



Multisited Design: An Analytical Lens for Transnational HCI

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In this article, we present and articulate the analytical lens of *multisited design* to illuminate transnational connections between sites of design, and aid in the translation of knowledge between designers and ethnographers. This position emerges from the authors' respective engagements in ethnographic research and design engagements with a slum community center in Bangkok, Thailand, and with “makers” and entrepreneurs in Shanghai and Shenzhen, China. In both cases, we found design to be a site of engagement with and interpretation of wider connections between different locales, and between local and global networks. We identify four crucial aspects of design for the purposes of this discussion: It is normative, concerned with function and the attainment of goals; it is practical, and oriented toward constraints and opportunities; it frames and defines problems concurrently with solving them; and it takes a systems approach that accounts for the broad context of the design situation. Approaching and participating in these aspects of design evolved in concert with our ethnographic fieldwork and analysis, allowing us to take design seriously without sacrificing an ethnographic commitment to nuanced description. We conclude by touching on the epistemological similarities, rather than conflicts, between ethnography and design.

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1. INTRODUCTION

This is a tale of two ethnographies, one centered around a slum community center in Bangkok, Thailand, and the other around practices of a growing do it yourself (DIY) maker and open hardware community in Shanghai, China. Both research projects were centrally concerned with the ways in which technologies take on varying meanings and positions in people's daily practices across different locales and in transnational collaborations. Both projects, though involving a long-term engagement with a primary locale, were also multisited, that is, centrally concerned with objects, concepts, and concerns that escaped their immediate locale. Finally, in both projects, analysis uncovered the importance of design thinking in negotiating the relationships between locations and across transnational connections. We suggest in this article that an analytical focus on design and material production, as they occur in diverse and distributed settings, can help us both make sense of transnational technological interactions and foster productive collaborations between the disciplinary practices of ethnography and design.

As we immersed ourselves in our respective field sites and attempted to analyze our experiences, we each found ourselves trying to write a "view from right here" that aroused empathy rather than defamiliarization. In communication among the authors of this article, we began to notice commonalities between some of the practices that we were each encountering: Both DIY makers in Shanghai and community activists in Bangkok were engaging in routine practices that seemed to us to be designerly in nature. As our fieldwork and analysis progressed, we developed these early intuitions into an analytical lens of *multisited design* that helped make sense of both ethnographic projects. We suggest that multisited design could be a valuable addition

to the ethnographic toolbox, illuminating transnational connections between sites of design, and aiding translation of knowledge between designers and ethnographers.

In this article, we draw upon methodologies from human–computer interaction (HCI), design, and anthropology to assemble an analytical and methodological framework that can accommodate current concerns with practices and value systems that span multiple regional sites, and the role of design in these settings. Multisited design draws attention to multiple and heterogeneous sites of design practice and to people’s situated tactics for collaborating and making sense of shifting global relations, across borders and beyond preexisting social frames.

We first describe our field sites, drawing upon prior work to explain some of the analytical and methodological commitments we started out with, including participatory design and multisited ethnography. We next present a vignette from a Shanghai hackerspace, illustrating some of the designerly, meaning-making activities that we encountered. We attempt, then, to clarify just what we are talking about when we talk about design, drawing on a body of research on design practice and design thinking in order to establish a rigorous yet inclusive framework for our analysis. A case study from the Bangkok slum community center concretizes the notion of multisited design, allowing us then to draw connections between the two studies, discuss designerly local encounters with transnational phenomena, and reflect on our own practices.

2. COLLABORATIVE ETHNOGRAPHY, DESIGN, & ANALYSIS

Lindtner has conducted research on China’s DIY maker and open hardware community since 2010 and traces its professionalization from the opening of China’s first hackerspace in Shanghai all the way to collaborations between makers and manufacturers in Shenzhen. Her ethnographic engagement with DIY makers in China examines in depth the local manifestations of what members characterize as a “maker movement.” What propels this belief in a global movement forward are experimentations with new forms of hardware production as well as writings about such modes of production in magazines such as *Make*, individual maker blogs and public talks. Lindtner’s research examines how makers in China appropriate and challenge ideas and practices coming out of what they believe to be a global movement. Her work shows that makers in China make use of the expertise and history of manufacturing in regions such as Shenzhen. Because of this history, makers in China believe that they are positioned uniquely to alter processes not only of “making” but also of industrial production. As part of this ethnographic research, Lindtner participates in technology projects, writings, and organizational practices of makers. For example, together with her interlocutors she produced a short film about creativity and open innovation in China and conducted a series of DIY maker workshops, both in China and abroad (see, e.g., <http://www.transfabric.org>).

Williams began her fieldwork in Bangkok with the intention to explore the topic of mobility within and between cities. She was interested in how Ubicomp and urban mobility already exist as part of everyday practice (Dourish & Bell, 2007); Bangkok, as a rapidly growing, sprawling, largely unplanned city, was an ideal site. Early on, Williams found that design itself was intrinsic to her engagements in Bangkok. Throughout Williams's ethnographic engagement with the slum community center (henceforth, The Mercy Centre) the participation in design activities became a central aspect of participant observation and collaboration with her interlocutors. Williams's design capabilities presented a form of participation that was valued by the center's staff. During its later phases, this ethnographic engagement also incorporated original design work conceptualized for the center and its particular situation, which is discussed in this article.

Although Williams and Lindtner conducted fieldwork in different geographic locations, our communications with one another, as well as with Anderson and Dourish, allowed us to see some key commonalities between our work. Throughout both ethnographic engagements, designerly makings as well as reflections on such productions were central to our sites as well as to our ethnographic methods. The maker community in Shanghai and the slum community center in Bangkok are both concerned with addressing particular social and economic issues in their respective regions while being tied into transnational networks of finances, social and cultural capital, and exchange, which we elaborate in more depth throughout this article. During an iterative process of engagement in the field, analysis, return to the field, and so forth, *multisited design* emerged as a fruitful term that distilled the common elements of our ethnographies into something communicable.

3. PRIOR METHODOLOGICAL WORK

In addition to its traditional concerns with the design and use of interactive digital artifacts, HCI has become increasingly attentive to the ways in which people encounter and appropriate technologies in relation to political and socioeconomic configurations across regions, or as integral parts of contemporary mobility and migration. A perusal of titles and abstracts in the proceedings of the ACM conference on Human Factors of Computing Systems (CHI), for example, reveals a steady increase in papers about mobility and mobile technology from 2004 to present (e.g. Ballagas, Memon, Reiners, & Borchers, 2007; Brewer, Mainwaring, & Dourish, 2008; Hagen, Robertson, Kan, & Sadler, 2005; Mainwaring, Anderson, & Chang, 2004; Williams, Anderson, & Dourish, 2008). A sharp increase in papers about information and communication technologies for development (ICT4D), localization, and cross-cultural interactions is evident from 2007 to present (e.g., Diamant, Fussell, & Lo, 2009; Olson & Luo, 2007; Wang, Fussell, & Setlock, 2009; Wyche, Magnus, & Grinter, 2009). Some of this work has challenged taxonomic views of culture, exploring instead the culturally and socially situated experiences and meanings of technology in varying

locales (e.g., Irani, Vertesi, Dourish, Philip, & Grinter, 2010; Lindtner, Anderson, & Dourish, 2012; Williams et al., 2008). Others have expressed concern with the focus on technological hubs in the industrial West (Dourish & Mainwaring, 2012; Suchman, 2002) and with methodological and theoretical treatments of regions beyond the industrialized West as “other” or “out there” (Taylor, 2011; Williams & Irani, 2010). Building on this prior work in HCI, such reflective engagement with our writings about and designs for specific places, cultures, and practices is central to our approach toward multisited design.

