

Aspects of Everyday Design: Resourcefulness, Adaptation, and Emergence

Ron Wakkary and Leah Maestri

School of Interactive Arts & Technology, Simon Fraser University

This article discusses how families appropriate artifacts and surroundings that lead to the design of everyday household systems, such as combining a chalkboard, a door frame, and a hanging basket with paper and sticky notes to manage lists and messages. Such systems continually evolve through the catalytic pressures of individual actions and design-in-use. The article reports on a study of four families in which the concept of *everyday design* in the home was being researched. In-depth descriptions and discussions of the observations and patterns are presented. The design implications of this study are also discussed. The research contributions are an explanation of everyday design as a novel way to understand interactions and routines in the home, descriptions of the key actions and process in everyday design, and the need to reconstruct the user in the sense of an everyday designer.

1. INTRODUCTION

In this article, we discuss the role of creativity in *everyday design* actions and its implications for designers. We examine a form of creativity that is part of our everyday experiences—what the pragmatist philosopher John Dewey (1934) referred to as our constant *doing* and *undergoing* in which we adjust to our surroundings and our surroundings to us. Creativity is discussed as resourceful, adaptive, and emergent over time, manifest through actions and routines that appropriate artifacts and our environment leading to unique design situations and systems.

Recent studies of the home have focused on issues of communication among family members (Crabtree & Rodden, 2004), domestic technologies (Blythe & Monk, 2002), ubiquitous computing (Tolmie, Pycock, Diggins, MacLean, & Karsenty, 2002),

This article is based on an earlier published version (Wakkary, 2007). We are grateful to the families who participated in our study and opened their homes to us. We acknowledge the support of this research through a grant from the Social Sciences and Humanities Research Council of Canada. We also thank the many collaborators in this research, including Madison Poon, Travis Kirton, Karen Tanenbaum, Corey Juhlin, and Ryan Betts.

Correspondence should be addressed to Ron Wakkary, School of Interactive Arts & Technology, Simon Fraser University, 250-13450 102 Avenue, Surrey, British Columbia, Canada V3T 0A3. E-mail: rwakkary@sfu.ca

and disciplinary concerns of methodology and accounts of the home (O'Brien & Rodden, 1997; Taylor & Swan, 2005). This article builds on the previous studies by describing the process of evolution in the creation of everyday design systems. Previous research importantly identifies appropriation and design-in-use (Henderson & Kyng, 1991) in the home; we aim to go further by understanding and describing the actions and dynamics behind these concepts. In addition, we provide a new rubric for users that make explicit their role in ongoing design through use. We describe home dwellers as everyday designers who remake or modify systems and who use design artifacts and actions around them as design and creative resources.

This article makes the following three contributions:

1. Presentation of everyday design as a novel way to understand interactions and routines in the home. In this view, the traditional understandings of use and design are too limited, and here reconsidered in the notion of design-in-use. Design-in-use is understood as the ongoing design and change through the use of artifacts and surroundings. The lens of everyday design extends the actions of design into use and considers design as a continuum in which professional designers share space with others in part of the design cycle.
2. Descriptions of adaptation through appropriation of artifacts and surroundings as a key action in everyday design. Appropriation is the remaking through use of design artifacts and structures in ways that were often not intended. Such actions are creative and lead to adaptation and evolution of unique design systems.
3. Identify the need to reconstruct the understanding of the user into a proactive and creative agent that is part of a design continuum to allow for adaptation in the use of interactive and information technologies.

We conclude with a discussion of possible design implications that includes the radical limiting of our constructions of the user, setting appropriation as a design goal for interaction design artifacts, consideration of artifacts as design resources to be creative material for further design, and reconsideration of a generic approach to technology because everyday design systems evolve to be highly unique.

2. METHODS

Our study included four families with young children ranging from 2 to 13 years old. The families consisted of two married couples and two mothers with live-in partners. The parents' professions included elementary and high school educators, a legal aid worker, a retail grocer, and an electrician. The study occurred over two 5-month periods with more than 460 hr of observations and interviews and with a team of researchers including three ethnographers; see Wakkary et al. (2007) for more details on our method. Our study employed design ethnography, which is distinct from ethnography in that the aim is not to create holistic representations of entire cultures or subgroups, but rather the focus is on generating accounts of specific social activities and interactions in which design is present within the observed interplay of artifacts, people, and contexts.

