

Design Method for Sustainable Interaction

-Understanding and Applying Unconscious Human Behaviors in Design

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Abstract: Sustainability has become a central research issue for interaction design, as emerging interactive products can create serious environmental impacts while products are being used. This research investigates a design method for sustainable interaction. A main concept of the design method is to understand and to apply unconscious human behaviors in design. Products designed with this method are expected to be used unconsciously by users with reduced environmental impacts. A framework of design space matrix is proposed, after understanding the attributes of unconscious human behaviors and the types of interaction behaviors causing environmental impacts. The proposed framework and design cases can be used as a base of a n advanced sustainable interaction design method.

Key words: *Sustainable interaction design, unconscious human behaviors, thoughtless act, design for sustainability.*

1. Background

As products become more complicated, we consume more resources and electricity through the products rather than the product itself. The products such as washing machines, cars, and electronics devices can create more serious environmental impacts while being used than manufactured or disposed [8]. Therefore, it became very important to consider the ways to reduce environmental impacts while the products are being used. As the environmental impact is directly influenced according to how users interact with the products, eco-design has become a central research issue in human computer interaction [1].

Researches on sustainable interaction largely remain in emphasizing the importance of this approach in the HCI domain or producing a few design examples [4]. Existing approaches of sustainable interaction design are mainly focusing on educating users or making them recognize the need of sustainability. The effects of these approaches are limited because interactions are highly influenced by users' habitual behaviors that are not necessary to be sustainable.

The objective of this research is to develop a design method for sustainable interaction. The main concept of the design method is to apply unconscious human behaviors in interaction design. Unconscious everyday human behaviors, sometimes referred as thoughtless acts [7], have been used as a source of inspiration for intuitive design [3]. The research intends to apply unconscious human behaviors to increase sustainability of interaction. Products designed with this method are expected to be used unconsciously for reducing environmental impacts.

To achieve the objectives, the types of interaction behaviors are classified in terms of sustainability while products are being used. In the design process, the first step is clarifying the problem to work on. The classification of interaction behaviors helps to define which type of problem the design will solve. The second step is to identify the attributes of unconscious human behaviors. While the behavior patterns can be used for analyzing a design problem, it is expected that the unconscious human behaviors can be the clues for finding a solution. With the types of interaction behaviors and the attributes of unconscious human behaviors, a design framework is developed in the form of matrix. The framework is for helping creative thinking for designers when they make sustainable interaction solutions. Based on the framework, design cases are created to explore exemplary solutions and to generate insights for an advanced sustainable interaction design method.

2. Identifying the types of sustainable interaction behaviors causing environmental impacts

Eco-friendly behaviors are often classified as 4R, which represents 'reduce, reuse, recycle and recover'. On the other hands, DEFRA explains 13 categories of pro-environmental behaviors in everyday life [2]. It presents guidelines for reducing environmental impacts in various situations. While these classifications are based on the 'activities', this research proposes three patterns in terms of the 'interaction' between users and products.

- **Behaviors involving a toggle selection:** This type causes environmental impacts by performing or not performing an action. Existence of the behaviors decides the eco-friendliness. Example behaviors include switching off electronic products, pulling out a plug from wall outlet, or reusing materials.
- **Behaviors involving a selection among multiple options:** This type causes environmental impacts by selecting one among multiple options. Optimal options vary depending on situations. Example behaviors include separating garbage collection for recycling, turning on lights in need, doing correct flush in the toilet, or selecting proper options in washing machine and air conditioner.
- **Behaviors involving an analogue adjustment:** This type can minimize environmental impacts by analogue adjustment for an optimum condition. This type frequently occurs in interaction with products which consume energy and resources. Example situations include finding optimal amount of detergent for washing clothes, deciding right quantity of water for bath, or using toilet paper.

3. Understanding unconscious human behaviors

People often behave unconsciously by external stimuli and environment without their own intention or knowledge. Unconscious behaviors can be explained as automatic process as being effortless, unconscious, and involuntary [5]. A lot of researches looked into the mechanisms of unconsciousness. Although little is known about the types of these behaviors, Suripresents seven patterns with the examples of thoughtless acts in everyday life [7]. This research identifies four attributes of unconscious behaviors. This can be also be

represented in a map with two axes as follows, depending on whether it is individual or social, and whether users had an initial intention or not (Figure 1).

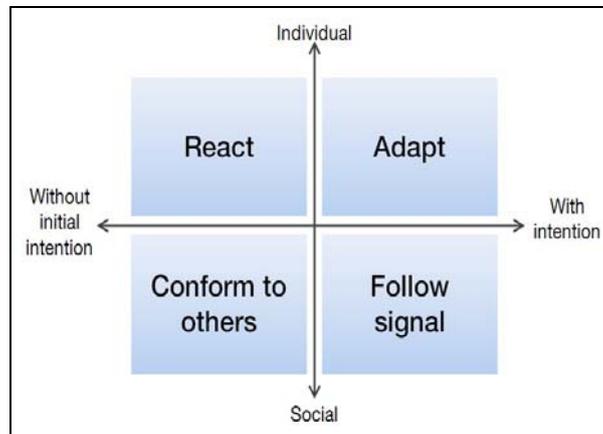


Figure 1. Four attributes of unconscious everyday human behaviors

- **React:** People interact automatically with objects and spaces that they encounter, even without any purpose. Affordance of an object often triggers this attribute [6]. People tend to walk on the road lines, or to place a cup on the safe area of a table. This is triggered by the fact that people enjoy making their own orders and desire the orders to be met.
- **Adapt:** Adaptation is related to people's intention. People tend to find opportunities from other objects for a desired condition. People take physical advantages from their surroundings, to achieve their objectives. For example, people usually put their coat on the back of a chair, or use their newspaper as a pot stand.
- **Conform to others:** In social psychology, conformity is the process by which an individual's attributes, beliefs and behaviors are influenced by other people. People unconsciously conform not only what other people is doing, but also the results of others' behaviors.
- **Follow signal:** People respond immediately for the messages that others made. This attribute is similar to 'react' or 'conform to others' attributes, but it has an initial intention. Users turn the volume up by following the signal of a round button and push up by following a sliding button, without thinking or learning.

4. The framework for designing sustainable interaction

With the types of interaction behaviors and the attributes of unconscious human behaviors, a framework was developed for the design method (Table 1). The purpose of framework is to identify design space matrix which

Table 1. Design framework

	Toggle selection	Selection among multiple options	Analogue adjustment
React			
Adapt			
Conform to others			
Follow signal			

designers can systematically develop design solutions for each space in the matrix. Design cases can be developed for each type of the interaction behaviors, applying specific attributes of unconscious human behaviors.

5. Conclusion

This research investigates a design method for sustainable interaction. A main concept of the design method is to understand and to apply unconscious human behaviors in design. This research has several future works. Firstly, the framework should be further examined in terms of the attributes of unconscious human behaviors. It is necessary to study if attributes can be reorganized or new attributes can be found to be added. Each attribute should be further investigated considering psychological theories. At the same time, a structural evaluation of environmental impacts adopting this method should be accomplished to examine the feasibility. The design cases should be developed and tested by users to see their effects on environments as well as on their unconsciousness. Finally, a general guideline for each type of interaction behaviors can be developed based on the design and the systematic exploration.

A framework presented here provides a theoretical base for sustainable interaction design method that can be practical in both industry and academia. The results of this work can be used as a design method to change users' behaviors for sustainability. The proposed framework can also be used as a systematic and an analytic tool for evaluation.

7. References

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