In addition, ethnographers within HCI often find themselves accountable to the concerns of designers and developers, and are called upon to address issues of how technology might be better designed. This has led to a tendency to choose framings that can influence design (Anderson, 1994; Dourish, 2006; Van Veggel, 2005). Our analytical frameworks are not one-size-fits-all, and an analysis that might be effective for design collaborations in one setting may fall flat in another. For example, the notion of *defamiliarization* has been both necessary and effective in studying European and North American domestic technology use precisely because, as stated by Bell, Blythe, and Sengers (2005), “*the home is so familiar*” (p. 149). In these situations, we already empathize easily with participants because we already perceive them as similar to ourselves. Defamiliarization, then, has been appropriate to the ethnography of overly familiar settings, because it forces us to step away, into the perspective we need to reframe ordinary problems and try original approaches. However, as noted by Chetty and Grinter (2007) while working in what was to them an *unfamiliar* cultural context in rural South Africa, defamiliarization may be less appropriate in an already-alien setting, where building bridges will actually be the more important accomplishment (Abu Lughod 1991). This prior work shows that our old methods do not always transition smoothly, as we study and design within a broad variety of technology practices and settings.

In our move toward a multisited design approach, two methodologies influential in HCI/CSCW have especially influenced our work—participatory design and multisited ethnography. As design was key to both our ethnographic engagements, participatory design is an important frame of reference for our work. In addition, because both our field sites are entangled in transnational webs of finance, politics, and collaborations, we turned our attention to recent contributions to ethnographic research from the anthropology tradition, in particular multisited ethnography. Next, we discuss both in more detail and elaborate how together with our fieldwork experiences they shaped our thinking toward multisited design.

3.1. Participatory Design and Development

Originating in Scandinavia, the collection of methods known as participatory design originally aimed to engage workers in codetermining the computational systems that might be introduced into their workplaces (Kensing & Blomberg, 1998). In developing regions, the related practice of “participatory development” is a set of methods intended to involve local stakeholders in development projects (Cook &

Kothari, 2001). The use of participatory methods in developing countries especially has been influenced and encouraged by large international funding organizations like the World Bank. In the more explicitly technical practice of ICT4D, researchers still typically refer to “participatory design” (e.g., Byrne & Sahay, 2007). As ICT4D grows as a field of research and design, participatory design’s initial concern with workers has seen a shift from a critical engagement with the politics of technology design towards a concern with marginalized populations (e.g., Iversen & Leong, 2012; Kam et al., 2006).

The spread of participatory design methods has not been frictionless. The underlying political commitments of researchers and workers may mesh seamlessly if both are working within a shared cultural and political milieu (Irani et al., 2010). Applying participatory design transnationally, or in locations where labor is not organized, has proven challenging (Muller, 2003). Participatory Design in itself is not a silver bullet that easily solves issues of neo-colonialism in technology design or development projects. Cooke and Kothari (2001) described such “participatory” processes that proved harmful to participants. They suggested that participatory methods evidence “subtle eurocentrism” that echoes concerns within HCI about a “center/periphery” or “in here/out there” bias in ethnographic field work (Dourish & Mainwaring, 2012; Taylor, 2011). Participants, for example, are typically brought into design projects whose parameters have already been defined by the researchers (Kam et al., 2006), or an organization (Byrne & Sahay 2007; Iversen & Leong, 2012); attention is rarely drawn to resourceful or designerly activities that participants are already engaged in independently of researcher intervention.

Our goal, here, is not to undermine participatory design as a method but to illustrate a possible approach toward refocusing on participatory design’s original commitment to politics and reflective engagement (Leahu et al., 2008). We believe that such a contemporary engagement with the politics of design requires an acknowledgment of the designerly and cultural productions we find in any given locale. We suggest that participatory approaches should deeply engage with both the unique material and cultural processes of design in a given locale *and* with the politics of digital production and participation. No matter if an ethnographic study or a design project, our work spans multiple sites, even if unintended so. Our own participation as researchers and designers, as such, escapes any given locale, just as much as our projects and fieldsites. For instance, if we set out to understand the complexity of American social media platforms such as Facebook or Twitter, we are necessarily confronted with the question of how these sites are appropriated across diverse political environments and cultural processes. Although not every single study can possibly engage in-depth with the multitude of sites our technologies are entangled with, we suggest that a sensitivity toward encounters, frictions, and tensions between different locales and communities of practice are crucial.

3.2. Multisited Ethnography

Although we characterized Shanghai and Bangkok as our primary field sites, significant parts of our field work took place elsewhere, and even within our primary

geographic locations we attended to the ways in which our participants positioned themselves relative to global infrastructures and flows of money, goods, and ideas.

The concept of multisited ethnography was developed by anthropologist George Marcus in the mid-1990s, in response to growing interest in the relationship between local particularities, movement of people, media, and ideas (Marcus, 1995). Marcus located the emergence of multisited ethnography within two broader developments: first, the unfolding of new arrangements such as transnational migration, time-space compression, and globalization; and second, interdisciplinary efforts to develop new vocabularies for analyzing these evolving arrangements. Multisited ethnography is not simply a call to “go to multiple places”; rather, it is a recognition that contemporary ethnographic topics escape the boundaries of the local, and so must be examined as inherently multisited phenomena. Key drivers in the development of this approach were “studies of new modes of electronic communication such as the Internet” and a move in development studies toward greater reflection and diversity in the meanings and implications of development (Escobar, 1995), echoing current topics of interest within HCI.

Recent years have seen an increase in the use of multisited or comparative fieldwork within HCI (Burrell, 2009; Lindtner et al., 2012; Mainwaring et al., 2004; Williams et al., 2008; Wyche, Magnus, & Grinter, 2009). Williams et al. (2008), for example, discussed the ways in which transnational Thai retirees fit into global systems of mobility and technology, by uncovering how they saw their own relationships to global processes and how they acted upon that knowledge. Burrell (2009), drawing on multisited ethnography, constructs the field-site as a network that incorporates physical, virtual, and imagined spaces and provides practical steps for how to trace and locate these configurations in ethnographic research. Transnational studies scholars have also adopted multisited ethnography in order to discuss transnational connection or friction without resorting to local-global dichotomies (Boellstorff, 2005; Ho, 2006; Levitt, 2001). Tsing (2005), for example, highlighted that far from being a deterritorialized phenomenon, the global is socially and discursively produced in various sites. Zhan (2009) used the analytical frames of “transnational connectivity” and “worlding” to think about the historicity, heterogeneity, incongruence, ruptures, and practices of location in the everyday practice of traditional Chinese medicine in the San Francisco Bay Area.

One of the underlying goals of multisited ethnography, then, is to avoid the common trap of separating local practice from a global world system. It aims to trace the movement goods, people, and ideas across different and sometimes conflicting spatial and political contexts (Appadurai, 1996; Burrell, 2009); it is from these tracings that we begin to understand what any larger “system” entails. Multisited ethnography contends that the ways in which subjects fit into the “world system” is in fact an important form of *local members' knowledge* that can itself be the object of ethnographic inquiry. It suggests that local phenomena are in and of themselves inherently “multi-sited” through the kinds of global connections people make or imagine from within a single locale.

Importing theories and methodologies from anthropology into HCI is not a seamless process, any more than is taking up participatory design throughout the

world. Although some exceptional studies have incorporated design sketching into multisited fieldwork (Wyche, Aoki, & Grinter, 2008), efforts to mesh multisited ethnography with design commitments on a deep level have mostly been lacking. We certainly do not believe that ethnographic work in HCI must be evaluated by each study's utility for any particular design project, but we do believe in building some shared language for ethnographers and designers, despite (or because of) the epistemological and collaborative difficulties sometimes encountered between these disciplines (Van Veggel, 2005). Analytical frames we choose during fieldwork and ethnographic writing will inevitably influence our problem formulations and spaces of possibilities for design, emphasizing some characteristics of our design situation and occluding others. In this article, we attempt to build a multisited analytical framing in which design is central to both our research method and analysis, with a commitment to positioning design and ethnographic writing purposefully *against* exoticization or center-periphery binaries and *toward* empathetic connection.

In the next section, we take a multisited approach to show some of the ways in which Shanghai-based hackers creatively encounter, appropriate, and reimagine both the Arduino microcontroller and the very notion of "open source" and how, in doing so, they discursively produce their notion of Chinese creativity and how it might relate to other (often Western) locales. We also begin to foreground the sorts of designerly activities that tie our respective studies together.

4. MAKING WITH CHINESE CHARACTERISTICS

China is open source in practice. This is different from the West where open source only exists in theory. Here, the actual maker in the factory is involved, the workers. Our hackerspace is getting at this. It's going to be a hackerspace with Chinese characteristics.

