Wearable Clothing Drop Box Design Using Persuasive Design Approach

Clara Theresia[1*] and Ruth Theodora Wiyono[1]

[1] Department of Industrial Engineering, Parahyangan Catholic University, Bandung, Indonesia

Abstract. The phenomenon of fast fashion (the trend of dressing in a short period of just six months to two years) is a trend that occurs today. This trend raises the problem of stacking clothes. Clothes that are not reused should be used and distributed to others in need or known as the recycling concept. This study aims to design a drop box that can collect and distribute suitable clothes by using Persuasive Design approach. Dropbox is used to improve the concept of sustainability of clothing products. The initial stage of the study was an interview to explore the target of user behaviour in using clothes and explore the inhibiting factors experienced by users due to confusion in distributing their used clothes. Affective design approach is chosen by applying tunnelling, reduction and conditioning technology methods. Dropbox design built in a physical and digital display of the product. The product evaluation process using Usability Testing with the results obtained an efficiency rate of 100%, an effectiveness of 90.625%, and a System Usability Score (SUS) of 83.44, showing that the prototype has good usability. In the persuasive aspect, namely effectiveness, quality, and capability, average values of 5.75, 6.125, and 5.958 were obtained. Improvement recommendations are made based on the results of evaluation by respondents, namely make a clear information at drop box product and display improvement.

1 Introduction

Trends in fashion constantly change quickly from time to time, and we determine it as a fast fashion trend [1]. Manufacturers want to provide the latest product to win the market. Fast fashion can trigger consumers to become consumptive and increase the number of fashion waste in the industry. Based on the literature review, we conclude that the Fashion Industry contributes to global pollution. It happens because manufacturing influences many emissions [2]. Several strategies can be used to slow down the harmful effects of fast fashion trends, for example, promoting sustainable lifestyles and educating customers about sustainability issues (encouraging people to purchase second-hand products and bio-based clothes.
Increasingly rapid technological advances and the rapid dissemination of information have an impact on the rapid changes in trends that occur, one of which is fashion trends. There are three clothing phenomena that occur in Indonesia, namely seasonal trends on holidays, thrifting phenomena, and fast fashion phenomena. The phenomenon that has a big influence

* Corresponding author: claratheresia@unpar.ac.id

is fast fashion. Fast fashion trends that occur around the world, is a term used by the fashion industry to describe fashion models that change in a short time (within a period of 6 months to 2 years), at affordable prices, and use poor quality raw materials [3]. Offering lower clothing prices indirectly encourages users to have a consumptive lifestyle, resulting in a pile of clothes or even discarded due to rapid changes in clothing trends.

The accumulation of textile waste is often found in the environment around us. A total of 92 tons per year of textile waste is generated globally [3]. One approach used to reduce clothing waste is with drop boxes. Drop box is a means that supports sustainability by distributing goods that are no longer used to those in need. With this drop box product, users or prospective users to be more aware of the 3R (Reuse, Recycle, and Reduce concept), especially in recycle. With the recycling process, the waste will be given added value so that it can be reused. An example of a drop box is shown in Figure 1.

Based on the example of a clothing drop box that has been described, there has been a clothing drop box, but it has not been able to attract the attention of people around because of several motivating factors to use this product. One method that can be used to persuade users to use the product is to use a persuasive approach.

Figure 1. Uniqlo Drop Box

By using a persuasive approach to the product, to change user behavior to donate clothes that are no longer used. According to KBBI, persuasiveness is the nature of subtly persuading to be convinced. Persuasion is an approach taken to make someone perform a target behavior or desired behavior [4]. Persuasive design is one method that can be used to change the thinking of the target user to perform the target behavior that the designer wants to achieve [5,6,7]. Therefore, it is necessary to conduct research related to drop box design using a persuasive design approach to overcome the phenomenon of stacking decent clothes in Indonesia.

