



Everyday Design as a Design Resource

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In the field of design, using artifacts in creative ways other than the ways envisioned by their designers has been regarded as merely a form of “use,” rather than a creative activity in its own right. This study reconceives everyday design as a process by which people create new uses for designed artifacts within given contexts. We enlisted four groups of professional designers into a practical design experiment. Two groups were provided with everyday design cases collected from a sharing application, Wikiuse, while the other two were provided with related design cases. The everyday design cases were found to encourage a design process that is strongly interaction-oriented. An “interaction-oriented process” is a design process that starts with recognition of non-intrusive, everyday actions inherent in everyday design cases, actions that are then incorporated into design solutions. Moreover, professional designers learn how such actions are achieved with everyday artifacts via everyday design cases, which consist of artifact–interaction pairs. Designers can thus reach a design solution by adopting interactions from everyday design cases. This process obviates the need for designers to represent the context of product use in their design processes, as professional designers who utilize everyday design cases are already heavily immersed in the actual context.

Keywords – Design Experiment, Design-in-use, Design Process, Design Resource, Everyday Design, Mobile Share.

Relevance to Design Practice – This article demonstrates the value of everyday design as a design resource, so that designers will have a better understanding of how to utilize everyday design cases in the design process.

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Introduction

Many people believe that design skills belong only to designers possessing exclusive knowledge honed at art/design schools. However, several scholars have stated that designing is a fundamental process for most creative work. For example, Herbert Simon (1996) defines designing as relevant not only to designers but to all professionals who adapt their work to meet particular goals for the preferred situation. Donald Schön (1984) insists that no matter what the profession, practitioners—designers and other professionals—work through “reflections in action.” Simon and Schön represent two paradigms in design that consistently state that designing is relevant not only to designers but also to other professionals. Yet, is designing necessarily and always “professional”? Alexander (1964) introduces the concept of unselfconscious design, which states that people unconsciously make a good fit from a misfit as soon as the misfit is recognized. Unselfconscious design, as Alexander explains, was recognized as traditional design before the advent of professional design and is observed in everyday lives. Wakkary and Maestri (2007, 2008) state that people create the best solutions from the boundaries of their artifacts and environments, which can be described as the metaphor of bricolage (Louridas, 1999). Adapting and changing everyday artifacts to improve their fit into people’s environments becomes a part of everyday activity.

Adaptation of designed artifacts to actual contexts has been an important research topic in various disciplines. Studies in the field of human–computer interaction (HCI) have focused on how people accept and appropriate designed technology within given contexts. The ways in which people appropriate technology

has implications for and provides direction to technology design and development (Heyer & Brereton, 2010; Salovaara et al., 2006; Salovaara et al., 2011). The role of user groups in appropriating technology has also been a key issue in the field of Computer-Supported Cooperative Work (CSCW). Studies in CSCW have examined the influence of appropriated technologies (Balka & Wagner, 2006; Dourish, 2003), the balance of the needs of a group and those of individual users within the group (Greenberg, 1991), and the use of technology in social settings (Mackay, 1990). Additionally, sociologists have examined how appropriated technology affects people’s lives socially and have emphasized the importance of the responsible development of technology, given its potential dangers (Bijker, Hughes, & Pinch, 1987; Latour, 1987). In HCI, CSCW, and sociology, most studies investigating technology appropriation have focused on its unexpectedness and have sought to reduce the unexpected nature of technology appropriation.

The same is true in design research. Observation of user behavior has also been important for designers in improving their designs. Here the focus has been on the difference between

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designers' intentions and consumers' experiences. Thus, various communication models aimed at reducing the gap between the two have been explored in the design discipline (Crilly, Maier, & Clarkson, 2008). Carroll, Kellogg, and Rosson (1991) emphasize the co-evolution of tasks and artifacts and the iterative nature of this process. However, the role of actual tasks remains limited to providing new requirements for design. Carroll (2004) expands the design process to actual uses. However, her argument for "designing for appropriation" and "designing from appropriation" remains limited to differences between expected and actual requirements, a limitation that has resulted in a dichotomy between production and use (Suchman, 1994). Breaking from this dichotomous view, this study builds on recent work by such scholars as Suchman and Wakkary by deconstructing the term *user*, defining a user as a more creative and proactive agent. When *use* is detached from *design*, people's behaviors in relation to designed artifacts are no longer the result of design. Rather, they are creative processes referred to in this study as everyday design.

There have been previous efforts to expand the role of user into that of creative agent. In economics, innovation by users has been emphasized as an important model of innovation, one enabled by the Internet and computer technology, allowing non-designers to function as designers. Von Hippel (1986) emphasizes the role of "lead users," who have stronger needs than ordinary users, while Kristensson, Magnusson and Matthing (2002) view creative users as a source of creativity. However, these researchers continue to emphasize certain users in particular: those who have design capabilities nearly equal to those of professional designers. In addition, *open design* allows design to be modified and derived. The core idea of open design is that design should no longer be exclusive but open, particularly to actual end users (Abel, Evers, Klaassen, & Troxler, 2011). Open design still depends on creative people who are willing to design. However, adapting and changing everyday artifacts does not depend solely on creative people but rather involves everyone.

Furthermore, collected cases of everyday thoughtless acts (Suri, 2005) and unexpected behaviors (Brandes & Erlhoff, 2006) have inspired designers to consider actual contexts and people's responses to those contexts. A collection of images of artifact appropriation is a good source of inspiration, as are other visual-centric methods, such as mood boards. Mood boards primarily consist of images at different levels of abstraction

that inspire designers to think laterally about ill-defined design problems, and aid other designers or clients in the early stages of the design process (Lucero, 2009; McDonagh & Storer, 2004). However, the collected images presented by Suri and Brandes are not abstract but rather reveal actual contexts and behaviors, suggesting that the cases in which everyday activities adapt and change everyday artifacts have value beyond providing inspiration to professional designers. Nevertheless, there has been little effort to directly connect everyday activities that adapt and change everyday artifacts, as they are used in actual contexts, to professional design. Therefore, this study first reframes such activities as everyday design and then investigates the value of everyday design in design practices, particularly the process of product design.