This is a quote from the cofounder of China's first hackerspace, when he debated with Lindtner the local manifestations of DIY making and open hardware in China. Hackerspaces are shared studios with communal tools and resources for their members to use, including sensor toolkits, microcontrollers, soldering irons, 3D printers, laser cutters, and basic electronics such as LEDs, resistors, capacitors, and so on. A key benefit of these physical spaces lies not just in providing access to material tools but also to a local community and a wider global network of like-minded computer enthusiasts who connect through their commitment to hands-on learning about hardware and software production, and the open sharing of technical knowledge. There are more than 1,000 active hackerspaces in existence worldwide as of April 2013.¹ In hackerspaces, people experiment with digital and physical materials, invent interactive systems, learn from one another, reflect on their practices, and debate societal and technological issues. There is no single narrative that spans such a wide

¹http://hackerspaces.org/wiki/List_of_ALL_Hacker_Spaces

range of spaces; rather, numerous and sometimes conflicting ideas and values animate them. This may include commitments to open source software and hardware design, Internet freedom and liberalism (Coleman, 2012; Coleman & Golub, 2008), DIY enthusiasm and hobbyist production (Allon, 2008), “maker” culture (Ratto, 2007), and the “peer production” of Web 2.0 (Benkler, 2006). Whereas many hackerspaces share a passion for unpacking the specifics of technological systems, they differ in their diverse interests, histories, geographies, and political economies.

China’s first hackerspace, *xinchejian* 新车间, opened in Shanghai in September 2010, then housed in a room of a coworking space. The community around *xinchejian* grew quickly and already 6 months later the hackerspace moved into its own space, a room on the third floor of an old vacated factory building. Only another 6 months later, six other hackerspaces had opened in other cities in China. Taken together, they comprise a growing community of DIY makers, tinkerers, and hackers with international reach. In spring 2011, for example, members of this growing community founded the “Chinamakerspaces” mailing list, which connects makers in and beyond China. The community has since organized a series of events including but not limited to mini maker faires, hackathons, startup weekends, and open hardware workshops. These events brought together makers as well as newcomers to DIY making from different parts of China, North America, and Europe. The events were in part motivated by the idea to introduce ideas of DIY making and open hardware to people in China. They helped instill a sense of community among Chinese makers and gain international visibility. Lindtner’s ethnographic research involved the attendance of many such events, as well as active coparticipation in the event organization. What Lindtner found across these events was a strong effort to localize DIY maker practice in China and grow a translocal community across cities in China. At the same, members of this growing community work toward establishing strong and long-lasting relationships with DIY makers, investors, and collaborators from abroad.

To accomplish this goal to both localize and internationalize DIY making, members of the growing community have begun establish close relationships and collaborations with Chinese manufacturers. The vision behind these efforts is that China’s manufacturing expertise constitutes an enabling bridge in the growth and expansion of what Chris Anderson (2012) described in a recent book publication as the rise of the “Maker Movement” as a “Third Industrial Revolution.” Anderson argued that contemporary open hardware and maker practice in hackerspaces will reinvent manufacturing and industrial production. Makers, he argued, extend the innovations from the earlier Web generation from software to hardware, from technology use to technology production, from peer production of digital things to peer production of physical things. Lindtner’s research shows that well before Anderson’s book was published in early 2013, China’s DIY makers and their international collaborators had begun to take advantage of China’s unique environment and access to resources and expertise in material production (Lindtner & Li, 2012).

Many members have written about this unique position and context of their work in China. Across the aforementioned events and discussions on social media

platforms such as Sina Weibo, Twitter, and Tencent Weixin, DIY makers write and talk about how to take advantage of China's manufacturing scene in practice. One of the core arguments that emerges out of these discussions is that Chinese cities such as Shenzhen are not only the world's largest manufacturer and home to factories such as Foxconn that produce for Apple, HP, and Intel but also constitute what many in and around China's maker community described to Lindtner as "a thriving manufacturing eco-system." This manufacturing eco-system comprises a network of actors ranging from large factories like the aforementioned Foxconn all the way to small craftsmanship workshops and copycat production sites. DIY makers argue that this ecosystem has flourished due to localized practice of open manufacturing and a new form of innovation, which some describe as "innovation with Chinese characteristics," or *shanzhai* (山寨) in Chinese.

Shanzhai traditionally stands for counterfeit products and has in the past often referred to low-quality copycat productions of well-known brands ranging from fashion such as Gucci bags to electronic products such as the iPhone. The literal translation of *shanzhai* into English, means "mountain fortress" and carries connotations of self-reliance and resourcefulness. Makers in China often refer to this second meaning of *shanzhai* to highlight that the continuous practice of copy has led to a growing expertise in material production and to the emergence of innovative products. In this formulation, copying, reuse, and innovation are not mutually exclusive. For example, *shanzhai* factories in Shenzhen, today, do not only produce copies of the latest tablet or mobile phone. They also remix functional but discarded components with new parts in order to produce novel products, often tailored toward niche markets in China and abroad. Oft-cited examples include mobile devices for Chinese migrant communities that allow users to send remittances easily, or phones with built-in compasses that point users in the direction of Mecca. As articulated by one of *xinchejian*'s cofounders,

We want people to take *shanzhai* seriously. Underneath the surface of Chinese counterfeits, *shanzhai* represents a super efficient micro manufacture system that operates on the principle of open source and open innovations. Instead of spending months and millions of dollars to design the one perfect product with millions of units, the *shanzhai* vendors adopt a market-driven rapid prototyping approach to the market. For example, upon observing the prayers habits of Muslim in the Middle East market, *shanzhai* makers produced phones with a digital compass and a reminder system, years before the big brands caught on.²

Foregrounding remix-as-innovation, *shanzhai* is articulated by makers as "open source in practice." Many makers believe that by taking advantage of Shenzhen's ecosystem of *shanzhai* and open manufacturing the image of Chinese manufacturing can be revamped from a site of cheap, copycat production to one that highlights the more creative connotations *shanzhai* shares with the international maker movement. An often-cited example in the DIY community in China is the creative permutations

²This quote is from an informal interview that Dr. Lindtner conducted in November 2010.

FIGURE 1. Seeeduino v 3.0 Atmega. (Color figure available online.)



of well-known open source platforms like Linux and Arduino,³ similarly based on copying and creative revising for particular contexts and requirements. China's makers materialized *shanzhai* in their hardware productions. Drawing upon ideas of DIY, they designed and built their own version of the open source hardware platform Arduino, by taking advantage of Shenzhen's *shanzhai* and open manufacturing eco-system. The productions vary, ranging from cheap low-end copies all the way to new boards with unique specifications, documentation, and improvements to the hardware—such as the now—in-international-maker-circles, well-known and appreciated Seeeduino board (see Figure 1), designed and made by Seeed Studio in Shenzhen.⁴ Both the copies and the innovative derivatives, as locally available and affordable open hardware packages they have helped propagate ideas of open hardware and maker culture within China. At the heart of this production of open source hardware lies the aspiration to meld the Arduino—an international symbol of DIY and open source counterculture—with practices considered to be intrinsically Chinese: A do-it-yourself mentality, inventive ways of working with materials, and adaptability to local shortages

³Arduino is essentially an easy-to-use microcontroller, a single-chip computer that supports the design of hardware-software-material interaction, and accompanying programming environment. It has popularized the design of interactive systems among hobbyists, and greatly reduced costs for professionals.

⁴Seeed Studio is a small-scale manufacturing and design house founded by Eric Pan in 2008 that produces an array of prototypes and products for and with the international maker community. Its biggest market today is the United States, <http://www.seeedstudio.com/>

and rapid changes to the physical and social environment, or as a Chinese DIY maker put it, “This is about bringing the California campus together with people in China to build things, to play with things, to build new innovative products.”⁵

Shanzhai productions in China today harnesses not only current local knowledge in hardware manufacturing but also a meaningful history and set of values around artistic creation. In their articulations of the role of *shanzhai*, makers in China at times also reference a history of art practice in Asia where the detailed copying of an artistic masterpiece was regarded as expressing deep admiration of the “original” work and its creator.⁶ The original was not considered to be a stable, uniquely authentic unit capturing a one-time, single-authored creative artifact but part of a process that continuously evolves through its appropriation and redesign by many. In this light, every copy, add-on, and modification is seen as part of the original’s ongoing creation process. In similar appeals to local histories of art and creativity, makers in Europe and North America might invoke past craft-based and current industrial modes of production in describing their practice (Maines, 2009), or reference 1920s avant-garde artists such as Duchamp, who opened and probed consumer products (Hertz, 2012). Through ideas of DIY and open source travel, these ideas are also mobilized in relation to particular histories, modes of production, and politics, whether in China or North America.

