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DESIGNING A PERSONAL SURVIVAL KIT IN FLOOD DISASTERS THROUGH PARTICIPATORY DESIGN APPROACH

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ABSTRACT

Flood is one of the natural disasters that often occur in Indonesia. One area in Southern Bandung that often floods in the rainy season is Dayeuh Kolot. Yearly, the flood happens about six to seven times with 3-meter high of water level so that people in the area have to be evacuated. To improve the preparation of the flood-prone victims in evacuation state, it is considered necessary to design a personal survival kit. This kit is intended to accommodate a variety of needs occurred during the evacuation so the victims could survive on their own although the assistance has not arrived. This paper discusses how we approach the design problem with the participatory design approach by involving participants from Dayeuh Kolot area throughout the design process starting from the needs identification, the concept development and the prototype evaluation.

Key words: flood, survival kit, participatory design.

1. INTRODUCTION

The geographical location of Indonesia makes this country prone to natural disasters. Volcano eruptions, tsunamis and earthquakes are several natural disasters that happen in Indonesia. Flood is one of the natural disasters that happen quite often in Indonesia. Indonesia was ranked as the sixth from 162 countries that are prone to flood risk (Indonesia's Country Report on Disaster Response Management, 2011).

Based on the number of affected people, Indonesia is on the top four rankings in 2013. The flood occurred on January 2013 had approximately 248.846 affected people based on the data from *Centre for Research of the Epidemiology of Disasters* - CRED (Emdat, 2013). In fact, according to the survey conducted by a financial company SwissRe, Jakarta occupies the fifth out of 10 cities with highest risk of natural disasters due to the flood that always happens. This survey is based on the number of affected people and also the losses caused by this disaster such as the damage of the facilities and the evacuation conducted during the disaster (Friedman, 2014).

Flood that occurs sequentially in a short time and repeats annually requires extra effort in handling. This is necessary so that the losses can be minimized. Up until now, the current government program that focuses mainly on the flood handling has not been able to effectively deal with the flood problem in Indonesia. The government is focused on providing physical flood control tools aimed to reduce the impact. Non-physical policies governing public participation in the disaster has not been applied properly so less significant impact can be applied (Iskandar, 2004).

As an effort to prepare the flood-prone victims in evacuation state, it is considered necessary to design a personal survival kit to be used in a flood disaster so the victims could survive on their own although the assistance has not arrived. This paper discusses how we approach the design problem with the participatory design approach by involving participants from Dayeuh Kolot, one area in Southern Bandung that often floods in the rainy season, throughout the design process starting from the needs identification, the concept development and the prototype evaluation.

2. PRELIMINARY STUDY

Before starting the design process, a preliminary study was conducted. The preliminary study took place in Citeureup village, Dayeuh Kolot, Bandung. This village consists of 940 households and is located directly adjacent with Citarum River that often flooded during the rainy season. The flood can reach up to approximately 3-meter high. In addition to floods caused by the rain, Citeureup often experiences flood from its neighbouring region, Citeureuy village.

The preliminary study was conducted by interviewing five residents of the village to gather insights about the condition experienced during the flood. We asked about the frequency of flood, the water level experienced, the preparation made during the flood, the objects brought along in time of evacuation and the dissatisfaction experienced during the time.

Through the interviews conducted, it can be concluded that:

1. The residents of Citeureup village have less preparation to flood disasters despite its frequent occurrence. This causes a lot of discomfort in the evacuation zone due to the lack of facilities provided.
2. The residents pay less attention to the safety of their valuable belongings despite the importance. This can lead to losing their entire possessions if big floods occur and destroy their homes.

The situation is very different in Japan where the flood disasters also often occur. Japan has a quite good disaster management system. Trainings on disaster are conducted regularly and even used as a subject in primary schools. The Japanese people are also used to prepare supplies containing survival equipments and other necessities for disasters. Some supermarkets in Japan even sell earthquake rescue tools in a form of bag that is ready to take when disaster occurs (Kristanti, 2009), as shown in Figure 1.

Figure 1. Example of Japanese survival kit

The alertness of the Japanese people makes the losses suffered during the disaster can be minimized to the smallest amount. Thus, a personal survival kit is designed as a tool that provides immediate necessity when help has not yet arrived at the evacuation site.

3. RESEARCH METHOD

The design process of a personal survival kit in this study will be done through applying the participatory design approach. In this approach, the flood victims (as potential users) will be invited to participate in the design process. The user involvement is needed to determine the actual needs of flood victims so the designed product will be able to satisfy their needs.

The design stages include the needs identification, the concept development, the prototype making and the prototype evaluation (Preece et al, 2002).