2 Methods

The research method used in this study is persuasive design. In persuasive design there are 8 main stages [7], which are the stages of research methods namely: determine receptive audience and target behavior, identify what is preventing the target behavior, choose an appropriate persuasive technology (reduction, tunnelling, and conditioning technology), imitate the successful experience (design workshop, SCAMPER method [8], Computer Aided Design), evaluate using Usability Testing [9, 10,11] and Perceive Persuasiveness Scale (PPS) [12]. The first stage starts from determining a simple receptive audience and target behavior. The specified audience is respondents aged 17-52 years and has shopping behavior at least once every two months. After that, to help determine. After determining the receptive audience, proceed with the stage of determining simple target behavior. At this stage, first semi-structured interviews to find out the characteristics of the target user. Interviews were conducted with eight respondents Based on the results of the interview, explicit and implicit identification of target user needs was carried out to understand the problems and needs of target users. The results of the interview, initial behavior was obtained in the form of lack of audience awareness related to the application of the recycle concept which caused respondents to let /accumulate clothes that were no longer used. Determination of inhibiting factors of behavioral targets can be obtained from the interpretation of respondents' statements during interviews conducted at the previous stage. Based on the results of the interview, it was found that most of the audience was confused to distribute clothes that were no longer used. It can be concluded from the results of the interview, the inhibiting factor of the interview is the lack of ability and trigger, Facilitator as a trigger serves to facilitate users and inform users/audiences that the target behavior is easy to do. Furthermore, appropriate technology channels are used to provide direction in assisting in the fulfilment of persuasive needs identified based on interview results. The role of computers in persuasiveness that is appropriate to accommodate these needs is computer as tools. The types of principles used to accommodate persuasive needs in the form of reduction, tunnelling, and conditioning technology are described in Table 1.

Table 1. Grouping Needs based on Persuasive Design

No	Persuasive Needs	Persuasive Design Tools
1.	Product is easy to use	Reduction
2.	Information is clear and gradual	Tunneling
3.	Rewarding users	Conditioning Technology

Based on the type of technology that has been selected in the previous stage, followed by benchmarking with the aim of obtaining an overview and examples of the implementation of existing persuasive technology. The benchmarking stage aims to obtain an overview and examples of existing implementations. The successful and relevant stage of persuasive technology implementation is then used for prototyping. The results of identifying needs and audience characteristics are used to create personas that aim to help provide an overview when designing alternative concepts. At this stage, alternative design is carried out as much as possible using a persuasive design approach to include persuasive elements in product design. Then, voting will be carried out on each alternative design result that has been designed to determine the best alternative concept result.

The concept scoring method is used to consider the weight of each alternative and the design results of each alternative. Furthermore, the selected concept alternatives will be carried out by the SCAMPER method to improve and modify the results of the selection of the best design alternatives so that they can be developed again [8]. Figure 2 is the result of designing a clothing drop box that has been improved by the SCAMPER method.