The collaborative building of the *shanzhai* Arduino and the sorts of conversations arising from its development process accomplish several things simultaneously. First, the device itself directly meets a local desire for a more affordable microcontroller package. Second, its creation meshes a Chinese history (as articulated by the DIY makers Lindtner worked with) of creative remix with the appropriation of a specific transnationally popular hardware platform, and a broader transnational movement in open source hardware. Third, it materializes the aspirations, just expressed, to foreground resourceful creativity in Chinese technology manufacturing. These acts of design and creation elicited—and embodied—critical discussions of Chinese modernization and what ideas of open source might entail for working in China.

5. CONNECTED BY DESIGN

Viewed as a creative activity, *shanzhai* begins to resemble some research and design practices in our own discipline of HCI. Design ethnography often exhibits an interest in specific and localized practices to identify new uses and users (Salvador, Bell, & Anderson, 1999), an interest shared in practice with *shanzhai* makers. Although *shanzhai*’s unsavory reputation in the West comes largely from issues around

⁵This quote is from an informal interview that Dr. Lindtner conducted in November 2010.

⁶Byung-Chul Han (2011) argued that this idea of the copy as artistic expression was common not just in Asia but also in Europe. What eventually led to the perception of the copy as a fake in Europe, he proposed, went hand in hand with tourist travel in the 18th century that led to the restoration of buildings and artworks to communicate their authentic historical and cultural identity. The preservation of artwork, as such, was embedded in projects of nation building, where authenticity and cultural belonging was essential.

intellectual property, this aspect of “copycatting” is not the main focus of our discussion here, and is less of an issue with explicitly open hardware like the Arduino. Bracketing the issues of intellectual property, then, we can perceive clear similarities between the creation of the Seeeduino, and research projects that have been published in HCI venues, such as the specialized LilyPad Arduino, redesigned for use in creating interactive textiles (Buechley, Eisenberg, Catchen, & Crockett, 2008). Putting members’ creative and design activities at the center of our analysis, then, helps us to *refamiliarize* their everyday practices and perhaps see our own in a new light.

Our analytical focus on design intuitively makes sense in a milieu like a hackerspace where participants are hacking, making, and explicitly engaging creatively with interactive technologies. But is it more broadly applicable? Why would we foreground design in, for example, a slum community center where members do *not* make a point of calling themselves designers or DIY makers? Suchman (2002) argued that rigorous understandings toward technology design should move beyond the designer–user dichotomy and examine the active work done throughout a network of production, appropriation, configuration, customization, maintenance, and so on, across boundaries of professional practice and privileged locations. Here we hope to provide some practical guidelines to help define and make visible the everyday designerly work that connects practitioners across disciplinary and spatial boundaries. Designerly engagement occurs not just during the design and production of technological artifacts but in their buying, their use, their remix, and even after the ostensible “death” of the product.

Definitions of “design” are varied and contested. Ours aligns with quotidian work such as Herb Simon’s oft-cited definition that design attempts a “transformation of existing conditions into preferred ones” (Simon, 1969, p. 55). More specifically, we regard design not just as an activity but as a way of knowing and of encountering the world, concerned with “practicality, ingenuity, empathy, and a concern for ‘appropriateness’” (Cross, 2007, p. 18), a set of practices and values that are strongly oriented toward situatedness (whether physical, cultural, social, or infrastructural).

In this sense, everyone designs, though not everyone is a professional designer; similarly, everyone does arithmetic, geometry, and deductive reasoning in their everyday lives, though most would not claim to be mathematicians. With all due respect to the rigor of professional design practice, we suggest that certain crucial elements are present in all designerly work, whether professional or amateur, expert or lay, whether or not the practitioner calls it “design.”

First, Simon (1969) described design as *normative*, or “concerned with how things *ought* to be—how they ought to be in order to *attain goals*, and to *function*” (p. 4). Although much of what we attempt to accomplish in ethnographic work is descriptive and interpretive, design often deals in imperatives. Intrinsic to design is a sense of pursuing opportunities and solving problems to change existing situations into preferred ones. A focus on this aspect of design calls attention as well to *whose* preferences are being addressed. Rather than making a situation “better” in an objective sense, opportunities for design can also be points of friction and conflict between different parties’ needs, hopes, and desires.

Second, design is concerned with *practicality*—creating solutions that work in context may be more important than uncovering universal truths. Often, this aspect of design is couched in terms of *constraints*, an inevitable and important part of any situation calling for design. Constraints here are not something to be viewed in a negative light; rather, they provide structure to the design problem. Designer Charles Eames (1993) noted in an interview that “design depends largely on constraints. . . . Here is one of the few effective keys to the Design problem: the ability of the Designer to recognize as many of the constraints as possible; his willingness and enthusiasm for working within these constraints.” Whereas design for industrial production is often concerned with scalability and wide appeal (indeed, those are some of the constraints of that particular design context), amateur and vernacular design practices may be more concerned with specific improvements to local, particular situations.

Third, design is an exercise in *problem framing*. Typically, design work does not involve finding the best solution to a completely defined problem; rather, “the problem and the solution develop together” (Cross, 2011, p. 11). Cross’s studies of designers at work show people interrogating and redefining problems by prototyping partial solutions; his close analysis of activities during a design process show team members tacking back and forth between “clarifying the task” and “searching for concepts,” not just at the beginning of the design process, but throughout. Schön (1983) referred to such work as a “frame experiment,” in which the practitioner tries out new ways of formulating intractable problems, and in so doing “listens to the situation’s back-talk, forming new appreciations which guide his further moves” (p. 63).

Fourth, designerly work takes a broad *systems approach* to addressing any given situation. An example of this can be found in the work of Gordon Murray, an industrial designer specializing in Formula One racing: Tasked with making his team finish races faster, he applied his design skills not only to the construction of the race cars themselves but streamlined the timing and structure of pit stops in order to shave precious seconds off of race time (Cross, 2011). Here the designer does not limit herself to a narrow scope but considers many interconnected practices and aspects of the situation for which she is designing.

Taken together, design can be framed as a fundamentally interpretive, relational activity (similar to ethnographic research and much of contemporary anthropological work), where both problem and solution take shape in a dialogue between the designer, their materials, and their situation. These four elements define a practice that, in its normativity, provides occasions to express values, hopes, and aspirations; in its practicality, grounds us in rich context and detail; in its emphasis on problem framing, opens us to the interpretive activities of our participants; and in its systems approach, highlights interconnections between activities and locales. As a creative activity, design emphasizes the resourcefulness and agency of participants; as an activity defined by constraints, it also awakens us to the ways in which agency can be limited by location within broader technical, legal, and social infrastructures. For these reasons, we believe that an emphasis on everyday designerly activities such as the Seeduino or the productions that come out of a hackerspace can constitute a powerful ethnographic lens.

Further, drawing inspiration from prior work on multisited ethnography in anthropology and HCI, we note the multisited character of this design action. In one sense, design is deeply local, engaged with particular settings and particular artifacts. In another, though, it always draws from other places, connects ideas together, and points toward alternatives; it articulates new narratives and suggests ways that new kinds of relationships can be forged between people, places, and ideas. Returning to the example of the local productions of the Arduino board in China, the Arduino has become an international symbol of open hardware and DIY maker ethos. It is a ubiquitously known hardware platform in any hackerspace around the world as well as in educational arts and design programs across many regions. Its early, low-end reproductions in China, on one hand, allowed DIY makers there to tap into these networks of open hardware enthusiasts before Arduinos were available and affordable to most consumers in China. At the same time, the recent production of new Arduino derivatives also challenges our ideas of what “authentic” making and innovation mean in the first place. The Seeeduno is by no means a cheap, unauthorized fake. On the contrary, designed on the principle of open source reiteration, it constitutes an affordable and high-quality version, made possible by Chinese makers who learned how to navigate and take advantage of Shenzhen’s open manufacturing scene. Supplying and collaborating with makers and factories in China, Seeed Studio works based on partnerships and the formations of new alliances between previously distant communities. This makes visible, then, that when a design problem is framed within a space of alternatives, it often escapes the bounds of a particular locale, much like multisited ethnography; both design and ethnography can reflect and articulate a relationship between local and global.