4. RESULT AND DISCUSSION

4.1 The Needs Identification

The identification of needs was conducted through interviews and observation. We interviewed ten residents of Citeureup

village consisting four woman and six men, and the staff of BPBD (Regional Disaster Management Agency), an agency responsible for handling disaster in West Java.

To help people identifying the needs of the personal survival kit to be designed, all of the participants were given a scenario as can be seen in Figure 2 and were asked to answer the questions based on this scenario.

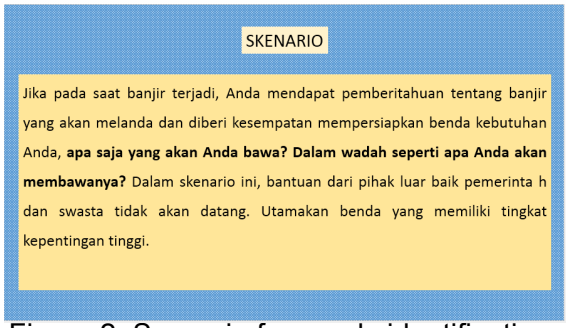

Figure 2. Scenario for needs identification

Based on the interview results with the residents of Citeureup village, thirteen needs were obtained while the interview with the staff of BPBD produced 2 more needs. The total needs to be accommodated are 15 needs as can be seen in Table 1.

Table 1. The needs identified

No	Needs: The personal survival kit…
1	Accommodates the need of food
2	Accommodates the need of keeping money safe
3	Accommodates the need of toiletries
4	Accommodates the need of clothing
5	Accommodates the need of blankets
6	Accommodates the need of storing important documents and stuffs
7	Is easy to carry in the time of evacuation
8	Contains equipment to accommodate the possibility of having to swim
9	Is waterproof
10	Accommodates the children's needs
11	Accommodates the need of beverages
12	Accommodates the need of personal medicine
13	Is lightweight
14	Has appropriate size to accommodate a variety of needs
15	Accommodate the need of appropriate footwear

Determining the importance level of the identified needs was conducted through the card sorting method (Righi et al, 2013) with five residents of Citeureup village as participants, as can be seen in Figure 3.

Figure 3. Card sorting process

4.2 Concept Development

The concept development of the personal survival kit was conducted in a design workshop session with three participants who previously participated in the needs identification stage. Each participant was paired with a university student to assist the drawing process of the desired design concept as shown in Figure 4.

Figure 4. Design workshop session

In the design workshop, a picture that contains all of the stuffs identified in the previous stage and pictures of various forms of containers that can be alternative of a survival kit are used as props to help the participants, as shown in Figure 5. This tool is used to facilitate the participants imagining the shape of various needs to be put in the survival kit and the shape of the survival kit itself.

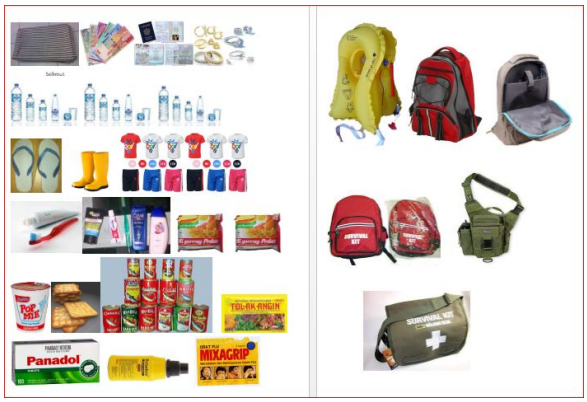

Figure 5. Props used in the design workshop

During the session, the students who assisted the participants only helped them to draw the design concept they want. The students gave feedback and stimulated the participants to rethink about their design by giving consideration and reminding them about the consequences of every design aspects they add to the concepts of personal survival kit. While designing the concepts, every participant was not allowed to communicate with each other so that they will not copy or get inspiration from other participants' ideas.

The design workshop generated three concepts generated that can be seen in Figure 6, Figure 7 and Figure 8.