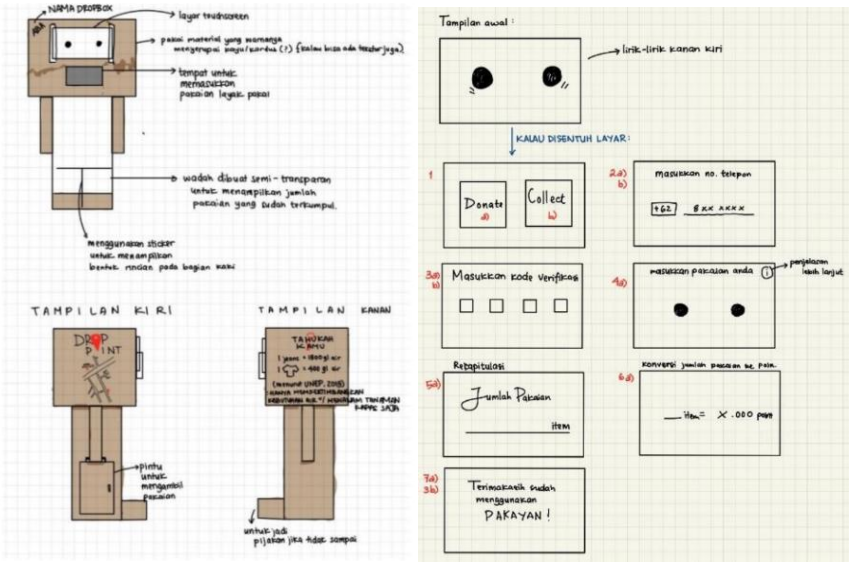

Figure 2. Final Sketch

SCAMPER method uses consideration of other alternative concepts, persuasive design, and can also meet identified primary needs which will then be made into a final concept displayed in the form of Computer Aided Design (CAD). The final prototype designed is a physical prototype and digital display on a touchscreen display. Prototypes aim to provide an overview and test one or several aspects of the product before designing a product [9,10]. The physical prototype of the clothing drop box will be shown in Figure 3.

Figure 3. Physical Prototype

Based on Figure 3, the name given to this product is "Pakayan", which aims to make the name of the clothing drop box easier to remember. The results of the physical prototype design are equipped with a digital display to assist the prototype testing process at the product evaluation stage. Because the drop box prototype uses technology in its mechanism and there is limited processing time, prototyping only reaches the medium fidelity prototype stage. The physical appearance of the prototype aims to be as similar as possible, but not all available features are perfectly integrated. The digital display on the touchscreen display can be seen in Figure 4.

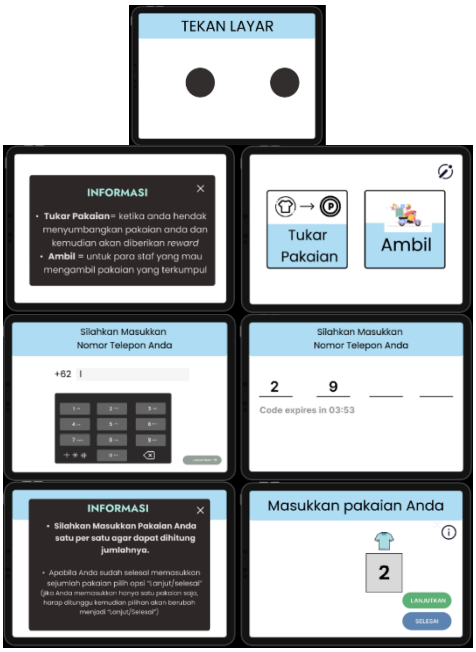

Figure 4. Touchscreen drop box Pakayan

3 Results and Discussion

After designing the clothing drop box, proceed with the evaluation stage on the results of the clothing drop box design using usability testing. The first stage is to design usability testing to help design the stages to be carried out at the evaluation stage using usability testing [9,10, 11] and perceived persuasiveness scale [12]. The evaluation carried out aims to test the usability / ability aspect of clothing, and persuasive of a product. The types of usability tested at this evaluation stage are effectiveness, efficiency, satisfaction, and usefulness the level of usability on digital displays is measured using the System Usability Scale (SUS) method [13, 14, 15]. Details of usability testing are presented in Table 2.

Then, in usability testing, a task list will be created. The task list contains details of the core tasks that have been assigned when conducting usability testing design. Task list is a reference given to respondents to reduce confusion about the sequence of steps that must be done by respondents when carrying out the evaluation stage. Details of the task list can be seen in Table 3.