We dub our approach multisited design to signal not just the connection between the two ideas but the bidirectional relationship between them. Our focus is not just design, but multisited design in the way in which design becomes explicitly a site for the imaginative projections that connect sites; not just multisited, but multisited design in the orientation toward artifacts, opportunities, and transformations.

We now bring our concept of multisited design as it emerged from Lindtner’s research on DIY making in China into conversation with Williams’s design ethnography with a slum community center in Bangkok. By centering design in an analysis of how a slum community center positions itself in relation to these two sites, DIY making in China and a concrete design intervention in Bangkok, we can begin to note how the connections, flows, frictions, and boundaries between locales are taken up as inspirations, opportunities, and constraints for design.

6. DESIGNING FROM A SLUM COMMUNITY CENTER

The Mercy Centre, established in 1976, is a nonprofit community center, orphanage, hospice, and network of schools that serves Khlong Toey, one of the largest, oldest, and most politically organized slums in Bangkok, Thailand. As a port,

Khlong Toey was already a connected community, a hub where international shipping cargo gets loaded into regional truck networks, where poor laborers flocked from Thailand's countryside, Vietnam, Burma, and Cambodia and continue to send money to their families back home. Bangkok, as a major port, has long been a site where Thailand encounters the rest of the world, and the capital city as a site of trade and encounter dates to 15th-century Ayutthaya (Breazeale, 1999). Khlong Toey, even while experienced as profoundly local, always also carries the background noise of its national, regional, and global attachments. Digital technology, then, has not suddenly and disruptively connected this neighborhood to its wider world but adds a new dimension to the ways in which people enact these connections.

The Mercy Centre's methods for providing education, childcare, and AIDS medicines rely on social and material resources that are both local and transnational. Legal aid workers navigate Thailand's legal system to advocate for street kids and recover crucial documentation, keeping track of which judges and which police officers might be inclined to help protect those children's interests. At the same time, the money that fuels their power to influence local happenings is sought through a transnational support network, using digital media. The infrastructure of this transnational connectivity, which includes PayPal, sister charities, and web hosting, is maintained by volunteers distributed across multiple continents. Williams, because of her prior professional design experience, participated in the design of the Mercy Centre's website and those of their sister charities in the United States and the United Kingdom, set up and maintained hosting and payment infrastructures, and helped with visual design of photo-documentary printed materials.

The website design was mostly driven to support international fund-raising, which, perhaps unsurprisingly, is where the money is. A large majority of online donations to the Mercy Centre, from 2009 until present, come from individuals in the United States, Europe, Australia, and Canada. American and U.K. sister charities recruit tax-deductible donations from two of Mercy's highest donating nations. An important means of persuading donors—either to donate for the first time or to keep donating habitually—is through the wide circulation of stories and images showing, first, the Centre's need for aid, and second, their ability to put it to good use. This international network allowed the Mercy Centre to gather the money, resources, and political clout necessary for large-scale programs. Simultaneously grounded in local knowledge, Mercy staff are capable of finding opportunities to intervene, with “practicality, ingenuity, empathy, and a concern for ‘appropriateness’” (Cross, 2007, p. 18) to nudge existing situations toward preferred ones.

A challenge, however, remained in utilizing funds and resources to deal with the hardship of slum fires, whose conditions and consequences are determined across multiple sites in neighborhood and government. The Mercy Centre deals with about two fires per year, in various slums throughout Bangkok, and in this section we highlight some of the designerly aspects of their interventions to prevent and mitigate slum fires. Many slum-dwellers in Bangkok are squatters; infrastructure typically provided by the city (e.g., electricity, garbage collection) is spotty, as residents are not officially supposed to be there. Electricity, then, is often expensive because it is

jury-rigged, resold, and marked up. If someone is behind on their bills, it would be typical for their landlord to cut off the electricity. Power outages are also reported to be a frequent occurrence in the neighborhood. In those cases, people usually fall back on candles for lighting. More routinely, food is typically cooked in very hot woks on an everyday basis. Cooking fires and unattended candles are two frequent causes of slum fires.

Slum housing in Bangkok is usually densely placed and made from wood, which means that fires spread quickly, damaging material property that is usually residents' principle form of wealth. After a fire, residents are officially required to ask for licenses to rebuild. These requests can easily be denied en masse and the land reappropriated. In theory, because Thai law allows a person to own a house without owning the land it is built on, residents can be compensated with cash and provided with alternative housing options. In practice, compensation is not given automatically but must be requested; alternative housing tends to be outside of the city center and farther from work opportunities, and cohesive support networks can be broken up and physically scattered. Even when the slum's land is unwanted, approval to rebuild can get caught in red tape, resulting in long delays for people who do not have much in the way of alternative housing options.

There are multiple opportunities in this interconnected system to design interventions for preventing or coping with slum fires. The transnational fund-raising strategies previously described provide Mercy with means to find temporary housing, feed disaster victims, and so on. But in thinking systemically about the interlinking causes and effects of slum fires, local opportunities present themselves as well. In cooperation with the fire department, for example, the Mercy Centre arranges safe public demonstrations of how to quickly extinguish wok fires (Figure 2).

The Mercy Centre also engages in damage control after the fires occur. In one instance, slum residents found a way to game the system in the aftermath of a fire,

FIGURE 2. Fire safety education at the Mercy Centre Bangkok. (Color figure available online.)



operating on the premise that it is better to ask forgiveness than permission. After a fire in the Tap Gaew slum on a Thursday morning—started after a resident fell asleep with her candle lit—neighbors worked together to rebuild dozens of homes before Monday morning, when the railway authorities who legally owned the land would be able to review permit requests:

It's important to rebuild rather than relocate, or be relocated. Everything material was gone, . . . making it even more important to hold on to the social structure. One of the men stood up to ask if they could be arrested if the [re]building was illegal. Another in attendance said that if anyone was arrested, everyone—absolutely everyone in the slum, moms and babies too—was to go to the police station and surrender, confessing identical guilt.⁷ (Maier, 2005, pp. 106–107)

Here we see how slum fires are enacted at various different sites: in an individual home in the slum, at municipal permit offices, at the local jail. The sorts of interventions that opportunistically take place at these sites, though not carried out by professional designers, exhibit characteristics of design thinking. They are normative in that they seek to repair damage done by fires, or to decrease the likelihood of future fires, demonstrating a preference toward a situation in which slum fires and their consequences are greatly reduced. They are practical, focusing on what can be achieved in the here and now, given the constraints imposed by municipal authorities' work schedules, lack of land ownership, local resources and habits, and so on. The interventions frame the problem of slum fires in different ways: On one hand, the design problem is a prevention issue addressable via fire safety education; on the other hand, the design problem is one of harm reduction and keeping the community colocated. Last, we see instances of systems thinking, for example, using the end of railway administrators' workweek to circumvent the problem of applying for permits.

Lindtner's fieldwork with China's growing DIY maker community reveals how designed objects, such as the *shanzhai* Arduino board, themselves undergo redesign and remix at multiple sites throughout their lifecycle, both absorbing and creating new and local meanings throughout. Our lens of multisited design, when applied to the practical issue of dealing with slum fires at the Mercy's Centre, emphasizes the ways in which supposedly seamless global communications systems are encountered differently from different locations. Design, in both of these cases, happens at multiple interconnected sites. Applied to the issue of slum fires, we see that a multisited view of the phenomenon (a view taken by participants as well as the ethnographer) reveals acupuncture points where a design intervention of limited scope can have far-reaching impacts. In this case, design is applied at one connected site with the hope that its effects will propagate.

⁷During the meeting described in this quote, it was also suggested that the children deliberately be brought to the police station with sticky hands and full bladders.