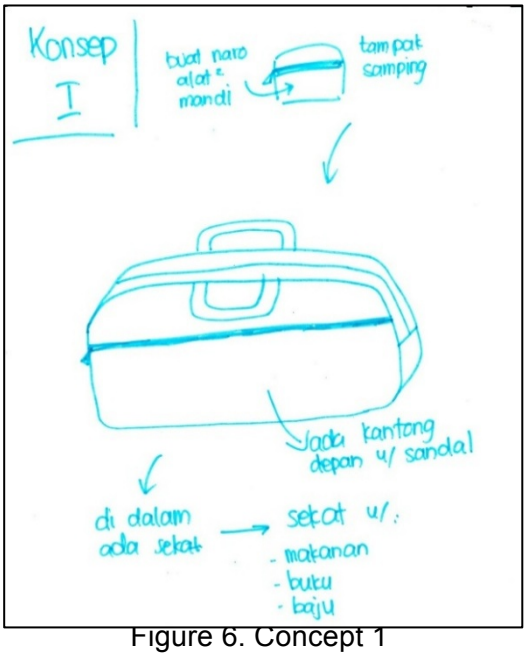

Figure 6. Concept 1

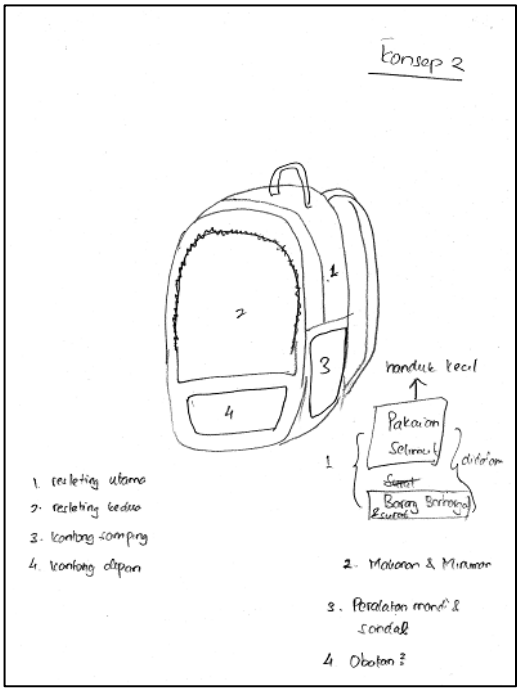

Figure 7. Concept 2

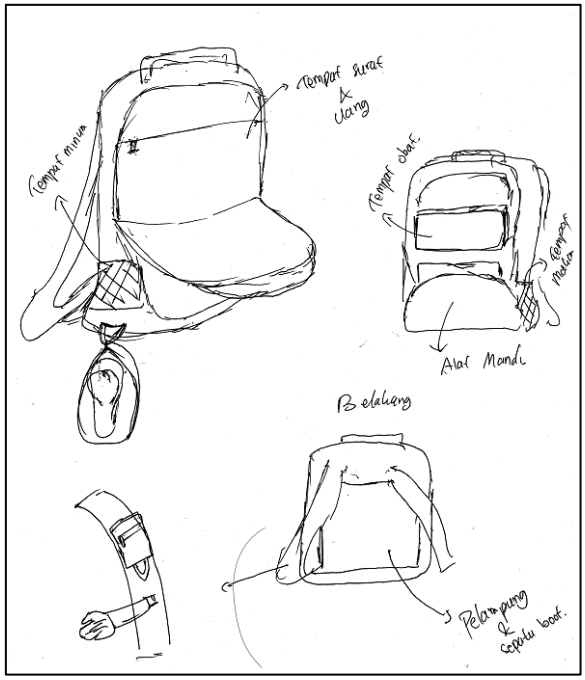

Figure 8. Concept 3

Once the illustration of the design concepts finished, every participant was asked to explain their concept and give assessment for the other two concepts by scoring. Participants can give a value ranging from 0 to 100 for the other concepts. The summary of each concept score can be seen in Table 2. Besides scoring the concepts, each participant also gave comments or opinions to the design concepts. This comments and opinions were used to improve the final concept of the personal survival kit.

Table 2. Concept scoring

Participant	Concept 1	Concept 2	Concept 3
1	-	60	60
2	65	-	85
3	60	95	-
Total	125	155	145

Due to the insignificant difference of the scores, the three concepts were merged to produce a final concept for the personal survival Kit by combining all the good aspects. The final concept of the personal survival kit can be seen in Figure 9.

In the final concept, the form of backpack was used so it is easy to carry the personal survival kit when a flood disaster occurs. In addition to that, the placement of various stuffs is also being differentiated in order to avoid trouble when getting the stuffs out of the backpack.

