Toy Car & Projector: An Attempt to Expand the Repurposability of An Artifact with Specific Form and Purposes

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Abstract
This paper describes a design project that explores and challenges the relationship between repurposability and specificness of an artifact. Kids often discover surprisingly new usages that were not intended by the designer of the artifact. Typically, a generic object with less specific purpose could offer more opportunities for repurposing. On the other hand a specific design may hinder the possibility. In the project, we design a toy car for kids with a build-in projector, in hoping to observe creative usages of a new toy with the intersection of two distinct purposes.

Author Keywords
Interaction design; design for repurposing; HCI; tangible toy; flying imagination

ACM Classification Keywords
H.5.2. [User Interface]: Theory and methods, Interaction styles, User centered design

1. Introduction
Children shape an imaginary world with everyday objects around them. Digital objects on the other hand

are designed to be multipurpose but their affordances are harder to perceive. Therefore, designing digitally enhanced tangible objects with 'repurposability' in mind is less straightforward. The recent development in computing and information technology has shifted the way people use technology from merely using it for "Usability" to enjoying using it for 'Non-utilitarian' and 'Hedonic' [1]. Playfulness and fun became important factors in designing the "intention of use" of systems, such as computer games [2][3].

It is a phenomenon that children often assign a product with new purposes and meanings, which are different from its original intended purpose. Children view objects surrounding them from different angles. They usually express desire to play an ordinary toy in variety of ways. It is a great pleasure to discover those unexpected usages.

Different objects certainly offer children various degrees in the range of repurposability. Typically, a generic object with less specific purpose could offer more opportunities for repurposing. On the other hand a specific design may hinder the possibility of being used for a different purpose. In this project, we are creating a new tangible object for children by combining two artifacts with two distinct purposes: a toy in the shape of a car, and a projector as the headlights of the toy car.

In the early participatory design sessions with children, we are showing sketches of the new toy and soliciting for potential usages other than as a toy and a projector. Our hypothesis is that it is possible to expand repurposability by combining two specific functions into one artifact. The new object will be a medium for children to connect the imaginary world and real world through their interaction with the object.

2. Related Study

2-1. Play for fun

German educator Fröbel (1896) defined that playing is the purest of human mental activity. Dewey (1916) considered that play is an important part of promoting children's physical, emotional, cognitive, and social development, and should be especially emphasized in childhood. Csikszentmihalyi (2003) found the cause of the optimal experience, *flow*, in which total concentration and complete absorption happens to whatever activity and situation. Children are frequently in flow when given appropriate challenges and encouragements. While in flow, they are immersed, engaged to their matters and ignoring any temporal concerns.

Elkind (2007) argued persuasively in his book 'The Power of Play' that children's imaginative play is in fact the preparation for learning and academic and social success. Huizinga (1938) suggested that the nature and significance of play as a cultural phenomenon, and the most important aspects of play is that is it fun [4]. Schiller (2004) is constantly seeking fun and unique force driving human urge for playing (Ludic drive) [5]. While the overall experience constitutes one, the three elements of experience, goals, awareness, and emotional state, are closely related to each other and make a deep impact on each other [6].

2-2. The Goal and Fun Experience

The study of experience constituting the content of a product or system has been shifted form pure usability to hedonic satisfaction [7]. The user experience can be

derived from the use the system with clear objective (goal mode) and activity-oriented experience (action mode) [7,8]. When a goal is fulfilled, there is no guarantee the experience is pleasant, enjoyable and exciting. When in activity-oriented experience, the use is guided by fun and playful factors in the activities, which is difficult to obtain [7,8,9].

Users could have fun experience even without a clear goal. Therefore, a design should provide users an escape from the real world instead of presenting a clear goal [5]. The design should provide an alternative distinct from the real life, rather than a symbolically replicated in the virtual reality.

3. Design for Repurposing

3-1. The Proposed Design

Our proposed design for children is a combination of a toy car and a projector. A toy care is a miniature replicate of a transportation vehicle. As a popular toy among kids, it offers the imagination and projection to the alternative life, separating from the real world where real harms could happen (e.g. a car accident.) While a toy car provides some flexibility to what purpose kids could use it for, the toy car design imposes certain limitation to the repurposability, comparing to a cardboard box (see Figure-1).

On the other hand, a projector is typically used to present various visual contents, including still images, motion pictures, or live videos. Its purpose is clearly defined, and its repurposability is lower than a toy car. In our new design, we plan the projector inside the headlights of the toy car. By combining these two seemingly less-repurposable objects, we hope to achieve greater repurposability. The rationale behind the concept is that the intersection between two orthogonal dimensions may provide richer design space for children to repurpose the new artifact than the design space of each dimension alone.

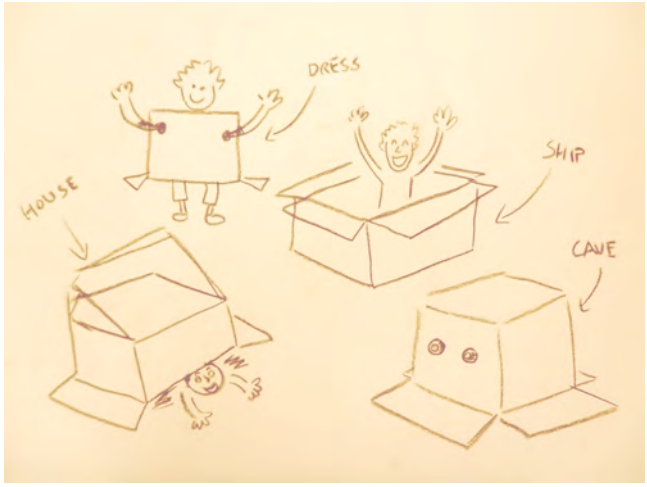

Figure 1. Different usages of a cardboard box by kids.

3-2. User Study Plan

In an on-going study with local children, we are running participatory design to solicit various intended usages to test our hypothesis as well as to re-design our toy car. In the study, we presented three sketches in the order of a real car, a toy car, and a toy car with built-in projector (see Figure-2). Children were asked to elaborate what they see from each of the sketches, and what they will do with it. We expect to see mostly ordinary results from the first two sketches, but surprising feedbacks from the last sketch.

The results will be categorized into clusters, and be analyzed in a way to determine the source and

influencer of the particular usage, as well as the distance between the original intended usage to the new usage. Each usage will then be placed on a 2D diagram to illustrate the change of repurposability between the 1D dimension (car, toy and projector), and the 2D dimension (projector car toy).

Figure 2. Sketches of a real car (left), a toy car (middle) and a toy car with built-in projector (right).

4. Plan for the Workshop

We expect to have analysis done from our on-going participatory design sessions before the conference. In the workshop, we plan to present our concept, the design as well as the results from the first user study. In additional to that, we plan to conduct a design session with workshop participants to brainstorm and to repurpose different objects. The sessions will be conducted in a way to test our hypothesis. Several generic objects, objects with specific purposes, and hybrid objects will be presented to workshop participants for repurposing. In the second half, an analysis of repurposability will be done in live to compare how much we can repurpose generic, specific and hybrid objects.

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