
Studying Appropriation of Everyday Technologies – a Cognitive Approach

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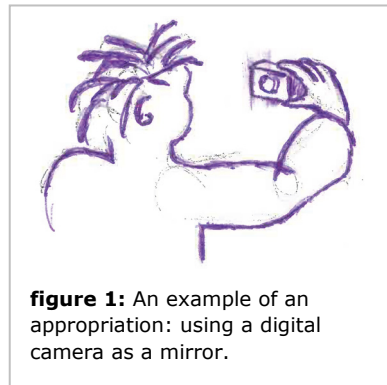


figure 1: An example of an appropriation: using a digital camera as a mirror.

Abstract

The ways in which users appropriate uses of technology – or invent new ones – have attracted interest in CSCW-oriented research, but much less has been written on its cognitive foundations, although concepts such as practical problem-solving, perception, and action are central to its understanding. I attempt to address this gap here by triangulating the phenomenon both theoretically and methodologically. In this paper, a reflection of the process provides a starting point for a study with a more focused research question.

Keywords

Appropriation, cognitive science, methods.

ACM Classification Keywords

H5.2 Information interfaces and presentation (e.g., HCI): User Interfaces - Theory and methods

Introduction

The term “appropriation” is applied when users invent ways to use technology for purposes that they had not considered before. For instance, this is seen when a digital camera user realizes that a camera can be used as a mirror by stretching out the hand and taking a photograph of one’s face (see Figure 1). Once learned, this use will be helpful also in many future situations. Appropriations therefore expand the usefulness of technology and are a positive HCI phenomenon.

In HCI, appropriation has been studied mostly within the CSCW context, focusing on its social dimensions: how users learn new uses from each other, how they promote and distribute them, and how the use is mutually negotiated [1, 3, 7, 8]. In addition, to inform the design for appropriation, also guidelines and principles have been presented. They usually emphasize the need to support learning from other users; to allow users to form multiple interpretations of technology; and to provide openness, configurability, and tailorability (e.g., see [2]).

However, the *cognitive dimension of appropriation* has not received equal attention. Learning, creativity, practical problem-solving, perception, and action are central concepts if one wishes to understand what takes place during appropriation. For instance, in the example given above, the user may have realized without anyone's help that a camera can be used in place of a mirror, but what process led to this invention? No studies in HCI exist that would address this question specifically; thus, no method or empirically grounded theory for the cognitive approach exists.

This gap is the reason for my studies on appropriation with a cognitive orientation. The purpose is not to contest the socially oriented views but to complement them with new understanding. I approach appropriation with the following questions in mind:

- What cognitive processes contribute to events when a user finds a new purpose of use for technology?
- How do these processes operate?
- How can these findings be made useful for HCI?

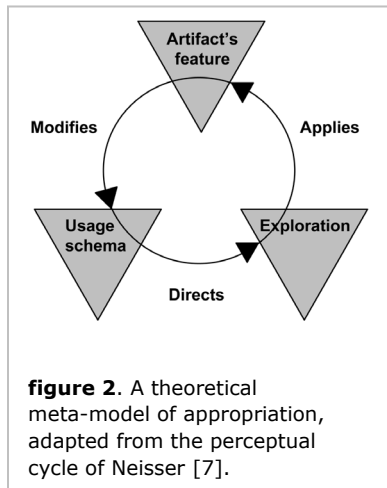
These questions are investigated in studies concerning everyday technologies, such as mobile phones and digital cameras. Individuals' appropriations are easier to observe in this context than in the workplace, where prescribed ways of use, negotiations, and practices learned together often play a central role. Below, I describe the work conducted thus far and the current understanding of what constitutes the most important question remaining to be answered.

Triangulating the phenomenon

Appropriation can be regarded as an emergent, unexpected, and situated phenomenon, which leads to methodological research challenges. For example, a researcher cannot ask users to appropriate if they do not perceive a need to do so, or ask them to explain how they appropriate. Also, it is often hard to predict when and how a new purpose of use may be found.

