A Taxonomy of Appropriation

Finding a Suitable Method to Explore Design-in-use

Hyangah Kim*, Seungki Kim**, Woohun Lee***

KAIST
*hakim2004@gmail.com, **best79s@kaist.ac.kr, ***woohun.lee@kaist.ac.kr

Abstract: Appropriation has been investigated through various methods in Design. To investigate the characteristics of the methods used to examine appropriation, this study builds a taxonomy with three dimensions and represents the cases with four methods: ethnography, snapshot capturing by designers, snapshot capturing by nondesigners, and experience sharing by the actors of appropriation, according to the discovered dimensions. This study provides the dimensions of appropriation with which researchers can distinguish the characteristics of the research methods.

Key words: Taxonomy, research method, appropriation, design-in-use

1. Introduction

Design involves leading people to use the technology as designed; recently, however, many studies have pointed out that people are naturally using designed artifacts -differently from the ways for which they were designed. When people use artifacts in ways that were not envisioned by designers, their activities are referred to as "appropriation", the so-called "design-in-use".

Various disciplines have explored ways in which people appropriate technology. Sociologists have examined the social impact of appropriated technology on people's lives [1, 11]. In HCI(Human-Computer Interaction), the actual use of an interactive system was an important source to gain the requirement for improving the system [5]. Recently, however, the gap between design and actual use is recognized as users' rights as protagonists of the experience so that the gap is neither a requirement nor a problem for designers. Rather, designers and design researchers were asked to study people's creative use of technology in order to design with appropriation in mind [4, 7, 12].

These studies explore the phenomenon of people appropriating technology by using different techniques. Ethnography is the most frequently used method to examine appropriation, in which researchers directly observe people's everyday lives and interview them during observation. Wakkary and Maestri [15] used ethnography to investigate how families build their own household system by appropriating artifacts. On the other hand, designers observe people's behaviors of appropriating artifacts in the field without inquiring more deeply into the behavior by gathering cases of appropriation. Books about cases of appropriating artifacts have been instrumental in providing inspiration for designers [2, 3, 13]. Additionally, without efforts to collect data on appropriation, researchers have been able to obtain data from blogs such as Thereifixedit.com [14]. The data in the blogs were shared not by researchers or designers but by the protagonists of appropriation or by direct observers—in other words, ordinary people. This kind of voluntary sharing by people is made possible through the specified platforms for sharing cases of appropriation [10]. The characteristics of cases of appropriation vary with the method used to

investigate appropriation. How, then, can researchers select a suitable method of exploring appropriation that meets their research objectives?

In order to understand the characteristics of the methods used to investigate cases of appropriation, we examined cases of appropriation from four different resources: ethnography, snapshot capturing by designers, snapshot capturing by nondesigners, and the platform of appropriation sharing. From the discovered variety between the cases from different resources, we first extracted eight dimensions and conducted a factor analysis to investigate the correlations among the dimensions. This study suggests three dimensions of appropriating artifacts that distinguish the methods of collecting data of appropriation.

2. Method

We collected cases of appropriating artifacts from four different resources: Wakkary and Maestri's study [15], the book Thoughtless Acts [13], Thereifixedit.com [14], and Wikiuse [10]. Wakkary and Maestri conducted ethnography with four families by observing their everyday lives for 460 hours. From their work, we attained seven cases of appropriation and learned their full stories, including processes, reasons, actual actors of appropriating and relations with other artifacts and family members. The book Thoughtless Acts provides information about hundreds of people's actions observed in the field. Each image of appropriating an artifact was recorded by direct observers; however, there was no way to know the actual intentions of the actors. Rather, the author of the book provided text as the inspiration for designs. Among the cases with text, we selected thirty-two cases. In the blog Thereifixedit.com, people posted their cases and observed cases of appropriating artifacts. Most postings consist of a picture and a simple text description, which is expressed as humorous and implicative. From thousands of cases on the blog, we selected thirty-six cases posted chronologically from the first case. In the same manner we used with the blog, we also obtained thirty cases from Wikiuse [10], which is a mobile-based platform for sharing cases of appropriation. In total, we had attained 105 cases of appropriation from four resources.