The design ethnography study was structured in three sequences: (a) developing a relationship with participants with the aim of the ethnographer shifting along the continuum from an observer to a participant; (b) focused data collection, looking for design related routines and activities; and (c) directed open-ended interviews and video walkthroughs aimed at members of the families explaining targeted routines, actions, and artifacts. Our process revolved around *sessions*. A session is a single visit by an ethnographer (typical sessions were 1 to 3 hr). Ethnographers participated in three to four sessions a week.

We utilized pattern language as a representational and analytical tool, similar to other fieldwork studies (Crabtree, Hemmings, & Rodden, 2002). Based on our gathered data and analysis, we created a working pattern language for our study that included 50 related patterns. A significantly smaller number of patterns directly describe everyday design.

2.1. Examples from the Homes

From our observations, we present several of the patterns that illuminate aspects of everyday design and especially the role of creativity in the appropriation of design artifacts, adaptation to the contingent nature of routines and systems in the home, and development over time of a given system. We have clustered our observations into three groups: *resourcefulness*, *adaptation*, and *emergence*.

Resourcefulness. We encountered many examples of families' appropriating artifacts in their environments and putting them to new and expedient uses. In certain cases, expediency gave way to integrating actions and artifacts into ongoing routines and systems.

The pattern *hanging jackets on chairs* characterizes a set of recurring observations of the repurposing of artifacts. The significance of the pattern is that readily available artifacts are used temporarily in a manner different than their original intent. For example, as the pattern name suggests, we often hang jackets on the backs of chairs. Although such uses are viable in the short term, they are typically less so in the long term, that is, a chair would not function well as an ongoing coat rack. During a session with Ryan and Janis, the family was gardening in the backyard. Ryan is a high school social sciences teacher. Janis is a legal aid worker. They have two sons, ages 8 and 10, and a daughter age 13. We observed that two plastic lawn chairs served as ready-to-use tables. On one chair, a coffee cup rested on the seat. Nearer to the far end of the yard, on another lawn chair was another coffee cup on the armrest, along with a newspaper, toys, and phone on the seat (see Figure 1). This example shows simple actions of appropriating artifacts by discovering and exploiting their affordances, such as the flat surfaces of the chairs.

Similar to the previous pattern, *making use of the half wall* is another pattern of reuse. The significance of this pattern is finding a role or new role for a structure in the environment. For example, each house in our study contained half-height walls. The tops of these walls were almost always put to use, if only by temporarily resting items on it. Timmie (Ryan and Janis's 8-year-old son) was



FIGURE 1 Two lawn chairs used as temporary garden.

often concerned with cleaning and organizing the house. Despite being unable to naturally reach the upper cabinets in the kitchen, he found a way around this problem. When Timmie emptied the dishwasher, he would remove the dishes and pile like items together on the counter. He would pull open the lower cupboard door and use the shelf in the cupboard as a step to climb onto the counter (see Figure 2). He would then kneel on the counter, open the upper cupboard door, and place the stacked dishes inside. Afterward, he would climb down, remove more dishes from the dishwasher, and repeat the process. 120

Timmie's actions show how resourceful use of artifacts and environments can become routine, that is, more integral to daily life than the expedient and temporary uses illustrated earlier. We were also able to trace how expedient and routine use can evolve into an ongoing system of organization. For example, Ryan and Janis utilized a series of *hanging jackets on chairs* and *making use of the half wall* patterns in sorting their many sports items. Ryan and Janis have a very active family that takes part in running, soccer, karate, dance, racquetball, and swimming. 130

The stairs to the second floor have a small landing facing the front door of the house, and it extends partly into the front foyer creating a small alcove to the side. Except for Janis, each member of the family has a bag for different activities, like a soccer bag for Andrew (Ryan and Janis's eldest son) that contains boots, shin pads, shirts, and so on. Spaces in the front foyer and stairs are invisibly mapped to each family member to place their respective sports bags. The boys' bags scale the left side of the stairs to the top of the landing. Ryan's bags tend to occupy the lower stairs on the left side. Brenda (Ryan and Janis's daughter) places her dance and soccer bags on the landing either against the wall or on the right side (see Figure 3). If a sport is not in season, the bags are stored away in the bedrooms. Neither Ryan nor Janis are sure how the system evolved. Ryan believes it started with his racquetball bag that he has had for 15 years and probably always left by the front door. Janis thinks she might have come up with the idea. They agree that the children became a part of the system when Brenda and Andrew received soccer bags from their leagues with their names on them. At any rate, 145



FIGURE 2 Timmie using the cupboard as a step as an example of making use of the half-wall pattern.



