USER EXPERIENCE STUDY OF SMALL PORTABLE HOME APPLIANCES
DESIGN STUDY OF SMALL PORTABLE STERILIZER

Kyo-hwe Goo / Marian Adusei/ Kido Chang/ James Andrew Self/ Jae-hyuk Chae
kyohwe91@gmail.com, marianadusei19@gmail.com, kidocee@gmail.com, jaself@unist.ac.kr,
volardesign@aol.com
Ulsan National Institute of Science & Technology, Graduate School of Creative Design Engineering
CDE

ABSTRACT

The project is about developing the user experience of an existing sterilizer aimed at the domestic market. This paper attempts to find the insights and the needs of a small portable household appliance that is relevant to the home context. The results found from the user study suggest criteria for home appliance units in general and 3 main keywords were developed using the results. The paper shows how the results found in the user study are used to generate appropriate concepts for small portable home appliances.
Keywords: Design Process, Design Methods, Home Appliance

BACKGROUND RESEARCH

The project commenced with desktop research work to develop a foundational knowledge on the project and the product itself. As a result the market was divided largely into two categories: sterilizer and air purifiers. Sterilization is the elimination of microbiological organisms to achieve a sterile microbial environment. Generally, sterilizers use UV light or chemicals to kill organisms. Chemical sterilizers sterilize surfaces and UV sterilizers sterilize the air itself.

An air purifier is a device, which removes contaminants from the air. These devices are commonly marketed as being beneficial to allergy sufferers and asthmatics, and at reducing or eliminating second-hand tobacco smoke. Generally, Air purifiers use HEPA filters to filter the contaminants. However, air purifiers do not clean surfaces but only filters out the air. Our product is a type of a chemical sterilizer because the chemicals kill the germs.

In the current market, sterilizers using chemicals are often used for cleaning surfaces, not air. There are products that are doing the same work as our product but with different technologies. A simple comparison shows that other products do their jobs more efficiently and are more user friendly.

A benchmark comparison was carried out for sterilizers and air purifiers. Sterilizers such as Lysol, Clorox, Spray Nine and Germ Guardian are small and efficient as a sterilizer while the price is very low.

Air purifiers, which filter out dust and germs in the air, are more expensive than sterilizers however they have a simplified design and are larger products that are designed to cover a broader space, instead of specific surfaces such as most sterilizers.

Our product was situated in the middle of these two categories, using a motor pump to dispense small chemical particulates to sterilize the germs in the surface and in the air as the particles diffuse into space and eventually land on surfaces.

Figure 1 Different Sterilizers

Figure 2 Different air purifiers

The position of the product needed to be carefully targeted as mentioned in (Prospecta Marketing) to be successful in the market.

With the background insight from the desktop research our team used the KJ method (ScupinRaymond, 1997), a brainstorming method, to identify keywords from the research. Research notes were gathered onto one table and were grouped together according to their similarities. The similarities became the category and issue of our research. Repetitive notes were discarded, and related notes were put aside. The categories found with the post it notes later would become the basis upon which our user study is developed. Five categories were created using the KJ method (SpoolJared, 2004): Physical Design, Usability, Functionality, Emotional Qualities and Branding.
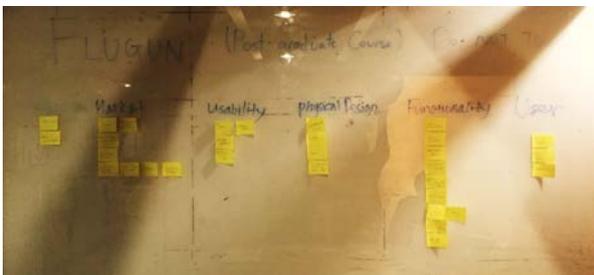

Figure 3 Issues from the desktop study categorized using KJ method

USER STUDY

To identify current needs and issues with the existing product a study was carried out in the home context using the attributes found in the background research. The user study was also carried out to gain insight how portable home appliances were used in the home context to help the team design a suitable home appliance product.

A Modified Contextual Inquiry approach was used to observe the users feelings, through their verbal reaction, with minimal external interruptions. After the observation, an interview was done based upon the observation and a few ready-made questions.