Table 2. Usability Testing

Name of Drop box: Pakayan	
Purpose of Testing	
1.	Measure the level of persuasiveness in disposable clothing drop box products.
2.	Measuring the usability level of disposable clothing drop box products on the criteria of effectiveness, efficiency, and usability
User Characteristics	
1.	17-47 years old
2.	Buy clothes at least once every two months
Method	
1.	Introduce yourself first to respondents
2.	Provide a brief explanation of drop box products and technical test implementation
3.	Explain the tasks on the task list to respondents
4.	Respondents perform the tasks listed on the task list
5.	Conduct interviews related to the experience of using prototype drop boxes of decent clothes when doing a task list
6.	Conduct interviews related to the experience of using prototype drop boxes of decent clothes when doing a task list
7.	Respondents filled out the PPS and SUS questionnaire forms
Equipment	
1.	Prototype drop box clothes
2.	Stopwatch
3.	Task list
4.	Stationery
5.	Used clothes
6.	Containers for storing used clothes
7.	PPS and SUS questionnaire forms
Assignment	
1.	Read information on drop box products for decent clothes
2.	Register or register
3.	Put clothes in the drop box of suitable clothes
4.	Exchange earned rewards for points

Based on Table 3, then the usability testing step will be carried out by respondents based on the usability testing procedure that has been designed in Table 2. Furthermore, tests were carried out on the criteria of effectiveness. If there is an error when the respondent performs a task, it will be given an "X" sign, but if the respondent can complete the given tasks without making a mistake, it is given a "V" mark. The test results on the effectiveness criteria can be seen in Table 4.

Table 3. Task list

No	Task	No	Details of Stages
1	Read the information listed on the clothing drop box product	1.	Read information using drop boxes (how to use)
		2.	View available locations on drop box products
		3.	Read the trivia listed on the drop box
2.	Register or register	1.	Respondents read the information listed on the drop box
		2.	Respondents first selected the 'change clothes' option.
		3.	Enter the phone number and select 'continue'.
		4.	Enter the OTP code or verification code on the touchscreen display
3.	Put clothes on the clothes drop box	1.	Read the information on the touchscreen drop box screen and close the popup by pressing the "x" button
		2.	Inserting 3 pieces of clothing one by one into the hole when a writing appears asking to insert clothes
4.	Redeem points for rewards	1.	Open the SMS on your phone and tap the reward link given
		2.	Redeem points for rewards
		3.	Verify redemption of points for rewards
		4.	Reward code successfully claimed

Table 4. Effectiveness Results

No	Respondent								Failure	Effectiveness (%)
	1	2	3	4	5	6	7	8		
1.	V	V	V	V	V	V	V	V	0	100
2.	V	X	V	V	V	V	V	V	1	87,5
3.	V	X	V	V	V	V	X	V	2	75
4.	V	V	V	V	V	V	V	V	0	100
Summary										
Average effectiveness						90,625%				

Based on Table 4, it is found that the average effectiveness result is 90.625%. This is because there are respondents who make mistakes in tasks 2 and 3. Next, usability testing is carried out on efficiency criteria. Because this designed prototype is a new product that has never been tried, to find out the standard time, Shumard will use the Objective Method adjustment [16]. The specified Shumard customization for each task is 80. The result of multiplying the average task completion at 5 replications is multiplied by Shumard's adjustment to obtain the

maximum completion time value. The results of the efficiency criteria test are presented in Table 5.

Table 5. Efficiency Score

No	Replication Time (sec)					Average (sec)	Rating Factor	WPM (sec)
	1	2	3	4	5			
1.	90,54	85,59	56,07	87,37	113,05	88,92	1,33	118,268
2.	30,4	26,38	23,83	21,69	21,68	24,80	1,33	32,979
3.	45,44	44,04	43,84	46,79	39,55	43,93	1,33	58,429
4.	17,75	10,97	11,44	14,46	14,62	13,85	1,33	18,417
Average efficiency						100%		

Based on Table 5, the efficiency calculation is obtained by calculating the number of respondents' implementation time that is shorter than the maximum turnaround time (WPM) divided by total replication (5). Efficiency results of 100% were obtained which showed that all respondents could complete tasks under the predetermined time standard. Furthermore, an evaluation was carried out on usability using the system usability scale (SUS) method consisting of 10 statements. The results of SUS calculations can be seen in Table 6.