FIGURE 3 Brenda's dance bag is on the landing (left); Ryan and the boys' bags are on the stairs (right).

they all agree it works for the fact that everyone seems to follow the system and it is easy to figure out.

The point we wish to emphasize through these examples is the family's resourcefulness in using artifacts and their physical surroundings. Resourcefulness in everyday design can be expedient and temporary; it can also form the center of ongoing routines and can be combined to create long-term systems. The activities described are familiar to all of us and therefore may be overlooked. However, on close examination the actions represent specific responses to a particular setting and the results are typically unique. In the next section, we describe how systems adapt as situations change and the uniqueness of individuals provide positive catalytic pressures.

Adaptation. We observed systems that are in varying degrees dynamic yet comprehensible and usable to all in the family. In this section, we describe how others impinge upon and change systems and how evolved use enable systems to adapt.

Cate is an art and theater teacher in high school. She has joint custody of her 10-year-old son, Alec. Alec collects and plays Warhammer, a role-playing game consisting of war figures and models. One session, Cate showed us Alec's Warhammer items in the family room. They were mostly on the floor. She told us that they used to be on the coffee table. Cate's mother bought Alec a table and metal tins to organize her grandson's growing collection of Warhammer figures and accessories. The tins were meant to store the individual armies, and the table was where he was to play. However, Alec did not use them in this way. The table and some of the tins were in his room. A tin of Warhammer paints was on the kitchen table. Some figures were stored in the tins, but much of it lay around. Cate admits, "Alec seems to have his own system." It is Cate that tries to maintain the system her mother's purchases suggest, and not Alec for whom it was intended (see Figure 4).



FIGURE 4 Cate organizing Alec's Warhammer toys.

This example illustrates the pattern, *going solo*. The pattern describes an individual approach that works exclusively for one person in a family, regardless of its impact on other members of the family. The impact can be negative, as in this example. *Going solo* actions critique an existing design or signal a change in a family member that may require some adaptation. The *going solo* actions provide an alternative that may operate in parallel or is targeted at creating change. 180

Beck is an electrician and a musician, and Kerry manages the home and works part-time as a retail grocer. They have two sons aged 3 and 7. Beck had been organizing the kitchen area where things and papers ended up, typically on top of the refrigerator, an open shelf dubbed the “microwaveless shelf,” and a toy basket shelf. As Beck put it, “Everything’s a fridge,” meaning things get piled 185 anywhere as they do on the top of the refrigerator. After several attempts at tackling the open shelf, Kerry removed most items and placed a framed picture in the shelf to prevent people from putting more stuff there (see Figure 5). This is an example of *going solo*, as Kerry intervenes in Beck’s organizing in order to target 190 a desired change.

We can see from the previous examples that Alec and Kerry communicated or provided alternatives through actions of use. In the next example, the *going solo* uses have become incorporated into a system over time, the family phone book. Janis discusses the family phone book (see Figure 6): 195

Janis: And someday it [family phone book] will all go in here. [She picks up the new blank phonebook.]

Interviewer: Do you want to talk a little more about this book?

Janis: Well, Lori, I was ready to move on but Lori likes the book.

Interviewer: Yeah, why’s that? 200

Janis: I don’t know. She’s sentimental about the book because it’s always been here. It’s got all the kids . . . [She puts it down on the table and points to parts on the front page.] It’s got emergency numbers . . . and doctors . . . and banks . . . community center, pools, and our work contacts. That’s the first page. And *then* it’s got everybody alphabetical—it’s got ferries . . . and music lessons, so things we needed, I mean for caregivers. And then it’s got everybody in alphabetical order . . . but then it’s got the kids by friends . . . and family. And that was Pat. [Janis points at a number on the last page.] I kept that because it has some kid context. 205

Interviewer: uh-huh

Janis: And that’s that. And someday it will go in here. [She points to the new book.] 210



FIGURE 5 The “microwaveless shelf” (left) prior to Kerry’s *going solo* action of placing the picture frame on the shelf (right).