Everyday Design

This study is based on the premise that everyone—whether recognized or not—engages in design in daily life. Everyday design reflects the resourcefulness that emerges when artifacts' designs are adapted to better fit into actual environments (Wakkary & Maestri, 2007, 2008). Design researchers have recently described this as design-in-use or design-by-use because the design process "happens" when artifacts are in use (Brandes, Stich, & Wender, 2009; Henderson & Kyng, 1991). Brandes and Eltholf (2006) describe everyday design as Non-Intentional Design (NID), thereby emphasizing unexpected and unintentional modifications that people make to everyday artifacts. Because many terms have been used to denote everyday design, this study specifically uses the term *everyday design* to emphasize the quotidian nature of this activity. Specifically, this study explores worthwhile design activity characterized by transformations of artifacts used every day by everyone.

Differences from Professional Design

Everyday design has several distinct characteristics. First, artifacts used in everyday design have already been professionally designed. Thus, in everyday design, artifacts are not used as creative material but rather are repurposed to perform new functions. For example, Figure 1 displays the wire binding of a table calendar that has been repurposed to hold a USB cable. In contrast, in professional design, the designer designs the artifact by utilizing raw material, such as the rubber material on the left-hand side of Figure 1, to produce a new product. Second, everyday design is characterized by environmental adaptation. Although professional designers consider actual contexts from their research data and their own experiences, everyday designers tend to interact in more nuanced ways within real contexts. For instance, the USB cable example (Figure 1) shows an office environment contextualized by a desk and work materials surrounding a computer, representing the real context of managing a USB cable. Third, everyday design requires no design expertise, such as knowledge of materials or modeling;

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rather, it requires experiential knowledge of artifacts used daily and the environments in which they are used. In using a table calendar to hold a USB cable, the everyday designer recognizes the shape of the wire binding and the width of the space separating the wire loops of the binding as appropriate for holding a USB connector. If the everyday designer had already tried using other products to hold the USB cable and failed, he may have concluded that, among all available items in the office, the table calendar's wire binding had the most appropriate shape for this function. Environmental contexts thus affect the ways in which individuals use daily artifacts, enabling them to practice everyday design. These quotidian features of everyday design emphasize the importance of context and behavior, whereas professional design is centered on function and form.



Figure 1. Holding USB cables in professional design¹ (left) and everyday design (right).

Everyday design is clearly linked to professional design. A designed artifact affords certain possible operations associated with it (Norman, 1990). In Figure 1, a professionally designed wire binding for a table calendar provides physical affordance for the insertion of some other physical item. Regardless of whether the method of insertion is intentionally designed, it is the result of professional design. Thus, everyday design refers to the exploitation, in actual contexts, of affordances designed by professional designers.

Method

Research Hypotheses

Everyday design is clearly distinguishable from professional design. However, everyday design cannot be detached from professional design, as it results from professional design. Thus, we may ask, what value does everyday design have for professional design? Many professional designers continue to believe that everyday design, that is, appropriating artifacts for alternative uses, merely reflects designers' misunderstandings of various contexts or the gap between designers' intentions and people's intentions. From this perspective, the role of everyday design is merely to provide design requirements for professional designers. However, in this study, we recognize

that everyday design is necessary because professional designers cannot anticipate all the various and dynamic contexts in which their designs will be placed (Henderson & Kyng, 1991), and that people, as protagonists of experience, have the right to appropriate artifacts (Heyer & Brereton, 2010). As an expanded design continuum, everyday design is viewed in this study as a more valuable design resource than the provision of design requirements, as a resource to be used along with other resources such as personal experience (Visser, 1995). Therefore, this study explores the value of everyday design in design practice in terms of its use as a design resource in broader contexts.

Everyday design concerns individuals' activities in creating new uses of artifacts in real contexts. An example of everyday design provides insight into the practical contexts that may lead to everyday design and new uses for existing artifacts. In the case of hanging an umbrella on a clothespin (Figure 2), a new action, "hanging things" rather than "holding things" (the use envisioned by professional designers), is found for an artifact (the clothespin). We therefore formulate the following hypotheses regarding the influence of everyday design on professional design:

1. With everyday design, designers can better understand real contexts.
2. With everyday design, designers can better understand people's actual actions with everyday artifacts.

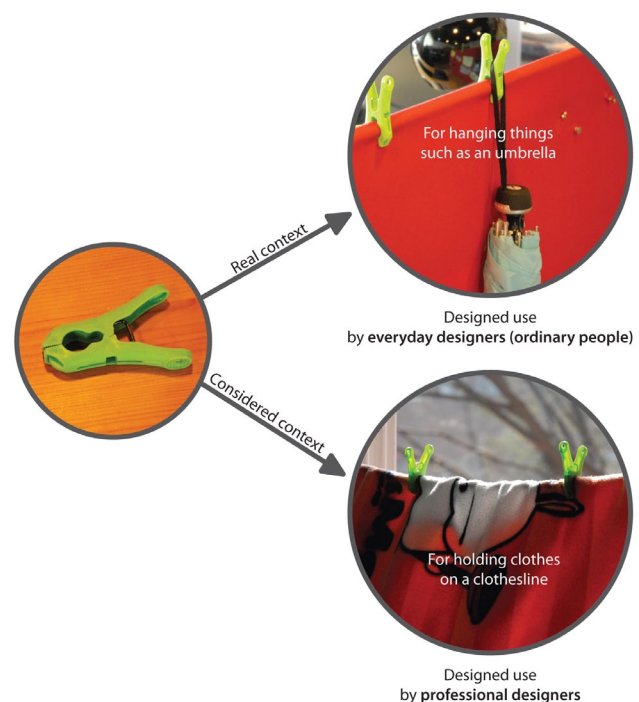


Figure 2. Values of everyday design for professional designers.