7. ACUPUNCTURAL DESIGN

In addressing the matter of slum fires, the Mercy Centre was able to identify sites where intervention could make a difference. They knew what they were and weren't capable of accomplishing. Their skills and connections are useful for working within the Thai legal system—this lends itself well to legal solutions such as helping to recover legal identification lost in a fire. With some financial and material resources, they can practically aid a community that wants to rebuild their homes over a weekend. With the ability to bring community members and city employees together, they are able to get firefighters to educate people on safety issues and putting out fires before they spread. Similarly, the Seeeduino is a fulcrum between *seemingly* opposite systems of production: open source development and manufacturing in China. The first is typically seen as a global grassroots movement often associated with craft and countercultural attitudes and the second associated with industrial production and mass-manufacturing. Seeeduino serves a global DIY maker community and simultaneously helps proliferate ideas of open hardware and making in China. As such, the boards satisfy and help enlarge the niche market of a community of makers that sees itself working at the intersections of local and international networks. It is the location of Seed Studio in a particular city at the hub of the world's electronics supply chains that made the Seeeduino's development, distribution and affordability feasible.

We can describe these two cases, Seeeduino's production in China and the Mercy Centre's fire prevention educational efforts, as an "acupunctural" design intervention. Both of them were performed with an awareness of the interconnected causes, effects, and actors involved, yet with an eye to specific local needs and capabilities. By acupunctural design, we speak to a simple, pragmatic, partial solution, a small action positioned such that it could have far-reaching effects. The design intervention here is the needle: It does not need to be fancy or complicated, and it just needs to be inserted in the right place in an interconnected system. The design of the Mercy Center slum fire education event was pragmatic and resourceful but with an eye toward the ways in which its effects might travel. The Seeeduino's development, distribution, and affordability was largely due to Seed Studio's specific location in the hub of the world's electronics supply chains and their relationships with local suppliers; yet at the same time, it remakes and reimagines transnational connections, relationships, and modes of production.

Taking a cue from this design practice as a well-placed needle, Williams decided to scope a small, but thoughtfully positioned, design project. As a designer who usually resides in North America rather than Bangkok, she felt less equipped to engage upfront with political solutions having to do with land ownership, or to change the means by which the city does and does not provide electrical infrastructure. By bringing in the consideration of multisited design, however, Williams was able to speak to both the limitations and advantages of her position and expertise. For instance, a simple intervention addressing one of the major causes of slum fires (as the Mercy Centre's demonstration did), could prevent some of the myriad interlinked problems caused by these fires. A multisited design approach revealed an opportunity for the design

of inexpensive, rechargeable, nonflammable lights that might serve as substitutes for candles. Let us elaborate.

Williams began by examining the locally available lighting solutions, focusing on rechargeable lights available for 30 to 150 Baht (about 1–5 USD). She tore apart off-the-shelf products and used some of their components in our prototypes. Once disassembled, it became evident that some of the cheaper models did not work as their packaging implied (in one instance, the crank recharger was not connected to the battery). Most of the inexpensive off-the-shelf products she found were flashlights that could be shaken, cranked, or squeezed to recharge, a form factor that is perfectly appropriate for occasional emergencies. However, because Khlong Toey's power infrastructure was unreliable, and because it was not uncommon for people to fall behind on electricity bills, she wanted to consider form factors appropriate for more frequent or extended use, such as providing ambient light, or hands-free focal lighting for reading or doing homework.

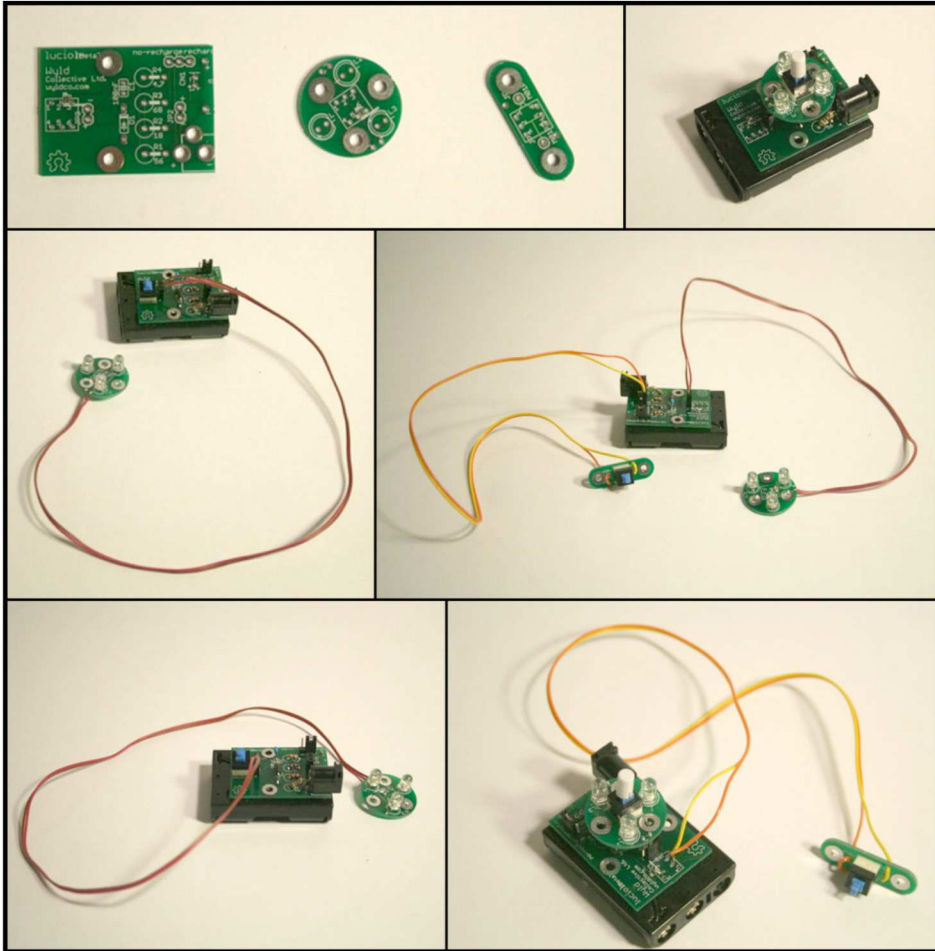
The lens of multisited design made visible that the design of the device, however, is only part of the work of designing a technological product. Providing reliable hardware at a price that slum residents can afford (ideally, 2 USD or less) is not easy. Williams therefore explored distribution models inspired by practices she saw in and around the Mercy Centre, in particular, the practice of entrepreneurial craft. Based on local crafting abilities, and the low prices of locally crafted objects, she expected that shipping a finished product to Khlong Toey may not be the most cost-effective solution, nor would it allow local users to adapt such a lighting solution to their own circumstances.

Instead, she took advantage of our own engineering capabilities and the price structures around electronic hardware—where the cost of components and manufacturing drop drastically for large batches—in order to supply local entrepreneurs with inexpensive, flexible lighting kits that can be configured into a variety of different forms. These entrepreneurs could in turn add value by creating cases and setting prices based on their own assessments of what their neighbors and customers might buy. This decision about distribution then informed further iterations of our circuit design; the hardware was subsequently designed to be assembled in a variety of different ways: as a hanging light, a desk lamp, a candle, and so forth (see Figures 3 and 4).

Looking at the practical survival strategies that participants had already designed for their situation, Williams asked if those strategies might also be a viable course of action for ourselves. In this view, we framed local participants as the experts and ourselves as the novices, in understanding how to cheaply adapt a product to local situations. Williams worked (and continues to work) with Mercy Centre staff to determine preferred form factors and distribution methods, add off-the-grid charging, lower the cost of production, and to confirm or adjust our intuitions about the potential effectiveness of this product.