2.1 Assumed dimensions as hypotheses

To define the characteristics of the four methods used to gather the cases of appropriation, we first extracted eight initial dimensions of appropriation from the collected 105 cases based on grounded theory [6]. We then rated the collected cases according to the initial dimensions on a 3-point scale: high, medium, and low.

2.1.1 Divergence from the intended place

In the process of design, designers consider the place where the result of the design will be used and anticipate its context. However, appropriation does not always occur only in the intended place. Among the collected cases, many occurred in unexpected locations. Therefore, we considered the distance between the place where the appropriation occurs and the place the designer intends to use as the first dimension of appropriation. However, it is difficult to measure the divergence from the intended place because many designs do not have explicit intentions to be used in certain locations. Therefore, we considered marketing intentions and used common sense [8] to measure the divergence between the intended location and the actual location, in addition to the designer's explicit intention.

2.1.2 Divergence from the intended actor

Similar to the intended place, the target user is set in the design process. However, appropriation is conducted not only by target users but also by unintended users. Therefore, we chose to examine the divergence of the actor

who is appropriating the artifact from the intended users as the second dimension. In measuring this dimension, we also considered marketing intentions and popular assumptions to measure the divergence between the originally intended actor and the actual actor, in addition to the explicit intention of the user.

2.1.3 Divergence from the intended form of the object

Forms of using the designed artifact are designed, but they can also be changed. Some cases of appropriation create new uses of the artifact in an intended form. Using a cup to collect coins is an example of this. On the other hand, appropriations can involve changes in the form of using artifacts. Placing an iron upside down to use as a hot plate is an example of changing the form of use. Furthermore, appropriation also changes the entire structure of the form, such as cutting the top off a plastic bottle to use as a cup. Therefore, we assumed this level of change from the original design of an object as a dimension of appropriation.

2.1.4 Necessity of appropriation

The motive for appropriation differs in each case of appropriation. Some cases display an urgent need to appropriate artifacts, while others occur just for fun. The level of necessity of the action is assumed as a dimension of appropriation.

2.1.5 Degree of expertise demanded

Henderson and Kyng [9] explained that tailoring requires the tailor's expertise; however, there are also many cases of appropriation that do not require any expertise. The degree of how much expertise is required in appropriating is one potential dimension of appropriation.

2.1.6 Amount of time and effort demanded

Appropriating occurs both immediately and over time. Immediate appropriation looks similar to the reaction to a certain context, while prolonged appropriation is much closer to the work of design. Therefore, we assumed the level of time and effort taken in appropriation as a dimension.

2.1.7 Novelty of the result

The result of appropriation often creates new concepts that do not exist in the market. In addition, some cases of appropriation simply replace an existing design. We looked at the novelty of the outcome of the appropriation and chose the level of this novelty as a potential dimension of appropriation.

2.1.8 Durability of the result

The result of appropriation can be temporary or somewhat permanent. How long the outcome of appropriation lasts was assumed as the last dimension of appropriation..

2.2 Rating collected cases

Two individuals who acquired the assumed dimensions in advance rated 105 images according to eight dimensions. After rating, to arbitrate the difference between the two raters, they met and discussed the grounds for their results. Finally, we arrive at the rating that both raters have agreed upon.

3. Analysis and Results

3.1. Principal Components Analysis

We conducted a factor analysis to examine the associations between eight assumed dimensions. We first performed Bartlett's test of sphericity for determining whether all assumed dimensions are uncorrelated and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy to see if the results of the ratings could be used for the factor

analysis. We then determined the number of the extracted factors by having the eigenvalues over 1. Finally, we rotated the component matrix to achieve the simplest pattern of factor loading with the VARIMAX algorithm.

Bartlett's test confirmed the uncorrelatedness of the variables ($\chi2 = 188.621$, df = 28, p < 0.001). The sampling adequacy was 0.620, according to Kaiser. All variables showed a communality value over 0.30. Kaiser's criterion suggested three principal components, which can explain the 61.664% of the total variance.