FIGURE 6 Ryan and Janis’s family phone book, which has been shaped through use and the incorporation of diverse individual needs.

As Janis describes, the first page has emergency numbers, family, and work contacts. The second page has information for lessons and numbers for ferries. The next few pages have various numbers in alphabetical order as is typical of most phone books. Less typical, is that the second-to-last page has the children’s friends’ numbers, and the last page has more numbers that Janis or Ryan found important at the time. Janis comments that Lori, a friend who takes care of Janis’s children (and who was also part of our study), wants to keep the phone book. Although Janis wants to transfer the information into a new book, this has not happened yet. In fact, new numbers, such as the ethnographer’s, continue to be stored in the old book.

The phone book incorporates many individual needs, from caregivers to the children to the parents. It appeared to us that each of these influences changed and shaped the structure of the book into its unique form through design-in-use. The book has changed over the 9 years of use by adapting to the pressures of use and individual needs. Of interest, Janis herself is not aware of the value of these changes, yet she implicitly sees the value. Despite wanting to replace it, she continues to use it.

Emergence. In the pattern *cocoon*, we described artifacts that change over time from the family member’s original intended use to another. An example of this is a hanging basket that Lori purchased. Lori is a part-time primary school teacher who lives with her 5-year-old son and, during the time of our study, a live-in partner named Abe. Lori explains that at first the basket was meant to be a fruit basket for vegetables and fruits; through time, it evolved as a place to put “urgent mail and notices” as part of her overall approach to organizing messages. In this case, Lori’s use of the artifact caused it to change and adapt. We found that *cocoons* typically go through a stage in which they are being used in such a different

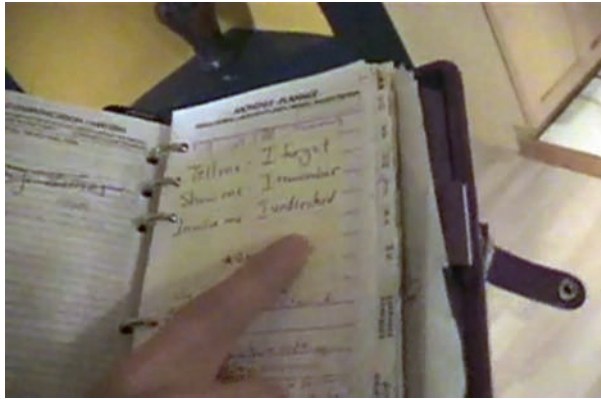


FIGURE 7 Lori's planner, which she "never used properly." Lori is showing how a sticky note is used to record a saying, and how it is.

way than originally intended that a greater change is inevitable. One such example was Lori's planner (see Figure 7):

240

Lori: My girlfriend gave me a planner and I thought "Oh great—it's one of those Filofax [brand name] things!" It's super-compartmentalized and organized, and I thought, "This is great—I will have all my little sections, you know [she flips through the planner], but I really never used the sections properly. And I ended up, you know, just finding my own . . . way . . . of storing information [she continues to flip through the book], which half of its. . . I used to buy the refills and I used to just have papers and write notes and rip them out and it became this sort of like "Oh, here's a piece of paper, I'll write down a note, rip it out." So it's empty now, it used to be full of paper—I just sort of kept the ones—there are some recipes, old phone number lists, and whatever.

245

250

Almost from the beginning Lori shifted the use of the planner. As she saw it, she "never used it properly." Nevertheless, she continued to order and use the refill pages. However, the planner had become a notepad of blank paper for use and a place to keep notes whether loosely or bound in the book:

Lori: Then I started to get some sticky notes and so that would end up being stuck in [she motions to slap a sticky note to one of the pages]. . . .