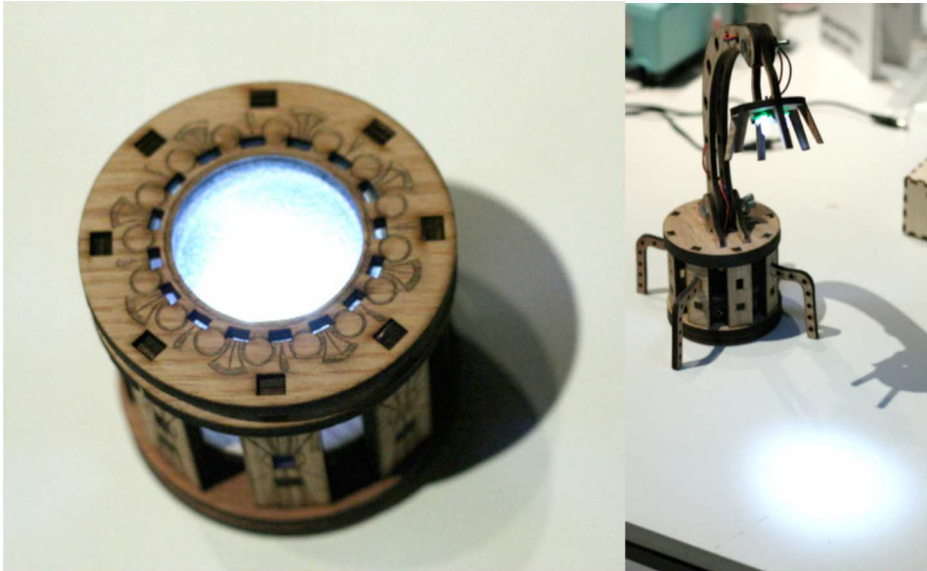
The multisited design approaches we have laid out here have recently culminated in a collocated collaborative effort. From January to May 2013, Williams and Lindtner were based in Shenzhen, participating in a 15-week-long hardware-focused accelerator program called HAXLR8R (www.haxlr8r.com). HAXLR8R, backed by

FIGURE 3. Several different configurations of a rechargeable light. (Color figure available online.)



SOSVentures—a venture capital firm based out of Ireland—provides funding for 10 startups; connects them to local manufacturers, makers, and hackerspaces in Shenzhen; and enables them to turn their hardware projects into products (Lindtner & Li, 2012). Williams was accepted to the program as a startup founder, together with her partner Bruno Nadeau from Fabule Fabrications, based on the prior design and ethnographic fieldwork in Bangkok as just discussed. Lindtner joined the program as an onsite ethnographer working alongside Williams and Nadeau to trace these ongoing experiments in bringing together DIY makers with Chinese manufacturers. Our collaboration at HAXLR8R has meaningfully intertwined each of our prior efforts in Bangkok and China, foregrounding the multisitedness of our own design efforts. Williams draws upon the design concepts and goals developed with the Mercy Centre in Bangkok. Lindtner draws upon personal and professional connections with China's

FIGURE 4. Two prototype enclosures demonstrating different configurations of identical electronic components. (Color figure available online.)



DIY makers that she has established over the last 3 years. Ultimately this makes visible how multisited design constitutes an analytical sensibility toward both design and ethnographic work, making explicit undercurrents and layers of connection between and within a given locale, through a design intervention and/or an ethnographic site.

8. DISCUSSION

One of our goals in doing multisited design, both in the context of our own fieldwork and more broadly in articulating it as an analytical lens, was to address some recent critiques of HCI ethnography (Dourish, 2006; Rode, 2011; Taylor, 2011) by performing specific ethnographic work that takes design seriously without becoming reductionist, taxonomic, scenic, or overdistilling our ethnographic accounts. Although ethnography and design are sometimes portrayed, at least within HCI, as having conflicting goals, the two practices share certain epistemological affinities, related to the four key aspects of design that we articulated in Section 5. First, because design has normative elements, we found that engaging in design during our fieldwork, as a form of participation, was effective in eliciting articulations of goals, aspirations, values, and criticisms. Second, in both design and ethnographic practice, problem framing is a central activity—through trial and error we grope toward the right questions, the point of view that reveals some pattern in the messiness. Third, both design and ethnography tend to be interested in the particular and practical achievements of

people within a relevant context. An orientation toward constraints and opportunities characterizes encounters with the global, both for ethnographic participants and for professional designers and researchers. Fourth, the systemic orientation of design thinking complements the commitments of multisited ethnography to trace material, social, and metaphorical connections between sites, out of which an understanding of larger systems emerges.

8.1. Design as Elicitation

Because design is a normative practice, design activities can implicitly critique existing situations and display aspirations and values. Discussions around design activities, meant to expose the rationale behind collaborators' design decisions, constraints, and requirements, can help to articulate these critiques, aspirations, and values. This is not the first study to include some form of design as part of an ethnographic engagement. Durrant et al. (2008) deployed speculative designs to elicit ethnographically valuable discussions by creatively disrupting typical photo display practices in people's homes. When studying technology appropriation among evangelical Christians in Kenya, Wyche, Aoki, and Grinter (2008) incorporated design sketches into their field work, which defamiliarized contexts of use, exposed latent practical factors, and elicited discussions about appropriation. They shared their sketches with local design students after conducting ethnographic interviews. Where we differ, however, is in our focus on the design *process* and the ethnographic opportunities afforded by designerly thinking and problem-solving processes.

Our recent (and ongoing) encounters with manufacturers in Shenzhen, as part of a real design process, drove home the point that factory engineers and electronics vendors were partners in our design efforts rather than simply resources or services that entrepreneurs could use. The practical demands of *doing design* revealed expertise, willingness to produce small batches, and affinities between manufacturing and DIY making that we would likely not have encountered in interviews. In China's unique manifestations of DIY making, design activities are both materially and semiotically productive. Products like the Seeeduino board embody some of their designers' intents and values as well as new partnerships between previously unlikely entities, that is, in this case, DIY makers and Chinese manufacturers.

At the Mercy Centre in Bangkok, collaborations around web design, brochure layouts, and photo collections proved an effective way to elicit articulations of aspiration and tactics, to uncover what stories people wanted to tell themselves (and others) about themselves. In these situations, Williams was not only trying to elicit; rather, feedback was motivated by the staff's knowledge that the materials Williams designed would be acting in the world, representing them to a wider public in ways that could materially affect donation rates. These design discussions not only elicited direct feedback but also inspired discussions about aspects of life at the centre that Williams might never have thought to ask about explicitly.

We suggest that the *normative* elements of design thinking provide a good starting point for discussing the ways in which design practices do interpretive cultural work.

When we consider design toward a “preferred situation,” we call attention to the subjective and interpretive nature of preference. By necessity, *someone is doing the preferring*, and their preferences may not be universally shared. The normative element of design can provide us with a starting point for articulating the frictions of competing preferences put into motion (or not) by different parties.

8.2. Interdisciplinary Problem-Framing

In our own design process, we used our experiences in the field, and our ethnographic analysis, as models for our design work to converse with, to help clarify our own design judgments. Ethnography certainly influenced our design work, though in a less straightforward way than by generating a list of requirements or implications as the final product of ethnographic analysis. The emphasis in HCI ethnography on “implications for design” arguably serves design as poorly as it serves ethnography. It is based on an understanding of a specific sort of engineering design (noted in Dourish, 2006) that is not necessarily applicable to the practices of interaction designers, or the areas of HCI (e.g., tangible interaction) that are becoming increasingly influenced by product design. Löwgren (1995) explicitly articulated the differences between what he called “engineering design”—focused on finding optimal solutions to a well-defined problem—and “creative design,” which engages more in problem framing. He made the crucial point that, *in practice*, even what engineers do sometimes looks more like creative design than the idealized model of engineering design. Fallman (2003), in arguing for HCI as a design-oriented field, pointed to “conservative,” “romantic,” and “pragmatic” accounts of how design works; the conservative account assumes a repeatable linear problem-solving process, whereas the romantic account black-boxes design as an artistic, personal, and unrepeatable endeavor. Of most concern to us is Fallman’s pragmatic account, which comprises a “hermeneutic process of interpretation and creation of meaning” that “focuses on the situatedness of the design in the life-world and brings to light the interweaving of roles, practices, and technologies involved in design.” By all accounts (Cross, 2011; Fallman, 2003; Löwgren, 1995; Nelson & Stolterman, 2003; Schön, 1983; Wolf et al., 2006), designerly approaches involve concurrent (not strictly sequential) problem setting and problem solving in a process that can be said to resemble a conversation between the designer and her materials and situation.