To investigate these hypotheses, we first collected cases of everyday design via the sharing platform Wikiuse, and then observed how groups of professional designers created design solutions, using the everyday design cases as a resource.

Collecting Examples of Everyday Design

Individuals who create everyday designs are not aware of the potential value of everyday design as a resource for professional designers, nor do they even acknowledge what they are doing. A sharing platform, Wikiuse², was designed to make people aware of—and consequently able to share with others—their everyday design processes, enabling professional designers to use everyday designs as resources in their design processes.

Wikiuse was developed as a mobile application that runs on iOS4. People can install the application on their Apple iPhones and easily connect to a Linux server by running the application. There were three reasons for building Wikiuse on a mobile phone platform: (1) most people carry their mobile phones at all times, so that mobile phones are the most universally used platform; (2) people can capture and easily upload photos of everyday designs with a mobile phone and do not need to transfer these images to a computer; and (3) as smart phones become more common and their application market grows, providing Wikiuse as a mobile application will allow more people to easily participate in this new platform.

Wikiuse is based on the item–function–picture framework (Kim & Lee, 2012), which represents cases of appropriation with minimal loss of information. People share their cases by inputting their uses of artifacts and explanations of why they used them as they did, as well as by adding images to their descriptions (screen E in Figure 3). Images enrich contextual information and articulate implicit information, which therefore need not be described explicitly. Wikiuse enables users to share information through the “+” buttons in the upper right-hand corners of screens A and B, as shown in Figure 3. In addition to item, function, and picture, Wikiuse allows users to input optional information such as location and tags. Although these optional fields can be left blank, they can also be used to provide supplementary cues to locate particular cases. To reduce the time and effort required to share a case, users can adopt an item or function used in another case using two buttons: “add other function to this product” and “add other product to this function,” as shown at the bottom of screen C in Figure 3.

Everyday Design in a Dormitory

This study first targeted dormitory residents as everyday designers: we collected cases of everyday design from dormitory residents and provided these cases to professional designers to design new artifacts for dormitory residents.

There are several reasons for choosing a particular group of people living under specific circumstances (such as students living in a dormitory). First, it enables professional designers to focus on specific design problems by using data from a distinct participant group. Second, overlapping mutual circumstances often lead participants to value cases more and make information obtained from specific cases more easily adaptable to their own lives. Individuals are also more willing to share their own cases with people in circumstances similar to their own. Third, dormitories are residences with limited space, and most dormitory residents live on limited budgets. Thus, dormitory residents tend to appropriate artifacts relatively frequently, as a lack of resources is the strongest motivation for appropriating everyday artifacts (Brandes & Erlhoff, 2006).

To collect cases of everyday design through the Wikiuse platform, we recruited 16 graduate students—seven males and nine females—who were living in a dormitory. All of the participants were iPhone users and could install Wikiuse on their cell phones. Before beginning the study, we collected dozens of cases through pilot tests involving five individuals to provide participants with examples of the types of cases to share (Solomon & Wash, 2012). The pilot tests were also used to debug Wikiuse prior to the study. We distributed Wikiuse ad-hoc over the air because the then-current version of Wikiuse was a prototype and therefore could not be made publicly available through Apple’s iPhone App Store.

Because participants did not recognize the concept of everyday design, they were asked to share with others any uses of artifacts that they considered worth sharing. They were able to share examples of everyday design without misunderstanding the concept of everyday design, as existing cases in Wikiuse helped demonstrate the idea. Participants were then asked to use Wikiuse every day for two weeks and to share their own everyday design

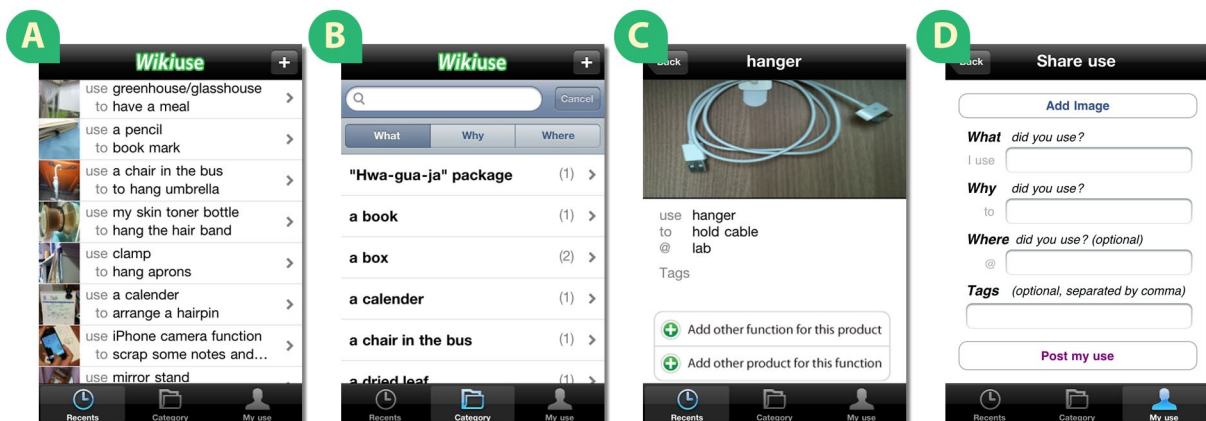


Figure 3. Interface of Wikiuse.

cases on Wikiuse as much as possible. A simple participation manual for Wikiuse—which describes the components of Wikiuse, its input method, and the functions of the buttons—was given to all participants before the study began.

