

論文の内容の要旨

論文題目 Design Support for Creative Problem Solving
in Developing Countries
(発展途上国における創造的問題解決のための
設計支援に関する研究)

氏 名 青木 翔平

In this thesis, the author proposes a design framework and a support system to assist local designers in developing countries to create problem solving products. Although there are a lot of examples of appropriate technology, most of them have been designed by the experts who have professional knowledge.

Based on the insight that local constraints can be utilized to support local designers, the author introduces a novel concept named as cultural excitation. The author defines the cultural excitation as an externalization of local contexts, in terms of a personal factor of designers, a cultural factor inherent in a local community, and an environmental factor that surrounds designers.

Following the analysis of the requirements for enhancing creative activity with the cultural excitation, the author proposes a design framework named as rapid prototyping spiral, which is a rapid iterating process of creating prototypes and getting feedback from users. In the design framework, the author defines four design spaces, such as problem space, function space, structure space, and tool-and-material space. The core of the design framework is that it enables designers to explore the design space to discover underlying issues, utilizing the interaction between each design space. The author also proposes a support system that is utilized for the design with the proposed design framework. The support system is comprised of the design space explorer, the mechanism module, and the electronic circuit module. They aim to support design and manufacturing knowledge, exploration of design space, and rapid prototyping.

The author conducts multiple experiments in Ghana to examine the effect of the proposed method, such as design of an eddy current separator to solve the e-waste problem, concurrent design of multiple artifacts to solve issues identified in an ideation workshop, and redesign of a fufu pounder to match the existing needs in a local community.

As a result, the following effects were observed in the experiments. First, transformation of the design space by rapid prototyping spiral promotes discovery of novel ideas. Second, considering superordinate concepts leads to find creative solutions. Third, negative aspects, such as constraints of materials, can be triggers of creative problem solving.

The author also provides evaluation for the proposed method from different angles. First, the author describes the effect of following factors in the successful cases, such as facilitation, skill level of designers, personal interest in social problems, and process of collecting materials. The author also analyzes the requirements of the cultural excitation, and clarifies the fact that a specific object, which is named as cultural exciter, can promote designers to discover creative ideas. In addition, the author explains the enhancement of capability among designers, which occurred through the experiments as the side effects. Furthermore, the limit of the proposed method is also discussed. Finally, the author mentions the applicability of the proposed method for design in developed countries.