Although designing rechargeable lights for the Mercy Centre and during our current collaboration in Shenzhen, we continually revisit our analysis and even some specific impressions from ongoing ethnographic fieldwork in China. We engaged in a conversation with our ethnographic model, returning to it when we had questions we wanted to ask it about our design ideas. For instance, as we interrogated our ethnographic model from the Mercy Centre, the problem of price setting became reframed as a problem of adapting to local circumstances, which encompasses both price and form. Such an interrogation could not have taken place with ethnographic results distilled into something so simple as a list of requirements specifications, or anything resembling “implications for design,” because such results would have

been aimed at firmly setting the design problem, instead of providing designers with the tools to frame and reframe the problem themselves. Rather than revealing specifications, our analysis revealed an opportunity, along with *partial* requirements (e.g., low price point, nonflammable, off-the-grid): a partially set problem, with room to reframe as we sketched and prototyped our way toward a product.

8.3. Practical Design

A reviewer of an earlier draft of this article pointed out that the light we designed during the Khlong Toey ethnographic engagement does not appear to be much more than a battery-powered flashlight. Although we have clarified some differences (e.g., reconfigurability and local enclosure design), on a certain level, that reviewer is correct. We took the basic concept of the rechargeable, battery-powered flashlight and hacked, tweaked, and reappropriated it for a specific niche. We even reappropriated some components from off-the-shelf flashlights.

In essence, we are making a *shanzhai* flashlight. The process described earlier in this article—where *shanzhai* manufacturers used components of existing phones, along with new parts, to rapidly redesign and produce phones to meet specific needs for sending remittances or finding Mecca—is quite similar to parts of our own design process.⁸ This returns us to the *practical* aspects of design and design thinking, the concern for appropriateness in particular contexts over universal truth. The design of our lights, of *shanzhai* Mecca-finding phones, and of Seeeduinos are all responses to particular sets of constraints and opportunities that their designers cared about. In our case, we found constraints of infrastructural power availability and price point, and opportunities in local craft, which differed from the constraints and opportunities for developing a generic rechargeable flashlight.

The practical concern with constraints and opportunities, and their crucial role in design and design thinking, provides us with some vocabulary for discussing the contingent, sometimes limited, agency that characterize people's encounters with other locales and with transnational phenomena. Not only does this concretize the abstract notions of "transnationality" and "globalization," but it uses the same sort of vocabulary to describe symmetrically both the practices of professional designers and of the participants or "users" with whom ethnography engages. This parallel language, we hope, makes it easier to see the ways in which we, as professional designers and researchers, encounter and are positioned within, transnational forces and infrastructures.

⁸Parallels can be drawn, also, to the sorts of permutations that open source projects go through, whether the many flavors of Linux adapted for different sorts of hardware or users (e.g., Debian for free software devotees, Arch for experience users who want a minimal OS, or Raspbian for the credit-card-sized Raspberry Pi computer), or the many variants of Arduino in different forms for different application areas (e.g., the Lilypad for soft circuits, the Nano for breadboarding, the Mega for projects that demand more memory or I/O resources, or the Seeeduino coming out new collaborations and partnerships). In all of these cases, design is approached not as the wholly original work of a singular auteur but as an exercise in resourceful appropriation and remaking, for specific situations.

8.4. Sharing a Systemic Orientation

We used the term “acupunctural” to describe Williams’s design for nonflammable, rechargeable lights and the production of Seeeduino boards coming out of new partnerships between makers and manufacturers in China. The notion of acupunctural design here is based on a multisited view of the design situation, emphasizing interventions that are positioned in a way that will allow their effects to spread throughout the system. This design stance, we believe, transitions easily from a multisited ethnographic analysis that focuses on the interconnections and influences among different sites, and the positionalities constructed therein. Our ethnographic analysis, rather than emphasizing requirements, first revealed positional opportunities for design.

This systemic approach, we believe, represents an underlying epistemological similarity between multisited ethnography and design thinking, specifically around the need for systems thinking in many successful design projects. Rather than starting from a narrow set of problem criteria, according to Cross (2011), effective design tends to consider how different factors, locales, and practices relate to and affect one another as an overarching system. The notion of multisited design recognizes this resonance and uses ethnographic analysis to help clarify systemic relationships that can help frame design problems and solutions.

9. CONCLUDING REMARKS

In describing the methodological and analytical lens of multisited design, we emphatically do not claim that we have found a silver bullet for collaborations between ethnography and design. Instead we want to emphasize the importance of an analytical lens. Design-ethnography collaborations must begin with the realization that field data are never neutral or “raw”; rather, the right sorts of framings are crucial to learning something useful with regard to design and use of sociotechnical systems, and different framings will help us learn different things.

One perceives patterns, relations, etc. in the sociocultural reality according to one’s preconceptions. By making these preconceptions explicit, and by reflecting on the appropriateness of them with regard to a given problem (*i.e.* by formulating research questions and formulate, albeit an implicit, theory), one actually confronts those preconceptions with empirical reality and advances ones understanding of it. (Van Veggel, 2005, pp. 10–11)

For designers, this entails an acceptance that ethnographic analysis, not just fieldwork, is a crucial part of the process. For ethnographers, it becomes important to carefully choose analytical lenses that are compatible with the design collaborations and partnerships that we enter into during ethnographic fieldwork.

Multisited design honors the commitments of both ethnography and design in the following ways. First, it leverages *normative* aspects of design practice to pinpoint

opportunities to elicit discussions of aspirations, values, and critiques with participants in the field. Second, it aims for a fluid interaction between ethnography and design as practices that each engage in *problem-framing* (not just problem solving), avoiding the pitfall of overly constraining a design project in its early stages. Third, its concern with *practicality* and *appropriateness* gives us a vocabulary to symmetrically discuss encounters with transnational phenomena, both for participants and for researchers, as constituting constraints and opportunities for on-the-ground actors with real but finite agency. Fourth, it emphasizes the *systemic* orientation of both creative design and multisited ethnography. Although multisited design is not necessarily *the* way to configure design-ethnography collaborations, it is *a* way that shows promise for certain design domains.

As the phenomena that we study evolve, methods and analytical frames must evolve apace. Multisited ethnography was a response to increased mobility of people, goods, capital, and ideas—the increasingly important role of mobility in the world demanded methodological approaches that dealt with mobility on its own terms rather than treating it as a transgression of solid, bounded sites. Participatory design, similarly, was a response to the relatively new (at the time) situation of introducing collaborative, technological systems into workplaces, and the power dynamics that could thus be exposed. Here we wish to call attention to HCI's shifting center of gravity, away from the industrialized West that has been the mainstay of our research for nearly three decades. Technological encounters in transnational and non-Western settings can no longer be treated as the “rest of the world” or “other”—these are central concerns that must be met on their own terms. Multisited design, we believe, is an analytic and methodological lens that is well suited to the problems inherent to designing for transnational, non-Western, and mobile contexts, and for increasingly savvy, empowered, and competent users of technology. Although excellent design exhibits ingenuity, an ability to look at a situation with fresh eyes and address it in original ways, it also exhibits a concern with appropriateness, coming from an ability to empathize with users. This combination of ingenuity and empathy marks out a fertile middle distance from which to design. In very familiar settings, the distancing strategy of “defamiliarization” is an effective way to achieve that middle distance. In settings that may be less familiar to many researchers, a more effective strategy would aim to bring us closer. Marcus (1995) proposed that a multisited approach, by emphasizing participants' understandings of how they fit into the “world system”, can create “intellectual identification between the investigator and variously situated subjects” (p. 113). By also emphasizing the contingent agency of participants' creative and designerly activities, we attempt to narrow the gaps that we might typically perceive between “designer” and “user.” Multisited design emphasizes the notion that we are collaborating with people who, *like ourselves*, are located in relation to certain communities and infrastructures, capable in some ways and constrained in others, aiming to facilitate “the meeting of different partial knowledges” (Suchman, 2002, p. 94). In our experiences, described in this article, our most promising design opportunities presented themselves in the sites where our and our participants' partial knowledges had the opportunity to mesh into something more.

NOTES

Background. This article is based on long-term ethnographic research and participatory design conducted by Lindtner in China, ethnographic research and design practice conducted by Williams in Thailand, and close collaboration on analysis and synthesis among the four authors throughout the research.

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