Finally, after two weeks, 245 cases shared by the participants were collected from Wikiuse. The cases illustrate everyday designs from participants' everyday lives: for example, bookmarks (first row of Figure 4), towel hangers (second row of Figure 4), and doorstops (third row of Figure 4). In addition, the collected cases reveal how participants used an artifact such as a hanger for various purposes, as observed in the right-hand column of Figure 4.

Experiment with Professional Designers

This study, which observed product design processes to investigate two research hypotheses, was conducted with groups of product designers. From the cases collected through Wikiuse, we determined that although dormitory residents live on limited budgets, they possess many digital products. Because of limited living space, the wires of the digital products they possess can cause problems by making the living space messy and preventing residents from using their digital products easily. Therefore, we formulated the design problem “managing and organizing the cables of digital products,” which professional designers were asked to solve during the experiment.

In the experiment, each group of professional designers was provided with information regarding the target user group. The target group was students who live in dormitories or in conditions similar to those of the Wikiuse participants. The circumstances that shape the lifestyles of the target group include tight budgets, limited living space, and above-average use of digital products. Professional designers in the experiments were asked to solve problems of “managing and organizing the cables of digital products” for dormitory residents.

Two groups of professional designers were given the Wikiuse cases, while two other groups were provided with related design cases. Comparison of the groups with and without the Wikiuse cases should enable us to understand the influence of everyday design in professional design processes. Each group consisted of two designers who were colleagues from the same company, enabling the construction of a relatively natural setting for the experiment. Team-based experiments tend to achieve better protocols for within-team interactions (Günther, Frankenberger, & Auer, 1996), and most design projects are indeed undertaken by teams. The eight professional designers in the study had one to three years of work experience as professional product designers.

Information about the participants is presented in Table 1. Each pair of groups, that is, groups A and B and groups C and D, was composed of colleagues from the same company. Thus, members of each pair of groups had similar work experience.



Figure 4. Cases collected through Wikiuse.

Table 1. The eight designers that participated in the designer workshop.

Group	Designer index	Age	Gender	Work experience	Products designed	Recently designed products
A	A1	26	Female	1 year 3 months	Electronic pen	Note-taker
	A2	24	Female	1 year 6 months	Electronic pen	Note-taker
B	B1	30	Male	1 year 4 months	Smartphone accessory	Note-taker
	B2	26	Female	1 year 2 months	Electronic pen	Note-taker
C	C1	27	Male	2 years 6 months	Consumer electronic products	Air purifier
	C2	26	Female	2 years 6 months	Consumer electronic products	Air purifier
D	D1	32	Male	2 years 4 months	Consumer electronic products	Air purifier
	D2	31	Male	2 years 10 months	Consumer electronic products	Air purifier

The first and third groups of professional designers, groups A and C, were given the collected cases from Wikiuse (Figure 5), whereas the second and fourth groups, groups B and D, were given the related product cases (Figure 6). To provide a manageable number of cases, the sequentially first 50 of the 245 cases collected from Wikiuse were selected. Each selected case was presented on a 6 x 10-cm printout, as shown in Figure 5.



Figure 5. Selected cases of Wikiuse.

Groups B and D were provided with information about six products that were possibly relevant to this problem, as shown in Figure 6.



Figure 6. Selected related products.

All of the groups were given one hour to design products to solve the design problem “managing and organizing the cables of digital products,” with the request that the final design concepts be drawn as visual representations. We videotaped the entire experimental process, which included discussion, drawing, designers’ gestures, and information management on desks (without interference or direct observation by the authors). All of the workshops were conducted in the same setting.

Groups A and B and groups C and D undertook their design processes at the same time but in different rooms. After one hour of work, each pair of groups was interviewed together in the same room. Before the interview, the moderator explained the differences in the design resources given to the two groups and showed each group the design resources that the other group had been given. Designers were asked about the practical design processes and the resources used by means of the following questions:

1. How was the experiment? Did you encounter any problems in the experiment (particularly with respect to resources)?
2. What are the primary resources used in a practical design process?
3. How do you obtain design resources for users or their contexts?
4. Did you collect first-hand design resources for users or their context? If you did, how did you collect them? Did you use any particular tools in the collection process?
5. If you have collected first-hand design resources for users and their environment, how do these resources differ from the Wikiuse cases?
6. (Groups A and C) Describe your use of the everyday design cases in the design process. What roles did the cases play? How would the process have been different if these cases had not been provided?
7. (Groups B and D) Describe your use of the design cases in the design process. What roles did the cases play? How would the process have been different if Wikiuse cases had been provided instead?

The goal of the interviews was to gain insight into the designers’ thought processes, which could not be recorded on video, and to examine how professional designers use design resources in their practical design processes.

Results

All groups created design solutions. Groups A, B, and D designed solutions in the form of products for managing wires, while group C designed a platform whereby people can share their own cases through the Internet, which is very similar to Wikiuse (Figure 7).

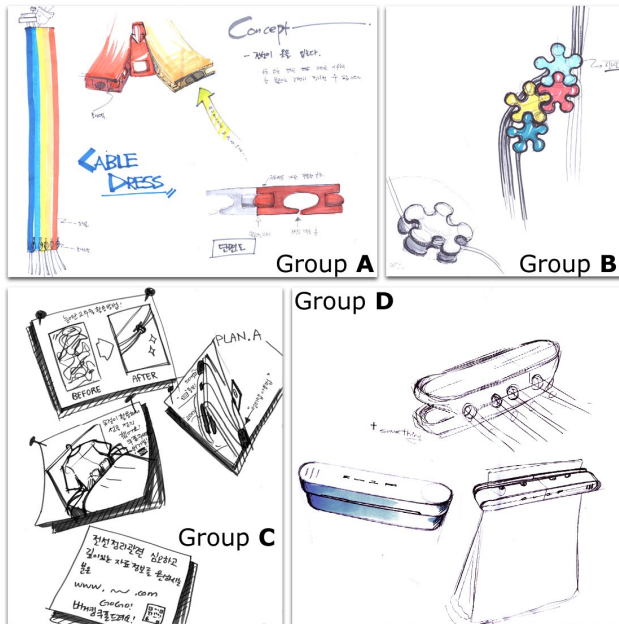


Figure 7. Design solutions.