Three of the participants were housewives and the study took place in their individual homes.

There are two types of product, the larger and the smaller. The larger product is intended for the industrial market whereas the smaller product is for the domestic market. For our observation, the housewives were given the smaller designed product, and later we did an interview according to their usage with it. The housewives were inexperienced in using the product.

Three of the participants were in the context of the business/ industrial environment. Two of the participants had experience with the larger product and the other had experience with the smaller product. Although the larger product is for the industrious market, the interviews and the analysis of the observations were interpreted with the home context in mind.

USER STUDY: CLIENT 1

Client 1 had used the larger product for 6 months. They stated there was no product like this on the market and they use is mostly because it is required to sterilize the workplace. The selling point is that the design is more attractive than its competitors. The summarizing key phrases for client 1 were: Coloring, target housewives, marketing the chemical and its work, power line, regulation of spraying power, button affordance.

Figure 4 User study: client 1

USER STUDY: CLIENT 2

The motel user, client 2, has been using the larger product for 2-5 months. They bought it so that customers can feel good when they are in the room, so it has been used mostly for getting rid of smell rather than to sterilize areas.

The summarizing key phrases for client 2 were: ease of use, poor feedback and indicators, insufficient chemical capacity, shoulder strap for portability, quick drying chemical, relevance of logo with product.

USER STUDY: CLIENT 3
Client 3 has experience using the smaller product for working to sterilize areas where children play. The user has been using the product for 2~3 months and he uses it once a week every Sunday, when he has no customers or kids around. He originally used Cesco's service once every month. He prefers to mix the solutions to have a good smell than a sterilizing chemical. He uses the appliance mostly for the children's toys and places the kids normally come into contact with.

The summarizing key phrases for client 3 were: Cleaning of kids toys and area, Wireless advantage, small size, weak spraying power, unmatched logo with product.

Figure 5 User study: client 3

USER STUDY: CLIENT 4
Client 4 has never used the smaller product and has two children and is a housewife who also works for a living. When there was an outbreak of flu in Korea she thought it was necessary, but today she does not believe that sterilizers are necessary for daily life. Normally she would use a detergent and hot water to clean up the toilet. She felt the most satisfaction using the product when she sterilized her children's toys, especially toys made of wood and small mechanical components. The reason is because she usually doesn't clean toys. She expressed good satisfaction when sterilizing the insides of beddings.

The summarizing key phrases for client 4 were: repositioning of product customer target, sterilization of kid's toys and play area, exposed chemical bottle, improvement of exterior design, improvement in the precision of feedback of buttons, noisy, relevant logo design.

USER STUDY: CLIENT 5
Client 5 has never used the smaller product before and has two children in her family. She mentioned that there was no feeling of effectiveness using products such as the Air washer. She would prefer to use it to sterilize storage areas containing children's toys where dust can accumulate. Also she mentioned that storage areas with repetitive use should be sterilized. Furthermore she mentioned that she would gladly take all the toys out and sterilize them again with care. She would not use the product for areas where cleaning had already taken place using detergents because of the chemicals of the product.

The summarizing key phrases for client 5 were: feeling of clean air after cleaning, kids toys and area of storage, insufficient storage for home appliances, simple and modernized design, smaller without sacrificing performance, relevance of logo with the product.

USER STUDY: CLIENT 6
Client 6 has two children and is a housewife who doesn't have experience of using the smaller product. She expressed the idea that sterilizing bedrooms was satisfying because her husband has sensitive bronchial tubes and would also help with her children's health. It was found that she sterilized the entrance thoroughly where there were closed-in areas such as the shoe closet. She avoided kitchen areas where chemicals, although it is harmless, could come into contact with the dishes and the food.

The summarizing key phrases for client 6 were: sleeping area, shoe closet and entrance area, avoidance of kitchen and food, awkward handle design and placement, better smaller modern exterior design, better affordance of button, and relevance of logo with product.

	Buttons with better feedback
	indicators to give the feeling of a cleaner atmosphere
Branding	Precise and clear naming scheme, Logo should be representing the product's purpose
Service Marketing	Maintenance of the product to solve the anxiety of Battery depletion with a battery replacement service and the cleaning of the product's internals
	Need to increase the credibility of its constituents (advertisement, packaging …etc.)

