfaction	Average of the 3 apps
1. Are you generally satisfied with the ability to enter your body size or your clothes?	3.37
2. Are you satisfied with the screen after selecting clothes at the shopping mall and comparing them with the size of your body or clothes?	3.63
3. Do you think the size comparison feature will help you choose the dimensions of the clothing you are buying?	3.83
4. Does the size recommended by the app match the actual dimensions of the clothes you wear?	3.40

Virtusize took the shortest time to enter the size: on average, 3 minutes and 31 seconds. The time taken to determine after size comparison was 5 minutes and 31 seconds. It was evaluated that the difference in size between the clothing that they wanted to purchase and the clothing they own could be clearly understood from the size result screen. The evaluators felt that it was 'easy to input clothes size', 'intuitive comparison is possible by overlapping and comparing the actual size of my clothes', and 'it is difficult to find because the clothes size comparison function icon is not clear'.

Fitco had the highest average in the meaningfulness of usability evaluation. In particular, the evaluation result of 4.1 was shown in the question: 'was it easy to know the order of menu use in performing the task?' The evaluators felt 'it was good to be able to make an intuitive size comparison', 'it was nice to be able to immediately check the type of clothes that suits the user after measuring the dimensions', 'taking a photo causes the size measurement to take much time,' and 'it would be good if the rough time it would take to add the clothing to a closet.'

For Fit'n Shop, the evaluators' comments were as follows: 'It was nice to be able to fit it with a real model and avatar'; 'I liked to tell you which part was uncomfortable by the shape and size of the clothes at a glance'; 'It took time to find the size input function'; and 'I need guidance on where the fitting room is.'

The analysis of the evaluation on the user's dimension input method showed that there was higher satisfaction with the user's direct input method of clothing dimensions. The reason is that it took the least input time, resulting in high satisfaction in terms of efficiency. However, to the question of 'What input method do you prefer when designing a new size comparison app?', they responded that they preferred the system that

automatically inputs the dimensions of clothes through taking pictures if the time to register the dimensions was to be shortened. The second method was to scan the body with a camera, which automatically enters the body size. As a result of the size comparison, the satisfaction of the screen was highest when the difference between the selected clothes and the user's clothes size was expressed as an image and the difference value was displayed.

Based on these results, the paper proposes the following when designing a size comparison function within an online clothing shopping mall. First, efficiency and satisfaction can be improved at the same time by offering both the direct input method of clothing dimensions and the automatic input method through photographing. Second, for the direct dimension input method, it is effective to provide a function of directly inputting numbers even if there is an input form through a scroll bar or buttons. In the case of inputting dimensions with a scroll bar, there is a limitation in that it is not possible to input dimensions outside the range. Third, in the case of the automatic dimension input function achieved by taking a picture, the waiting time is long. Therefore, it is necessary to inform the user an approximate time to wait for the result and the current progress speed so that the user can be aware that the function is currently in operation. Fourth, since not many users have experienced the clothing shopping mall size comparison function, a guide to the size comparison function and work steps to be performed for the size comparison should be provided in the main clothing shopping mall so that the user can understand which menu to click to use the function. Fifth, the size comparison related menus, icons, and wardrobe icons should be located in an easy-to-find place and clearly visible. Sixth, it is necessary to help the user select the clothes to purchase by intuitively displaying the difference in size between the clothes to be purchased in 2D or 3D form and the user's dimensions and by clearly displaying the difference values for each part.

5. Conclusion

In this paper, usability evaluation was performed on online clothing shopping malls that currently provide a size comparison function. The results showed that the size comparison function helped to shorten the time to determine the dimensions of the clothes to be purchased. In addition, on the size comparison result screen, the difference between the size of the clothes to be purchased and the user's dimensions could be clearly understood, and the size comparison function was found to be helpful in selecting the size of the clothes to be purchased. However, it took too much time to find the size input function and size comparison menu, and it was difficult to know the reason for the delay. While it was necessary to go through several steps to perform the task, the part that gives feedback so that the user can finish one step and start the next step was insufficient.

In order to improve this, two methods are provided, a direct input method for the dimensions of clothes and an automatic input method through photo taking, and in the case of the automatic dimension input function by taking a photo, the waiting time and the speed of progress must be informed. It provides guidance on the size comparison function and the steps to be performed for size comparison, and the size comparison related menu, icon, and wardrobe icon should be located in an easy-to-find place. It is necessary to intuitively display the difference in dimensions of the user and the clothes to be purchased in 2D or 3D form, and clearly indicate the difference value for each part. It is expected that the results of this study will help design size comparison functions of online clothing shopping malls in future, thereby improving customers' overall satisfaction.

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