- Group A: flexible conduits with integral zip fasteners into which users can insert wires and which can be zipped together.
- Group B: reels with serrated flanges, onto which users can coil wires and which can be snapped together.
- Group C: channel through which dormitory residents can share methods of managing wires.
- Group D: all-purpose clip that can be used not only for wires but also for other objects.

Coding the Design Process

From the experiments with four groups of designers, we obtained videos that visually recorded how designers used drawings, memos, gestures, and verbal protocols during the design process. We first viewed the videos and transcribed all of the *visual representations* from drawings and memos, the *verbal and nonverbal (gestural) protocols* of designers, and the *given resources*.

Table 2. Example of open coding and axial coding.

Transcription	Open code	Axial code
C2: (Viewing the case of using a shoe as a door-stop) This is a natural action. (Viewing the case of hanging earrings on the wire mesh of a shelf) Earrings, yes. These people live like this because it is natural.	Natural action Natural	Way of analyzing everyday design Perception of everyday design
C1: Right. Roughly hang and put...	Roughly do	
C2: I think being natural is very important. Helping these people manage wires without them getting entangled. Inducing natural space and actions.	Natural design, helping people without interruption, balance with natural context	Design goal
C1: I managed wires by putting all the wires into a multi-outlet power strip and placing the power strip between the bed and the wall.	Managing wires by hiding wires	Linking personal experience

Next, we coded the data based on *grounded theory* (Charmaz, 2006; Muller & Kogan, 2010). One of the authors first conducted open coding sentence by sentence. Then, to compare everyday design cases with other design resources, one of the authors clustered codes in axial coding (Charmaz, 2006; Muller & Kogan, 2010). This process of coding is shown in the example given in Table 2.

Axial codes indicate differences between the Wikiuse cases and the related design cases in terms of designers' manners of perceiving and analyzing resources. Moreover, the designers working with the Wikiuse cases prioritized different problems compared with the designers working with the related design cases; thus the design processes with and without Wikiuse cases were distinct.

Perception of the Resources

The designers who were provided with related design cases referred to the given cases as "this type of solution," "this way," or "managing like this." These terms indicate that the related product cases were perceived only as solutions to a given design problem. In contrast, Wikiuse cases were variously referred to as "this practice," "these people," "people with this kind of lifestyle," "people in these contexts," and "live like this." Thus the designers perceived Wikiuse cases in terms of target users, the target users' practices, and the contexts in which these practices arose.

Analysis of the Resources

Contexts vs. needs

The designers of group A continuously discussed why people used artifacts in the ways documented in the Wikiuse cases. The designers examined cases one by one and, when they encountered a case they could not understand, reasoned from the context in which the case occurred. For example, designers A1 and A2 discussed the case of using a sticking plaster to prevent a light switch from being pressed as follows:

- A1: What's this?
- A2: For keeping the light on?
- A1: Maybe for keeping the light off.
- A2: Ah! Seems very eager to save energy!

The designers of group C did not ask why people behaved as observed in the Wikiuse cases. However, after thoroughly examining the cases, they characterized people in “these contexts” as annoyed by the effort required to manage wires. Afterwards, the designers of group C did not directly discuss the actual context but instead discussed with confidence the characteristics of the target group, even though such characteristics connote context. Thus, the designers of group C characterized the target group in the actual context without describing the actual context.

In contrast, the designers of group B, who were provided with related design cases, discussed how the design would come out. Designer B2 noted that two of the given design cases are solutions that reflect users’ opinions collected from the Internet. Designer B1 then investigated the needs of the given design cases. The designers of both groups B and D strove to grasp the actual context by discussing the context of the design process more extensively than did the designers who were provided with the Wikiuse cases. Lack of information regarding the actual context made the designers of group B unsure of what types of wires were problematic for the target group. Their protocols indicated that they were confused about the nature of the design problem, as expressed verbally:

- B2: I think this way is better because I had no difficulty in managing wires of mobile products such as mobile phone chargers. Rather, for me, wires around my desktop are annoying.
 B1: You mean that light wires of digital devices are okay, but wires that need to be managed one time are more problematic, right? But look at it this way. You put your iPhone with earphones into your bag. This is a portable use case, but it is also annoying, isn't it?
 B2: Yes, it is. But, I think the problem [the given design problem] does not mean portable devices.

In addition, uncertainty about the actual context led designers to cling to given design limitations such as tight budgets or limited space, which were the sole hints regarding the context of the target group. The designers of group D discussed the implications of a “tight budget” several times:

- D2: This [tight budget] continually troubles my mind.
 D1: Tight budget?
 D2: Yes, I like this idea. But if I live on a tight budget, am I willing to buy this? A dormitory is not solely my place but rather is shared with a roommate. I wouldn't pay for this product.
 ... D1: A tight budget does not mean that they cannot buy anything.
 D2: But if I had 1 dollar and this costs 1 dollar, I would buy other stuff, more important things.
 D1: But these people are undergraduate or graduate students. They have enough money to buy this kind of stuff.

Designers' personal experiences

All designers in the four groups mentioned their own experiences. Interestingly, Wikiuse cases recalled designers’ personal experiences of certain actions, whereas the related design cases recalled experiences of related products. For instance, in the case

of hanging a hair dryer on a towel rack, designer A1 noted that she had done exactly the same thing, and designer A2 noted that she usually hung her towel on a door handle. These two experiences are linked to the action of “hanging.” Similarly, designer C2, when examining the case of hanging a USB cable on a table calendar, mentioned her similar experience of hanging a telephone cable in the gap between the desk and the drawer in her office.