Table 6. System Usability Scale Score

No	Statement	Respond							
		1	2	3	4	5	6	7	8
1.	I feel like I will use this system more often	3	4	4	3	4	4	3	4
2.	I think the system doesn't need to be so complicated	1	2	2	1	2	2	1	2
3.	I find this system easy to use	5	5	4	4	4	5	5	4
4.	I felt that I would need help from a technical person to be able to use this system	1	2	1	1	1	2	2	2
5.	I found the various functions on this system to be well integrated	4	4	4	4	4	4	4	4
6.	I feel too much inconsistency on this system	3	1	2	2	2	1	2	1
7.	I feel that most people can understand the use of this system quickly	5	4	4	4	5	5	4	5
8.	I feel that this system is not practical to use	1	2	1	2	2	1	1	1
9.	I feel confident to use this system	5	4	5	4	3	5	5	5
10.	I need to learn a lot of things first before using this system	2	2	1	2	2	1	1	1
Average SUS score		83,44							

Based on Table 6, the average SUS score is obtained by summing the total score of each respondent multiplied by 2.5 and then calculating the average value. If the average SUS score below 68 indicates poor product use [13]. The average SUS score is 83.44 or included in the excellent category or the product has a good level of usability. In addition to usability, persuasive aspects are also taken into account to determine whether the emergence of behavior changes with the emergence of this product, Perceived persuasiveness scale (PPS) is used to measure persuasive aspects consisting of effectiveness, quality, and capability [12]. The following are the results of the perceived persuasiveness scale assessment conducted on 8 respondents described in Table 7.

Table 7. Perceived Persuasiveness Scale Score

Statement	Respond								Average
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
Effectiveness									
This product will cause changes in my behavior	5	5	6	5	6	6	5	5	5,375
This product causes me to make some changes in my behavior	7	6	5	6	6	7	6	6	6,125
After viewing this product, I will change my attitude	6	6	6	5	5	6	6	6	5,75
Average of effectiveness									5,75
Quality									
This product is accurate	7	6	6	6	6	6	5	7	6,125
This product is trustworthy	6	6	4	6	7	7	6	5	5,875
I believe this product is true	7	6	6	7	6	6	7	6	6,375
Average of Quality									6,125
Capability									
This product has the potential to change user behavior	6	6	6	6	5	5	5	6	5,625
This product has potential to influence user behavior									6,125
This product has the potential to inspire users									6,125
Average of Capability									5,958
Grand Mean									5,944

Based on Table 7, it is found that the average values on the criteria of effectiveness, quality, and capability are 5.75, 6.125, and 5.958. The average total is calculated by calculating the average of the three criteria. Because the average total result has a value greater than 4.9, it can be said that the product can change the shopping behavior of the audience/user.

4 CONCLUSIONS

There are eight user needs related to clothing drop box products that are used in reducing the amount of clothing buildup in residences. Based on the results of the identification of these needs, there are three persuasive needs in the form of products that are easy to use, clear and gradual usage information, and products that provide rewards. The shape of the prototype resembles a robot to make the drop box look more attractive to see from a distance. In addition, brief information related to the location of the drop box and trivia was presented. There is an inhibiting factor in behavior in the form of a lack of ability of the user to donate used clothes which results in the need for the role of facilitator as a trigger.

The limitation of the research experienced was due to time constraints so that only 1 day of evaluation was carried out. This has an impact on the results of evaluation on persuasive aspects or the measurement of behavior change cannot be evaluated accurately. In addition, the limitations of the prototype form made resulted in limitations at the evaluation stage because the design of electronic components was only designed analytically so that they could not be tested directly.

There are several suggestions given so that the implementation of further research can be developed and become better. Future research should use a longer period of time in order to test the persuasive aspects of the drop box prototype so that it can measure behavior change accurately. Second, before testing a prototype, respondents should first be explained about the prototype mechanism in order to understand and reduce confusion in respondents when conducting the evaluation stage. Third, the prototype repair design should be remade and evaluated related to the prototype improvement proposal to find out whether the problem can be resolved.

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