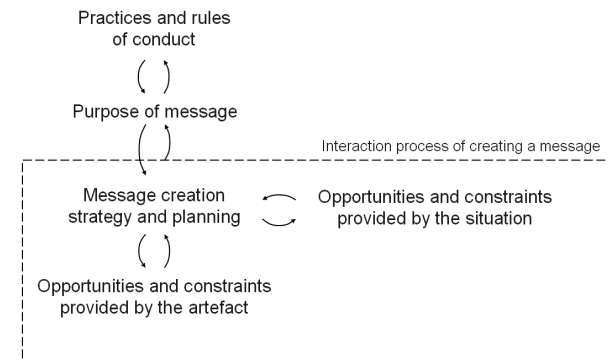
These constraints do *not* mean that appropriation need be researched only via open-ended studies and *post hoc* reflection. I have approached the challenge through triangulation: carrying out studies from different angles to identify a specific research topic for closer scrutiny. When found, such a topic will be relevant to appropriation research in more than one way and allow for a systematic methodological approach. So far, the following studies have been completed or are in progress:

- *Analysis of interaction in naturalistic settings.* A mobile group media application, mGroup, was studied in an open-ended field trial with 12 users. This revealed patterns of collocated interaction (grabbing, showing the content, etc.) that turned the individual-oriented phone into a group object [9]. However, the observa-



tion-based method proved too unstructured for studies focusing specifically on appropriation.

- *Repeated interviewing.* Another methodological approach was applied in a nine-week study of the mobile comic strip creator Comeks.¹ Users were interviewed at 2–3-week intervals about their message exchanges. Ethnomethodological literature (e.g., [4, 5]) was used to conceptualize this process, in which a user, through experience, learns to perceive a system's functionalities as new resources for action [10].
- *Theoretical reflection.* To describe appropriation with concepts from cognitive science, the notions of schema and perceptual cycle from ecological psychology [7] were applied for conceptualization of appropriation as an interplay of perception, action, and user's representations of technology (usage schemas – see Figure 2). They were found useful especially for modeling appropriations that resemble practical problem-solving [11].
- *Re-analysis of interview content.* The usage schema concept allows for re-analysis of the Comeks interviews (in progress). The interviews can be segmented into cognitively relevant segments, including, for example, narratives about moments when new features in Comeks were learned. Via qualitative analysis of hundreds of excerpts, I have developed a model for an interaction process that leads to new means of use. The model also binds together the socially and cognitively oriented findings on appropriation (see Figure 3).
- *Web survey for evaluating the relative importance of different explanatory factors in appropriation.* The web survey is the third methodological triangulation for appropriation. Its purpose is to evaluate different individual-based factors that can explain active appropriation. Among these are for instance curiosity about try-



ing the technology in different settings, being very reflective about one's use practices, having an accurate mental model of how the technology works, and tending toward *ad hoc* uses of technology. A quantitative web-based survey (in progress) will investigate how well each factor correlates with a set of non-obvious uses of a digital camera (the use as a mirror being one of them). The tentative findings from pilot studies suggest that having an accurate mental model of the technology and its surrounding technology ecology is the most important factor in active appropriation – in fact, even stronger than, for example, learning from others.

It is important to notice that the models in Figures 2 and 3 actually describe the same interaction process. The dashed box in Figure 3 describes in more detail, in the context of multimedia message creation, what goes on during the stages of exploration and application in Figure 2. The appropriations resulting from this process

¹ www.comeks.com

can be understood as changes to or new formations of the usage schema in Figure 2.

All in all, apart from the first case study, the studies seem to highlight the importance of how functionalities of technology are perceived and understood, prompting the following research question: *how does the user perceive and make sense of how the functionalities of a tool are connected with other tools, the user's goals, and characteristics of the situation?* This question is relevant to both HCI's understanding of users and the need to fill the gap in current appropriation research.

The next study

In order to research perception of functionalities, a suitable everyday technology needs to be found whose characteristics are open for experimentation and observation. More precise answers than in *post hoc* analyses of what takes place (such as in the Comeks-related studies above) could be gained by manipulating the interface of a chosen technology to test specific hypotheses. A search for such a technology is under way. Another possibility is a study based on "cognitive interviews" concerning the technology, before and after a period of use, and comparisons of users' understanding of how the system can be used for everyday tasks.

If successful, both of these studies have potential to anchor appropriation to existing understanding of cognition in HCI and also provide insight into how appropriation can be addressed in interaction design.

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