Table 1 Insights & Criteria of User Study

The interview and the actions of interviewees in the observation files were carefully observed and written down and organized into Table 1.

Thus, the project progressed by finding 3 keywords based upon the user study to give a specific direction for conceptualization.

USER STUDY: 3 KEYWORDS

The 3 keywords were chosen by the team from the user study depending on how critical it was to the portable sterilizer. The process here is subjective to the team however, to make good use of the user study, and to avoid straying off track, the team decided to stay with the 3 keywords based upon the insights found from the user study.

PORTABILITY & MOBILITY
This term was developed due to the users need for the product to be more portable and mobile than it is currently. From the user study, housewives frequently held the device with both hands while sterilizing their home. The aspects of portability and mobility would be essential in redesigning for the home context.

AFFORDANCE & FEEDBACK
This term was developed primarily because of the confusions and problems around power button feedback identified during the user study. The power button's response was delayed confusing the user if the product was malfunctioning or out of battery. This would be solved with a responsive button. However, it does not need to be confined to the 'power button' but can be interpreted more

Figure 6 User study: Client 6

PACKAGING OF DATA
From the data, observation and interview, keywords were developed to guide the team during concept ideation. The data was organized into a table divided into 5 categories which were: Physical Design, Functionality, Usability, Branding, Service marketing, found during the research phase of the project.

Category	Insights/ Criteria
Physical Design	Holistic design
	Style should be suitable for display in the kitchen or in the living room
	Style should resemble a cleaning product
	smaller & lighter
	Ergonomic handle to support one hand usage
Functionality	Spaces or objects users have stronger needs such as toys (wooden, mechanical), closed areas, particularly dirty areas such as the toilet, fabrics that accumulate germs easily, bedding
	Improve on the cordless design (improve the docking of cordless device)
	Noise reduction (internal components)
	Dual functionality, fixed automatic functions as well as a separate product to use at will
Usability	Simple and easy refueling procedure wide opening that involves no additional equipment
	One handed use for multitasking
	Buttons with better affordance (know whether the button is press and release or hold for a while)
	Indicate the readiness of use such as water & chemical levels, battery life and heating

generally, such as an indicator that gives an indication of the machine state or its surroundings.

ECONOMICS OF TIME

This term was developed because of the busy lives of the housewives. The user study showed that housewives are very busy both catering for their children and working. Some wanted the device to be used instantaneously to clean their hands or an object in a short period of time. A solution to fit into the busy lives of the housewives would help the product to be relevant to the home context as well as the lives of the housewives.

USER SCENARIO & CONCEPT

Using the 3 keywords, the team had ideation sessions to devise a concept that is relevant to the sterilizer and to the home context. From the many conceptual ideas, the most appropriate concept was finalized which is explained in the following.

USER SCENARIO

The following illustrations are the user scenarios of an idea that incorporates all of the 3 keywords.
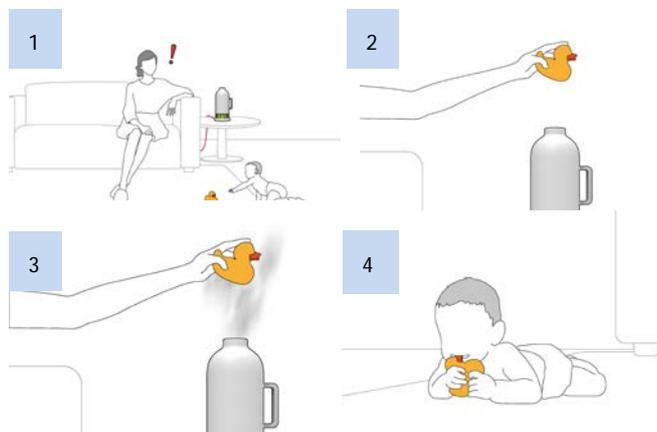

