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Things Making Things

Designing the Internet of Reinvented Things

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Design has long been human-centered, but with data technology things too can become part of the design and innovation process.

Digital technologies such as the Internet of Things (IoT), machine learning, and artificial intelligence are rapidly disrupting long-established design practices. These technologies have a profound effect on the nature of products and services and raise fundamental questions about the way designers design.

Designers have traditionally been motivated to create something original either by their own inventive talents or by the needs and desires of users. They do not typically enlist the things they make as partners in the design process. Yet the social life of things¹ has much to inform the design process. After things are created, they often live “secret lives” through being used in novel ways beyond their intended purpose: rain boots become doorstops, cups become props, and forks become garden utensils. In this way, things “carry the experiences they had with us inside them.”²

As designers, we should not overlook real-world usage. After all, a kettle can be more than just an appliance for making coffee and tea: it can also be a tool for cooking pasta, making a liquid detergent to clean the drain of the sink, or ironing clothes. Understanding the many different and unexpected ways people use things calls for new design methodologies that go beyond human invention.

Over the past five years, Delft University of Technology’s Connected Everyday Lab has instrumented various things that often end up together in a home. To find out what insights might be learned by looking at the world through the “eyes” of these sensor-enhanced objects in a typical day, we conducted a series of studies that we refer to as “thing ethnography.”^{3–6} By studying the use of things collectively and in pairs, we sought to discover previously unknown facts—for example, how the use of a coffee cup might reveal insights about use of the kettle, how the use of the kettle might do the same for the fridge, and how together they might reveal unanticipated practices such as the disposing of trash.

In our first study, Thing Tank, we attached cameras to cups, kettles, and fridges in several houses⁶ (see Figure 1a). We chose these objects because they tend to be in proximity to each other, what we refer to as a kettle-fridge-cup (K-F-C) configuration. The captured imagery revealed unexpected relationships of these things with other things such as stoves, tables, and even beds (see Figure 1b).

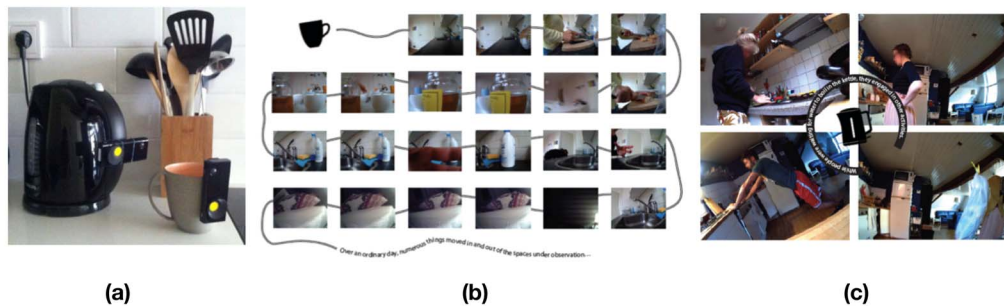


Figure 1. Thing ethnography. (a) Kettle and camera instrumented with cameras. (b) Imagery from a cup throughout a day reveals the cup's relationships with other things. (c) People used time waiting for the kettle to boil to engage in other activities.

We observed unanticipated and creative use of these things in multifaceted ways. One was movement. While the kettle mostly remained stationary, the cup kept moving around and creating co-usage relationships with almost any other thing it ended up close to, from the cupboard to the table to the sink and eventually the bedside. Another facet was opportunistic affordance. Although the kettle did not move much, it opened up time for people to engage in other activities waiting for it to boil:⁴ talking on the phone, reading the newspaper, cleaning, and even doing a couple of push-ups (see Figure 1c).

The takeaway is that things do not exist in isolation. They are already “connected,” even before they are electronically connected to the Internet. To understand the many unexpected yet relevant interconnections and dependencies between things—what we call “data worlds”—we must develop algorithms capable of capturing when objects are used for activities different than those originally intended.

A good example is how older people resourcefully misuse objects to cope with their ageing physical and cognitive skills.⁵ For example, we observed how a broom with a piece of tape attached to the end of the handle becomes a handy spider killer for high ceilings, a magnet becomes a tool for picking up small, flat objects on a table, and a wearable fitness tracker becomes a stop to keep the wardrobe door closed.

The observations of our study led us to conceptualize IoT technology as “connected resources”: things that are capable of adapting their functional behavior to changing circumstances and that can empower users—in this case, the elderly to remain vital and independent. These recombinant sensors can be used to cleverly pin, arrange, and organize digital content around the home, as if it was a physical object. Once in use, the sensors begin to learn from the way in which they are combined and deployed, and they encourage older people to learn from one another's strategies. Designing connected resources helped us give the things of the IoT a less prescriptive and more future-oriented role. It made us realize that machine learning could be used to open up possibilities for older people to develop and share their own coping strategies, and create their own means to be active and live independently.

Even though our experiments clearly indicate that there are complex relationships among things, the traditional focus on invention and current emphasis on user-centred design both assume that human imagination and capabilities drive design. The relationship is unidirectional: only humans make things.

Our work shows that we also need to consider the things themselves and explore how they are repurposed—for example, at how brooms are used both for sweeping the floor *and* for reaching high ceilings. Even more importantly, our work suggests that the next-generation machine learning techniques must also look at the reverse—for example, at how attaching tape to end of a broom handle “makes” a spider killer, or something else for which we do not have a name yet. Things make things too.

What designers would call misuse of a product is an untapped resource for innovation. Exploiting the IoT to mine datasets and learn how things are being used in unexpected ways will tell us

how we come to appropriate and create value for the things we use in everyday life. This opens up design opportunities.

As algorithms and autonomous devices increasingly uncover new insights and make new things ranging from assistance requests to smart contracts, we need to look beyond human-centered design and learn to engage in partnerships with things—to replace mastery over things with “deep listening” and creativity with “stewardship.” We need a design practice that makes us more humble and aware of our biases.

Thing-centered design has shown us that smart mobility technology is not just about energy efficiency and functionality but also about fostering new social relations.³ It also has taught us that technology for older people is not just about compensating for physical and cognitive decline but also about empowerment and resourcefulness.⁵ Having things doing design work alongside humans should lead to new solutions that are not just smart and efficient but also socially desirable and sustainable.

REFERENCES

1. A. Appadurai, ed., *The Social Life of Things: Commodities in Cultural Perspective*, Cambridge Univ. Press, 1986.
2. W.G. Sebald, *Unrecounted*, New Directions, 2007.
3. W.-W. Chang et al., “‘Interview with Things’: A First-thing Perspective to Understand the Scooter’s Everyday Socio-material Network in Taiwan,” *Proc. 2017 Conf. Designing Interactive Systems (DIS 17)*, 2017, pp. 1001–1012.
4. E. Giaccardi et al., “Things as Co-Ethnographers: Implications of a Thing Perspective for Design and Anthropology,” *Design Anthropological Futures*, R.C. Smith et al., eds., Bloomsbury Academics, 2016.
5. I. Nicenboim, E. Giaccardi, and L. Kuijer, “Designing Connected Resources for Older People,” *Proc. 2018 Conf. Designing Interactive Systems (DIS 18)*, 2018, pp. 413–425.
6. E. Giaccardi et al., “Thing Ethnography: Doing Design Research with Non-Humans,” *Proc. 2016 Conf. Designing Interactive Systems (DIS 16)*, 2016, pp. 377–387.

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