Table 1. Principal Components Analysis

Assumed dimensions	Principal Components		
	1	2	3
Time and effort demand	.874	.147	.013
Expertise demand	.796	.175	.098
Divergence from the intended form of the object	.717	.037	-.039
Durability of the result	.544	-.333	-.474
Necessity of appropriation	.313	.162	.138
Divergence from the intended location	.038	.841	.051
Divergence from the intended actor	.287	.733	-.133
Novelty of the result	.157	-.122	.891

C1 (30.175% of variance): This component involves five assumed dimensions: time and effort demanded (0.874 of factor loading after rotation), expertise demanded (0.796), divergence from the intended form of the object (0.717), durability of the result (0.544), and necessity of the appropriation (0.313).

C2 (18.125%): This component describes two assumed dimensions: divergence from the intended location (0.841) and divergence from the intended actor (0.733).

C3 (13.363%): This component explains an assumed dimension, the novelty of the result (0.891).

3.2 Mapping cases to extracted components

From the factor analysis, we acquired factor scores of 105 cases for three principal components through a regression analysis. We mapped the cases with saved factor scores to three dimensions of components.

4. Discussion

4.1 Defining three dimensions

The first component, (C1), describes how serious the action of appropriation is. Serious appropriation requires more expertise, produces more changes in the shape of the appropriated object from the design, lasts longer than easy appropriation, and results from more necessary needs. Therefore, we defined this component as ***seriousness*** of appropriation. Divergence from the intended location and the intended actor significantly loaded to the second component, (C2). It indicates the distance between the designed context and the actual context, since context involves both the location and the actor. In other words, it refers to the level of unexpectedness of the context in which the appropriation occurs. Therefore, we addressed this component as ***unexpectedness*** of the appropriation. The last component, (C3), explains the ***novelty*** of the result. With the defined three components, we achieved three dimensions of appropriation for a taxonomy (Figure 1).
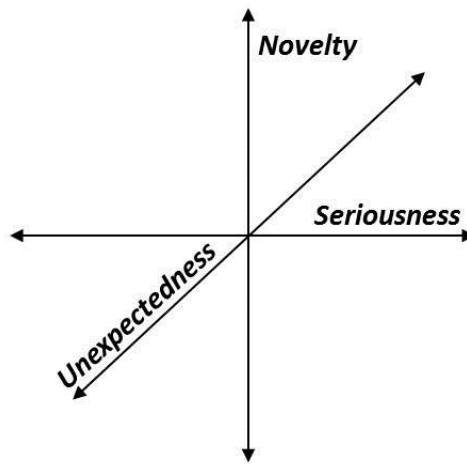
Figure 1. Three dimensions of appropriation: seriousness, unexpectedness, and novelty

4.2 Characteristics of methods

The results of mapping the collected cases to three dimensions discovered the characteristics of the method of investigating the cases of appropriation. To visualize the results in a simple two-dimensional matrix, we separated three dimensions into two matrices (Figure 1): seriousness-unexpectedness and novelty-unexpectedness matrices. We represented four resources as four eclipses with the average (the center of each eclipse) and standard deviation (the height and width of each eclipse) of cases from each resource.

Three dimensions discovered that the cases from Wakkary and Maestri's work [15] are slightly serious and slightly novel appropriations that occurred in the intended context. However, compared to others, these cases have a high standard deviation, which means that there is variability in the values of the three dimensions. This is because the authors intended to explore various types of appropriation, and the cases represented in the paper are from each pattern, which covers different characteristics. This means that the participatory ethnography explores various types of appropriations, and researchers can intentionally focus on a certain type of appropriation.