255

The sticky notes allowed her to augment the planner. Notes could now be placed anywhere in the book, even over used pages. And notes could be taken on sticky notes and later stored in the planner if she did not have it with her at the time.

Lori: Like I have, you know, lists of—almost like a calendar but I didn't use the calendar actual . . . calendar . . . pages? I would just use them as lists of things that I needed to do for . . . coming . . . days. And then I sort of ended up adding, you know, notes to myself. It became just everything. I had like sayings [she shows a saying written on a sticky note stuck on a page] in there that I liked. I'd have teaching ideas that I'd get in other classrooms . . . dance steps. . . . I don't know—it just had everything!

260

265

At this stage Lori's planner had become a place to keep notes and lists. She no longer used any of the originally designed structure of the planner, ignoring the categorized sections for notes and addresses and the calendar section (the main design feature). She had even stopped ordering refills because sticky notes allowed her to reuse the already filled or ripped out pages. Lori's agenda book had gone through a metamorphosis through use and as typical with a *cocoon* pattern, substantial change was afoot. Eventually, the change came when Lori stopped using the planner replacing it with a larger system that came to be known in our study as the "messaging system." Over time the system adapted a chalkboard, a door frame, the fridge door, and the hanging basket. Phone messages and reminders would go on the chalkboard, which was near the front door of her apartment. Sticky note reminders would be stuck to the door frame of the front door. Notices and school handouts would be put on the fridge door, and notes and lists on loose paper would go in the hanging basket together with the mail. Lori and Abe would leave shopping and to-do lists for each other in the basket (see Figure 8). Because these lists were visible in the wired basket, Abe or Lori would pick up the list on the way out. If they were unable to complete the list it would be returned to the basket with the purchased items crossed off. It's important to note that Lori was not actively conscious of the changes or emergence of the system. This happened over time in piecemeal fashion.

In summary, we have described how systems emerge through adaptations. We identified patterns like the *going solo* pattern in which individual family members provide an alternative use that either was critical or signaled a change. We observed that these actions could become successfully incorporated into a system or artifact as in the example of Ryan and Janis's family phonebook. Another pattern is change over time as identified in the *cocoon* pattern where actions shift the original purpose of an artifact or system into something altogether different.



FIGURE 8 The hanging basket is used to place lists that are visible to both Lori and Abe.

3. RESULTS

Our findings describe how everyday designers adapt and evolve artifacts and surroundings in the home. Several examples such as the use of lawn chairs as tables (see Figure 1) or the kitchen cupboards as steps (see Figure 2) illustrate how simple actions discover and exploit affordances of artifacts and surroundings and put them to new use. These acts become incorporated and form the basis of ongoing routines and systems. This is best illustrated in Ryan and Janis's sports sorting system (see Figure 3) and Lori's messaging system (see Figure 8). Other researchers describe systems in the home (Crabtree & Rodden, 2004); however, our findings do not just describe the systems but describe how such systems occur and are established.

We found that all family members contribute to the design of systems in the home unlike Taylor and Swan (2005), who describe a centralizing and hierarchical role of the mother. Individual actions can be said to provide innovative pressures on the design of everyday systems. We provide a nuanced view of who is involved in the making and evolving of systems in which mothers play a large role yet others influence and create routines and systems, whether they be the parallel approaches of Kerry or Alec, or other *going solo* patterns of use that become integrated over time.

The simplest of appropriations are often opportunistic and temporary; however, it is through experiencing artifacts in use that further ideas, combinations, and recombination are generated, forming new routines and systems. We expand on these notions by describing at a granular level how artifacts are altered over time to become more unique, and specifically address a need, such as Ryan and Janis's family phone book (see Figure 6) or Lori's planner (see Figure 7). The family phone book was essentially a homemade affair, composed of a paper binder of blank pages with alphabetic headings created by a word processor and computer printer (see Figure 9). As such, it was easily modified.

The example of Lori's planner focused on the materials and how easy it was for her to create new uses or even substitute materials by integrating sticky notes. In the *cocoon* pattern we found that artifacts, systems, and routines change dramatically from their original use to a new use that an even greater change is inevitable. During this stage, the use may be unclear or contradictory, yet this does not preclude it being continually used until it changes. For example, to return to Lori's fruit basket, at one stage it was a place to store her sunglasses, avocados, and urgent mail. Yet, continued use of the basket allowed for it to evolve into becoming part of her message system. Given that we view everyday design as a creative process it is no surprise that allowance is made for emergent properties to manifest over time.