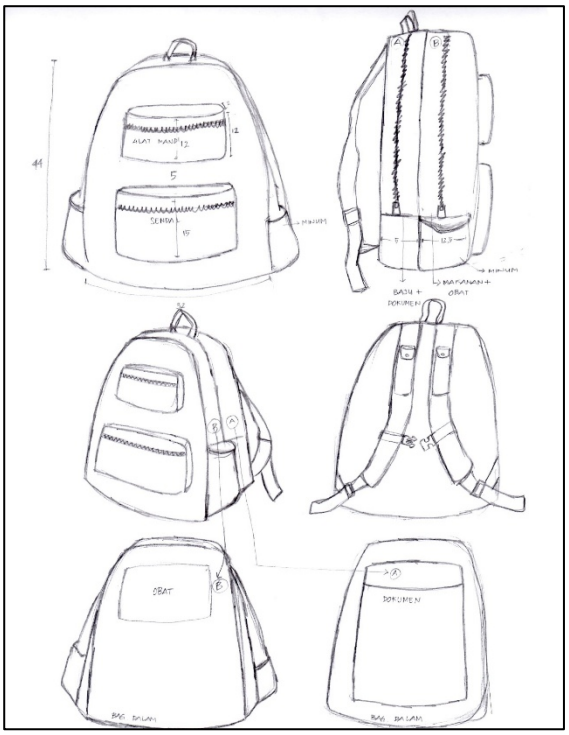

Figure 9. Final concept

4.3 Prototype Making

Three prototypes were produced in this research: the three-dimensional design, the physical prototype, and the video prototype. All of the prototypes were made to explain the function and advantages of the personal survival kit better to the participants. The first prototype, the three-dimensional design, is used to indicate the size of the personal survival kit and serve as guidelines in making the physical prototype. The three-dimensional design can be seen in Figure 10.

The second prototype is a physical prototype. It was made using material that meets the need of waterproof and lightweight. The outer material is Best BMW 1682D and the inner material is Torin. The physical prototype can be seen in Figure 11. The form of the physical prototype is a backpack because it is considered easy to carry than other form of bags. There are several pockets intended to contain various stuffs as designed in the final concepts. The

physical prototype was used to present the survival kit to the residents of Citeureup village in the prototype evaluation stage.

The third prototype is a video prototype. It was created to provide guidance about the function and usage of the designed personal survival kit. Figure 12 shows some footage of the video prototype made.

Figure 10. Three-dimensional design

Figure 11. Physical prototype

Figure 12. Video prototype

4.4 Prototype Evaluation

Two evaluations were conducted in this research in order to evaluate the physical prototype of the personal survival kit. The first evaluation was in the form of a focus group with seven residents of Citeureup village, as shown in Figure 13. In this session, the residents were taught on how to use and the function of the personal survival kit. The participants of the focus group were then asked to put on the backpack (personal survival kit) and try packing the stuffs (Figure 14) in order to know the limitation of the prototype.

Figure 13. Prototype evaluation session

Figure 14. The content of personal survival kit

The result from the focus group as the prototype evaluation session can be seen in Table 3 in the form of participants' comments and suggestions of design improvement.

Table 3. Evaluation result from the focus group

Comments	• *The outer form is good. There is a pocket for each stuff.* • *The slipper container is not big enough.* • *Using pockets to differentiate placement of stuffs makes the filling of the personal survival kit easier.* • *The size of the personal survival kit is big enough to accommodate all of the stuffs.*
Suggestions of design improvement	• A child's carrier should be added to the shoulder straps. • In order to prevent the personal survival kit from getting wet in rainy days, it is better to add a cover. • The pockets in shoulder straps should be adjusted so they will fit when used.

Additionally, the personal evaluation from the researcher was also carried out. It was considered necessary because the researcher was also part of the design team. The evaluation result from the researcher can be seen in Table 4.

Table 4. Evaluation result from the researcher

Comments	• *The important document container in the personal survival kit is less practical and less safe as it only uses velcro to attach.* • *The aesthetic side of the personal survival kit has not properly considered.* • *The zipper of the personal survival kit has less conspicuous colour that sometimes it is hard to find. It is better to make the zipper in a different colour and a bit flashy.*
Suggestions of design improvement	• It is better to add whistle hung on the personal survival kit that can be used during an emergency. • Each pocket should be labelled so there is less confusion on filling the personal survival kit. • The personal survival kit is better to have a flashy material on it so that it is easier to recognize during the disaster (in case the user is dragged by the flood, it is easy to be spotted).

5 CONCLUSION

This research has presented the design process of a personal survival kit intended to accommodate a variety of needs occurred during the evacuation of flood disasters so the victims could survive on their own although the assistance has not arrived. The participatory design approach was applied in the study by involving participants from Dayeuh Kolot (an area in Southern Bandung) that often floods in the rainy

season, throughout the design process starting from the needs identification, the concept development and the prototype evaluation.

There are fifteen needs that have to be accommodated in the design of a personal survival kit. Three concepts were generated based on these needs in a design workshop session. To give a better impression about the personal survival kit designed, three prototypes were built, including a three dimensional design, a physical prototype, and a video prototype. The prototype evaluation resulted in some recommendations to improve the design of the personal survival kit.

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