In contrast, the designers of group B mentioned personal experience with given design cases. Designer B2 mentioned that she would not buy the product of case 2 because of its large size. Moreover, designer B1 said that his colleague used the product of case 1 and that it looked neat.

Unremarkable actions

The designers of groups A and C, who were provided with the Wikiuse cases, recognized natural everyday actions from the cases. In the post-interview, designer C2 noted that she would not normally be aware of these unremarkable actions in the usual design process. Designer D1 added that the unremarkable nature of such actions prevents designers from being aware of them, although the actions are very important for creating non-intrusive designs. Being aware of unremarkable actions is also related to recalling identical/similar personal experiences.

Recognizing everyday actions leads to the design of new interactions or products. Designer A1 devised an action, inserting a wire into an aperture, based on the case of using a suction cup for holding a phone charger cable (Figure 8). Designer A2 subsequently created a form, a desk with several slots in which people can hold wires. Later, the designers of group A came up with more ideas for different forms and interactions but finally returned to the action of inserting wires into apertures. They had modified a form from slots on a desk to long zippable conduits, as observed in Figure 7.

Group C avoided designing a new interaction or creating a new form. According to the following discussion, the designers of group C agreed that a new design that suggests a new method for managing wires cannot be mingled with people’s everyday actions.



Figure 8. Case of using a suction cup for holding a phone charger cable.

C2: These give us such insight into natural actions of managing stuff.

C1: Yes, very natural.

C2: Not newly designing but just natural... For us product designers, it is easy to design new products and provide new designs to people. But there are natural things for those people, so we need to adjust our results to them. Be natural as much as we can!

... C2: I think these people do not want a new product. They just hang, insert, and put...

C1: Then how about using these cases as the result?

Thus, the design solution of group C is not a new product but a channel through which a target group of people share their solutions with one another.

In contrast, the designers of groups B and D did not mention everyday actions but rather discussed whether people would willingly use the products of given design cases. In the post-interview, the designers of groups B and D, who were tasked to design without the Wikiuse cases, coveted the Wikiuse cases because of the way they revealed unremarkable actions. They expected that if Wikiuse cases had been provided to them, their final solutions would have been different.

Categorization

The designers of groups B and D, who were provided with related design cases, categorized the design cases. The designers of group B categorized cases in three ways: 1) products for managing mobile cables versus products for managing power cables, 2) products for hiding wires versus products for managing wires, and 3) products that are used repeatedly versus products that are used only once. Similarly, the designers of group D also grouped cases into products for hiding wires, products for exposing designed wires, and mobile products. The designers who categorized cases researched the pros and cons of each group. Afterward, they decided upon a design direction by combining the strengths of each group. In contrast, the designers of groups A and C did not categorize Wikiuse cases.

Prioritization of Design Constraints

All groups were provided with identical design constraints, as follows:

- Tight budgets
- Limited living space
- The use of many digital products

However, the groups prioritized the three restrictions differently. Group A designed a product for managing wires that involves the easy insertion of wires into a designed linear slit. To satisfy the space constraint, the designers of group A avoided designing bulky furniture, and they used cheap material to reduce the price of the product. However, group A continually focused on the need for easy management of wires to be adapted to actual contexts. The designers of group B emphasized “tight budgets” and so sought to design a product that solved many problems simultaneously. In addition, they designed modularized products

that people can buy as needed. Group C designed a sharing platform, not a product, because they concluded that target users are annoyed with the effort required to manage wires. The designers of group C believed that fun aspects of their designed platform would motivate people to manage wires. Finally, group D mostly focused on the tight budget constraint. To solve this problem, they came up with the idea of recycling products from packaging, adding accessories to products already possessed, and multiple-use products. The final design of group D was a clothespin-like clip for holding wires and other items such as clothes and paper.

In summary, groups A and C, who were provided with Wikiuse cases, did not focus on the given design constraints as much as the other two groups. Instead, groups A and C formulated a new design problem, “non-intrusive use,” and were eager to solve this problem. In contrast, groups B and D, who were provided with related design cases, prioritized “tight budget,” which was one of stated design constraints.

Overall Design Process

In summary, differences in the designers’ manners of perceiving and analyzing resources, and of prioritizing design problems, led to differences between the design processes of the groups provided with Wikiuse cases and those of the groups provided with related design cases.

The designers provided with Wikiuse cases first examined all cases one by one. Both groups discussed unremarkable but everyday actions that the designers had not recognized before these resources were provided. Furthermore, the designers inferred the environment in which the target group lived, how frequently particular actions were undertaken in given Wikiuse cases, and why particular actions were undertaken in given Wikiuse cases. Afterward, the designers of group A began to share experiences of their own that were similar to what they observed in the Wikiuse cases, whereas the designers of group C described the target group with confidence. Then both groups engaged in idea generation, during which designers occasionally mentioned the target group and their context by referring to the Wikiuse cases. Interestingly, when the designers of groups A and C rejected or justified an idea, they also discussed the characteristics of the target group, including their environmental and economic conditions, which were inferred from examination of the Wikiuse cases.

In contrast, the designers of groups B and D, who were provided with related design cases, categorized the given design cases. The criteria used for categorization were types of wire and methods of managing wires. When categorizing cases, the designers discussed how people use the categorized products. In cases of managing mobile products, the designers discussed how people coil wires and how often people use these types of products. Afterward, the designers of both groups B and D discussed the actual context and decided which category of product was appropriate for the target group, given the context. Both groups decided to combine two categories and started to think about modes of interaction and form that could be used to mix the two selected categories.

Discussion

Helping Designers Become Immersed in Context

According to Alexander (1964), design is the process of making a good fit between form and context. Hekkert and Vijk (2011) emphasize the “interaction” level, that is, the relationship between product and person, in the product design process. This interaction pertains to how people interact with the product and links to the context that gives rise to the interaction. Hekkert and Vijk’s process, the so-called ViP process, targets future-oriented design projects, whereas the design task in this study focuses on existing problems. However, the product–interaction–context relationship is also found in the design process of this study. When the designers of groups B and D first categorized the design cases provided to them, they considered how users might interact with the various products, and then discussed the actual context. The context led designers to create new interactions by mixing existing actions and thereby achieving the final design solution. This flow is similar to the ViP process, except that it structures the future context from the past context (Figure 9).