Figure 7 Storyboard: Economics of Time

Figure 7 is an illustration of how the concept model activates when an object is placed close to the tip to sterilize the object quickly. This helped address one of the key concepts emergent in the user study: Economics of Time. This adds value to the product because it would support and facilitate the users to fulfill their needs quickly (Berry EggenGerard, 2003).
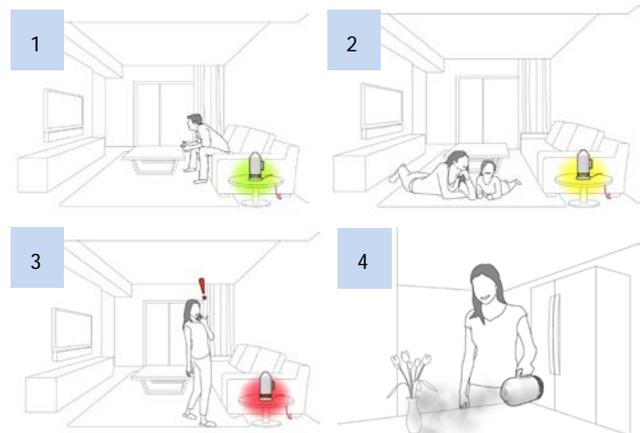

Figure 8 Storyboard: Affordance & Feedback, Portability & Mobility

Figure 8 is an illustration of how the concept can be removed from the dock to sterilize a remote area. Furthermore, the colored indicator added to the product experience of sterilization in the home context, which provides the users a better home experience without overpowering technologies (KimSang, 2003). The color changes as the time passes to indicate the frequency of sterilization in the home. This scenario addresses both Affordance & Feedback and Portability & Mobility.

DESIGN CONCEPT

The finalization of the concept led the team to explore different forms the concept can take through further ideation sessions.
Figure 9 and 10 show two concepts that explored different methods the chemical can be dispensed through.

Figure 9 Design Concept 1

Figure 9 illustrates a concept that disperses the chemicals upwards so the proximity sensor is positioned at the tip. When the object is placed close to the product's tip, the chemicals disperse upwards to sterilize an object.
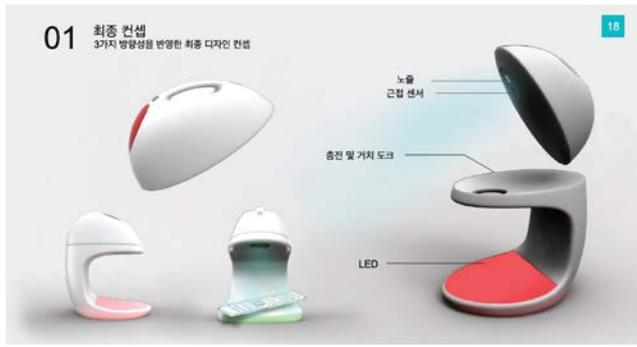
Figure 10 Design Concept 2

Figure 10 works on the idea of an indicator changing light using a proximity sensor. It is designed in a way that it has an area where objects that need sterilizing can be placed upon for easy sterilization.

FURTHER STUDY

Further study is expected as the design project progresses, for example, exploring the aesthetics of the design and incorporating the working components into the design to develop a fully working prototype.
Carrying out a further study using different household appliances would broaden the scope of the study. Comparing the studies would reveal a common trait in household appliances and particular traits for different types of small portable home appliances.

ACKNOWLEDGEMENTS

REFERENCES

Berry Eggen, G. H. (2003). Exploring and enhancing the home experience. *Cognition, Technology & Work*, 44-54.

Kim, S. H. (2003). Smart home - digitally engineered domestic life. *Personal and Ubiquitous Computing*, 189-196.

Prospecta Marketing. (n.d.). *Prospecta Marketing*. Retrieved April 2015, from http://www.prospectamarketing.com/ArticlesAndCaseStudies/tenkeys.htm

Scupin, R. (1997). The KJ Method: A Technique for Analysing Data Derived from Japanese Ethnology. *Human Organization, Vol. 56 (no. 2)*, 233-237.

Spool, J. M. (2004). *The KJ-Technique: A Group Process for Establishing Priorities.* Retrieved from User Interface Engineering: http://www.uie.com/articles/kj_technique/