What becomes apparent is that the ongoing dynamics and pressures on everyday design actions shape routines and systems into a level of uniqueness that is finely tuned to the combined needs of family members in their setting. Equilibrium is sought in which routines and adoption are balanced against each other supported by the resourceful adaptation of artifacts and surroundings. The everyday unique routines and systems are a result of creative actions as defined by resourcefulness, adaptation, and emergence over time.

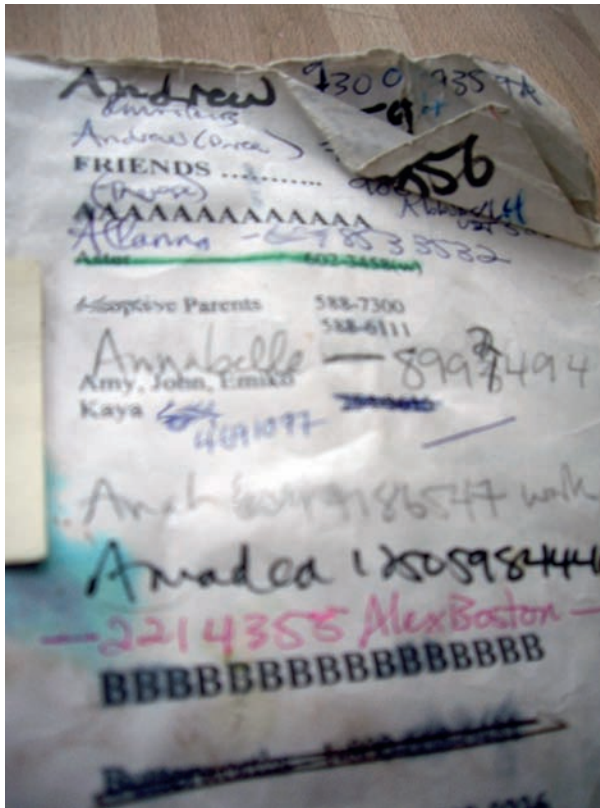


FIGURE 9 Page from Ryan and Janis’s family phone book showing its homemade qualities.

4. CONCLUSION

340

In many respects, the notion of everyday designers is not entirely new. After all, people have been redesigning our designs all along. Dewey (1934) observed the “artistic engagement” in everyday activities like tending to plants, patching a lawn, or stoking a fire. Suchman (1994) argued for restating production and use such that a distinct boundary does not lie between them. Alexander (1964) 345 discussed what he called the *unselfconscious process*, in which a design system maintains equilibrium through constant actions over time. Alexander would eventually describe the process of continuous adaptation as *piecemeal building* (Alexander, Ishikawa, & Silverstein, 1977). Louridas’s (1999) concept of designer as *bricoleur* describes a continuum of activity that presages the everyday designer. 350 Designers, like *bricoleurs*, make do with resources available to them and explore the situation through action for new uses and connections. The major implications for design of technology can be outlined in the following.

Radically limit our constructions of the user, which means embracing the idea that we do not need to define use in predictive detail. This acknowledges the role 355

of another creative agent, the *everyday designer* at a later point in the design cycle. This includes shifting away from what designed technology does for whom to what can be done *with* the designed technology, that is, in considering a chair one does not model a *chair user*, rather a designer thinks of what actions can be performed with a chair like stacking, sitting, lying it on its side, hanging it, hanging things from it, putting things on it, tilting, and so on. The “user” is reconstructed as a creator of actions who precedes an identity rather than a user with an identity that prescribes actions. 360

Appropriation is a design goal. This is a significant challenge in current interactive technology because it is entirely dependent on the aforementioned point. It asks that professional designers design artifacts so they are open to and even invite use in ways that were not intended in the original design. For example, in the IT equivalent of paper, rather than consider it as a medium that supports written text and drawings, we can design toward an action space that invites rolling, folding, folding together, marking, ripping, making holes, gluing together, and so on. 370