The cases from the book *Thoughtless Acts* [13] are discovered to be light but novel appropriations. The cases collected from the blog Thereifixedit.com [14] present serious appropriations occurring in an unexpected context. Finally, the cases shared through Wikiuse [10] are revealed as light and ordinary appropriations in an intended context.
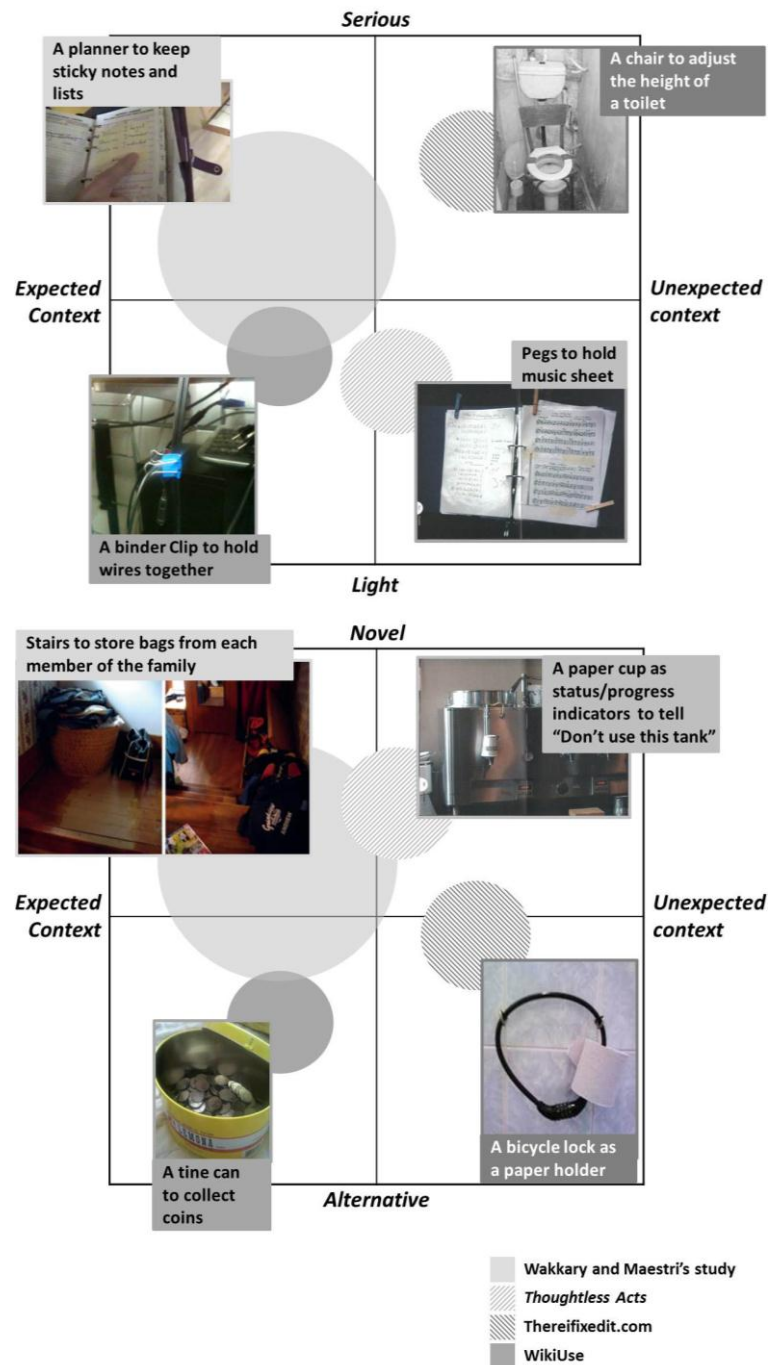
Figure 1. Seriousness-unexpectedness and novelty-unexpectedness matrices

Even though three dimensions distinguish four methods, these distinguished traits need to be verified with more data collected through each method to be declared as the characteristics of the methods. However, these three dimensions prove that they are useful to distinguish the characteristics of methods and provide the possibility of using them to define the nature of methods of investigating cases of appropriation with more data.

5. Conclusions

This study collected cases of appropriation using four different methods—ethnography, snapshot capturing by designers, snapshot capturing by nondesigners, and experience sharing by actors of appropriation—and extracted the initial eight dimensions of appropriation to distinguish the characteristics of those methods. A factor analysis of the results from rating the collected cases, according to the initial dimensions, discovered three dimensions of appropriation: seriousness, unexpectedness, and novelty of the appropriation. With these dimensions, we presented a taxonomy of appropriation and distinguished the characteristics of the four methods. Future work will expand this taxonomy with more cases of appropriation from these four methods as well as other methods.

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7. References

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