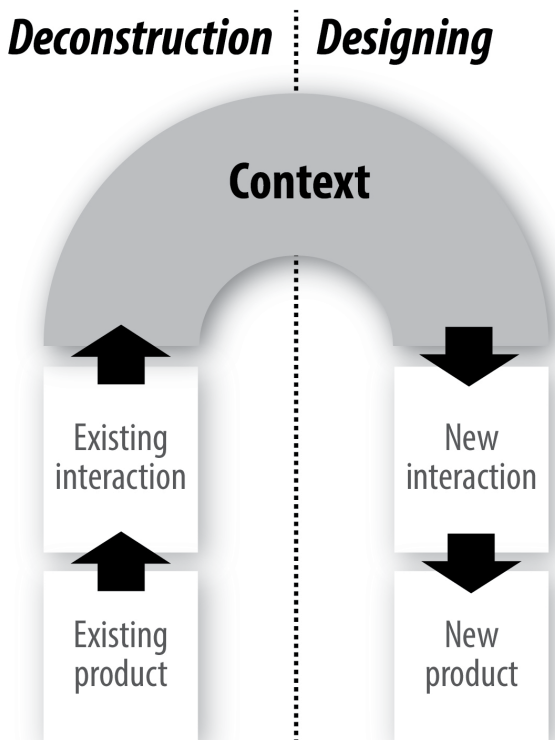


Figure 9. Design process with related design cases.

In design tasking, the designers of groups B and D were eager to grasp the actual context of the target group. The difficulties for the designers in groups B and D are a very common problem in professional design processes. As Alexander (1969) notes, in professional design, which is a self-conscious design

process, designers must conceptualize an actual context in which they are not present and iteratively match their conceptual design to the context. Designers have difficulty shaping a context that they have not experienced. To solve this problem, the design discipline has employed many methods, for example, ethnography, including observations or contextual interviews. These methods enable designers to access live information from actual contexts, but such methods require time and money. Although designers can directly observe target groups and their actual contexts, it is also difficult for designers to grasp a context not from their own perspective but from that of target users. To solve this problem, the scenario method and persona provide designers with ways to draw an actual person within the target group and within his/her actual context to take on that individual’s perspective rather than that of the designer and thus to better grasp the context and its problems. In summary, professional designers strive to reduce the gap between their contextualized contexts and actual contexts.

However, we found that designers provided with cases of everyday design were more immersed in the actual context. The designers examined the actual context when examining cases of everyday design and then described the characteristics of the target group with confidence. After examining Wikiuse cases, the designers did not discuss context, but their references to the target group implied the context, for example, the environmental and economic conditions of the target group. Thus, the designers of groups A and C grasped everyday actions and actual contexts from the cases of everyday design, but the linking to context was implicit, as marked by the light gray arrows in Figure 10.

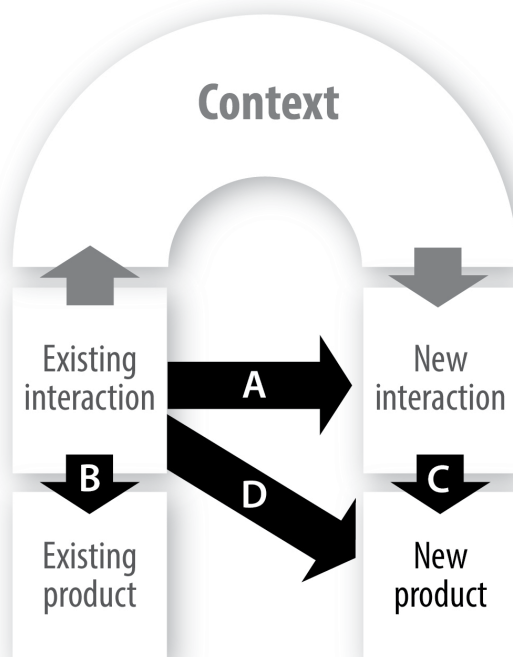
Therefore, based on comparison between the groups provided with everyday design cases and those provided with related design cases, we conclude that everyday design cases, as a design resource, enable professional designers to become immersed in context. Professional designers do not need to conceptualize the context of target users, but they can be absorbed into the context of target users by observing actual contexts with everyday actions through everyday design cases.

Interaction-oriented Design

We may ask: What aspect of everyday design cases enables designers to become immersed in actual contexts? Pictures of everyday design appear to be effective in conveying rich information about actual contexts because they are scenes of actual contexts, and designers tend to be inspired by images (McDonagh & Denton, 2005). If that is so, cases of everyday design have only as much value as pictures of actual contexts, as provided by design researchers or other collectors.

This study, however, reveals that the design process involving everyday design does not start from existing products, although the cases of everyday design include everyday artifacts of the target group (Figure 10). Rather, professional designers first recognized interactions—relationships between actors and artifacts—from cases of everyday design. They thereby understood which products were used for given actions. This indicates that the starting point of the design process in everyday

design is the “interaction of human and artifact.” This is a point that distinguishes the design process in cases of everyday design from the general design process, which starts with the “product” by browsing catalogues to search for related design cases, as all product designers mentioned in the interview session. We thus label processes that start with “interaction” “interaction-oriented” processes.



