Desirability in design for safety: Developing life jacket through creative problem solving method of TRIZ

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Abstract: Drowning is one of the main causes of death worldwide and according to the recent statistics published by coast guards of the US, Canada, and UK, most of drowned people were not using a life jacket. The main reason to refuse wearing a life jacket considered being undesirable design of current samples. This project intended to develop more desirable product and in order to achieve this goal, some of the main TRIZ tools were utilized in five phases of product development process. Moreover, in order to examine our hypothesis, different studies on behavioural factors associated with life jacket use were reviewed and this became clear which boaters avoid wearing life jackets due to its bulky, uncomfortable and restrictive design. The product appearance and usefulness also were questioned by some boaters, when they indicated life jacket is just suitable for weak swimmers. Final result of this project presented in form of a concept which grants user's needs in both normal and emergency situations and makes it beneficial in all phases of the product using process. This concept combines life jacket, shoulder bag, smartphones capabilities and survival kit in one product to improve product desirability, usability and also its appearance.

Keywords: Life Jacket, Desirability, Safety, Product Development, TRIZ

1. Introduction

According to the World Health Organization report published in 2014, Drowning is the 3rd leading cause of unintentional injury death worldwide. In 2015, The U.S. coast guard stated that more than 75% of fatal boating accident victims drowned and almost 84% of drowned people were not wearing a life jacket. This figure is very similar to what the Canadian Coast Guard has declared on the basis of 20 years drowning statistics. The U.S. coast guard also surveyed boaters across the country and found that 90% of them do not wear life jackets. The hypothesis which can be described regarding the cause of the problem is that current samples feels undesirable and not enough beneficial from users’ point of view, especially before emergency situations. In another word, it seems people tend to use the safety system which has less interference with their main activity and be more consistent with their daily experiences. This project aimed to explore new design solutions and develop more
comfortable and appealing life jacket through a creative design process. The main structure of this process is formed according to the method of TRIZ and involves five main phases:

1) System identification, 2) Investigating users, 3) Identifying ideal final result, 4) Concept generation 5) Concept evaluation

2. Methods

2.1 System identification

At the beginning, the problem was defined properly by using innovation status questionnaire (ISQ). ISQ encourage designers to look at the problem from different points of view by raising discussion about critical questions. ISQ very fundamental titles and subtitles include: Primary useful function of the system, System structure, System environment, System resources and Problem situation (Regarding to Primary useful function of the system)

2.2 Investigating users

In this step, exact users of life jacket and their complaints about current samples were considered. In this regard, some published studies on behavioural factors of life jacket users were reviewed. These studies have reported the most common reasons of boaters to refuse wearing life jacket as follows:

1) It is Bulky, 2) Uncomfortable, 3) Restrict movements, 4) Needed only by weak people.

2.3 Identifying ideal final result

In phase 3, After analysing collected information about behavioural factors of boaters and also structure of the current samples, Ideal Final Result was described. The IFR has to preserve the advantages of the original system, eliminate its deficiencies, does not make the system more complicated, and does not introduce new disadvantages. Accordingly, the ideal solution is defined as below:

1. It creates an essential advantage in all phases of the product-use process it.
2. It is designed regarding users’ daily needs and experiences.
3. The system is desirable, because it is comfortable (No limitation in users’ movements - Don’t make them heat or sweat).
4. It is safe and reliable in water (avoid cold water shock - Keep head and mouth of unconscious user out of water).
5. It makes the rescue operation much easier (Equipped with communication or signalling device to transmit system status to a monitoring facility - Be highly visible for lifeguard during day and night - Facilitate grabbing and rescuing floating users - In some emergency situations keep floating users close to each other).
6. It is not expensive.

2.4 Concept generation

In the 4th phase, identified Problems of the system were converted to the engineering parameters in contradiction problem matrix which includes 39 parameters. Confliction among some of these parameters considered being the cause of the problem in the system. At first, this is necessary to find each parameter that needs to be changed and also each parameter which is an undesirable secondary effect. Then, the 40 TRIZ principles of inventive thinking were applied. These principles are a list of known solutions which used together with the contradiction matrix to solve technical
problems. In this way, TRIZ software was utilized to calculate and suggest applicable principles regarding the system technical contradictions. Finally, during brainstorming sessions, about 60 ideas were proposed on the basis of suggested principles.

2.5 Concept evaluation

During the last phase, concepts were evaluated regarding to defined parameters from phase 3, including Desirability, Reliability, Adaptability with daily users’ experiences, Cost, and Level of complexity. Then, top two ideas with more scores were optimized by merging into one solution.

3. Results

This process resulted in a Concept which grants users’ needs in both normal and emergency situations and makes it beneficial in all phases of the product using process. This concept incorporates life jacket, shoulder bag, smartphones capabilities and survival kit all together to improve product desirability and usability. Its particular structure also keeps vital organs of the wearer out of cold water to avoid cold shock.

4. References

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