Design *design resources* to be creative material for further design. In line with appropriation and parallel to a class of interactive technology known as creativity support tools, we can consider design artifacts that will be reused in further design systems similar to how everyday objects are recontextualized in *found art*, *collage*, and *assemblage* in contemporary art. In these cases the materials’ properties are extended, reused, given new meaning, and newly discovered in different contexts. 375

Everyday design systems evolve to be unique, and that requires not thinking of technology applications in a generic sense and deeply radicalizing the idea of customization. 380

Clearly, these implications do not apply to all interaction design but make sense when considering everyday design in the home. In the context of Jonathan Grudin’s (2005) continuum from mandatory to discretionary use, the examples in the article are beyond making choices about designs to being actively creative in the ongoing making of designs. In these cases, the aforementioned implications apply. 385

We found that creativity is at the heart of everyday design. Family members are resourceful in how they appropriate artifacts for new uses in routines and systems. Such systems continually evolve through the catalytic pressures of individual actions and design-in-use. In this article, we reported on our study of four families in which we were researching the concept of everyday design in the home. We discussed background concepts of design ethnography and pattern languages. We provided in-depth descriptions and discussions of our observations and patterns. 390

The research contributes explanation of everyday design as a novel way to understand interactions and routines in the home, descriptions of the appropriation of artifacts and surroundings as a key action in everyday design, and the need to reconstruct the *user* in the sense of an everyday designer. 395

REFERENCES

- Alexander, C. (1964). *Notes on the synthesis of form*. Cambridge, MA: Harvard University Press.
 Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: towns, buildings, construction*. New York: Oxford University Press.

- Blythe, M., & Monk, A. (2002). Notes towards an ethnography of domestic technology. In *Proceedings of ACM DIS 2002 Symposium on Designing Interactive Systems* (pp. 277–281). New York: ACM Press.
- Crabtree, A., Hemmings, T., & Rodden, T. (2002). Pattern-based support for interactive design in domestic settings. In *Proceedings of ACM DIS 2002 Symposium on Designing Interactive Systems* (pp. 265–276). New York: ACM Press. 405
- Crabtree, A., & Rodden, T. (2004). Domestic routines and design for the home. *Computer Supported Cooperative Work*, 13, 191–220.
- Dewey, J. (1934). *Art as experience*. New York: Minton Balch.
- Grudin, J. (2005). Three faces of human-computer interaction. *IEE Annals of the History of Computing*, 27(4), 46–62. 410
- Henderson, A., & Kyng, M. (1991). There's no place like home: Continuing design in use. In J. Greenbaum & M. Kyng (Eds.), *Design at work: Cooperative design of computer systems*. Hillsdale, NJ: Erlbaum. Q2
- Louridas, P. (1999). Design as bricolage: Anthropology meets design. *Design Studies*, 20, 517–535. 415
- O'Brien, J., & Rodden, T. (1997). Interactive systems in domestic environments. In *Proceedings of ACM DIS 1997 Symposium on Designing Interactive Systems* (pp. 247–259). New York: ACM Press.
- Suchman, L. A. (1994). Working relations of technology production and use. *Computer Supported Cooperative Work*, 2, 21–39. 420
- Taylor, A. S., & Swan, L. (2005). Artful systems in the home. In *Proceedings of ACM CHI 2005 Conference on Human Factors in Computing Systems* (pp. 641–650). New York: ACM Press.
- Tolmie, P., Pycock, J., Diggins, T., MacLean, A., & Karsenty, A. (2002). Unremarkable computing. In *Proceedings of ACM CHI 2002 Conference on Human Factors in Computing Systems* (pp. 399–406). New York: ACM Press. 425
- Wakkary, R., Poon, M., Maestri, L., Kirton, T., Juhlin, C., & Betts, R. (2007). How informances can be used in design ethnography. In *ACM 2007 Extended Abstracts of ACM CHI 2007 Conference on Human Factors in Computing Systems* (pp. 1875–1880). New York: ACM Press. 430
- Wakkary, R., & Maestri, L. (2007). The resourcefulness of everyday design. In *Proceedings of ACM Creativity and Cognition 2007* (pp. 163–172). New York: ACM Press. Q3