This interaction-oriented process first enables professional designers to adopt existing interactions for new designs (arrow A in Figure 10). Design requires the creation of new forms and new interactions. Therefore, adopting an existing form or interaction is taboo in the professional design process. Nevertheless, designers provided with everyday design cases were not reluctant to adopt interactions from the Wikiuse cases. This is because the designers in groups A and C did not view actions in the everyday design cases as types of design they could not copy. Rather, the designers appeared to believe that such adoption, by facilitating the design of non-intrusive products, was considerate of the target group—a perspective based on the assumption that new designs based on everyday actions of target individuals can be more easily accepted than designs involving unfamiliar interactions. Therefore, direct adoption of interactions based on everyday design cases is distinct from design based on related design processes. This direct link between an existing interaction and a new interaction or product also obviates the need to link to context, which is a bridge between two interactions, as depicted in Figure 9. It is shown in this study that professional designers provided with everyday design cases described actual contexts less than designers provided with related design cases.

Second, the interaction-oriented process enables professional designers to grasp the relationship between existing interactions and artifacts (arrow B in Figure 10). Designers in group A were impressed with people’s everyday action of “inserting” items into various apertures. The designers of group A thus conceived of the pair, “inserting” and “aperture,” and incorporated this pair into their final design. The interaction–artifact relationship also indicates a “function–means relationship” in traditional design methods such as the object tree (Cross, 1989) and functions–means tree (Tjalve, 1979) methods. Thus, interaction–artifact pairs help professional designers find appropriate means or forms to support specific functions or actions. Designers were thus able to reach a new design, using that relationship as an analogy (arrow C in Figure 10). By following the processes outlined, designers can create solutions directly from existing interactions (arrow D in Figure 10).

In this study, everyday design cases enabled professional designers to become immersed in actual contexts involving unremarkable, everyday actions. This study does not conclude merely that everyday design contains rich information about context and everyday actions. Rather, everyday design involves human–artifact interactions that occur in people’s everyday lives. These interactions convey actual contexts, involving causes of interaction, and enable designers to incorporate particular action–artifact analogies into new designs. This result confirms our research hypotheses and demonstrates how the objectives stated in the hypotheses are accomplished through everyday design.

Expandability and Limitations of Everyday Design

Do the everyday design cases collected from one group of target individuals have value for professional design? Although the cases collected from dormitory residents indicate specific circumstances, namely, dormitory rooms, the residents’ practices and problems—the action–artifact relationships—are common. Inserting an item into an aperture is not an action that is exclusive to dormitory residents. Therefore, we assume that the value of an interaction–artifact relationship is not limited to a specific group of people. However, further study is needed to investigate how universal relationships in everyday design cases are.

The value of everyday design, as revealed in this study, does not imply that everyday design cases are an all-powerful design resource. Design processes that incorporate everyday design are “interaction-oriented,” that is to say, based on interactions that occur in the real world. However, the role of everyday design lacks confirmation for future-oriented design projects in which professional designers must conceptualize a future context based on various other design resources. Moreover, non-intrusive designs are not desirable in all design projects. Rather, many designs require professional designers to creatively design unique but attractive interactions. In such cases, unremarkable everyday actions do not help professional designers. Therefore, the value of everyday design is limited to design projects that involve existing problems and non-intrusive actions.

Wikiuse Cases as Cases of Everyday Design

Cases of everyday design, collected through Wikiuse, were used to help designers understand human–artifact interactions that occur in people’s everyday lives. Our preliminary study (Kim & Lee, 2013) revealed that Wikiuse makes people aware of their everyday design activities—activities not recognized before the use of Wikiuse—and of the value of everyday design. Such awareness is found to lead protagonists to share cases first-hand, enabling the collection of everyday design cases on a large scale and saving designers the trouble of directly gathering them. However, the role of Wikiuse is broader than merely collecting everyday design cases.

Wikiuse requests that people describe an everyday design case by identifying an item and its repurposed function. Here the verb expressing function usually describes an action, except in cases of causative verbs, and the verb “to be” in the passive voice. Each Wikiuse case contains an artifact–interaction pair. Wikiuse cases thus clearly convey the interaction–artifact relationship, which is the core role of everyday design as a design resource. Additionally, Wikiuse cases involve pictures. Each picture in a case conveys tacit information not easily expressed in language. Moreover, a picture includes the context in which everyday design occurs, which helps designers understand the place, space, and products not directly involved in the everyday design case. Pictures of everyday design accessed via Wikiuse thus help designers grasp actual contexts. Additionally, the images supplement word-centric data, items, and functions, and provide methods of inspiration in the form of other visual-centric methods.

There remain limitations to the present version of Wikiuse. First, Wikiuse must provide designers with methods of managing everyday design cases. In this study, Wikiuse cases collected from target individuals were given to professional designers. Professional designers must therefore examine the individuals who participated in Wikiuse and verify whether such individuals are part of the relevant target group. Additionally, the next version of Wikiuse should support the ability to select appropriate cases based on item, function, and contextual information such as location.

Conclusions

This study expands the design continuum to uses of artifacts after purchase, defined as everyday design. This does not involve the mere replacement of a term; rather, the role of everyday design must be considered broadly. The role of everyday design has traditionally been limited; therefore, in this study, we have investigated the value of everyday design as a design resource useful as more than just an indicator of design requirements. To do so, we collected everyday design cases directly from people through the sharing platform Wikiuse, and provided these cases to professional designers. By studying four groups of designers, we showed everyday design to be an important design resource in the professional design process in that it encourages an interaction-oriented design process. In this process, professional

designers recognized non-intrusive, everyday actions and incorporated them into their designs. Furthermore, the everyday design cases conveyed the interaction–artifact relationships present in people’s everyday lives, enabling professional designers to link observed interactions to their new designs. This process, by directly linking the two interactions, also obviates the need to represent the context that is the bridge between existing interactions and new interactions.

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Endnotes

1. Cordies, cable organizer designed by Quirky (for more information see <http://www.quirky.com/products/84-Cordies-Cable-Organizers>)
2. Wikiuse was renamed EveryUse in July 2012 (see <http://www.everyuse.org>).

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