



The Benefits of Using Design Workbooks with Speculative Design Proposals in Information Communication Technology for Development (ICTD)

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ABSTRACT

This article argues that design workbooks can benefit the field of Information Communication Technology and Development (ICTD). To demonstrate this, I present a workbook comprised of 12 speculative design proposals. I then present findings from interviews conducted with 22 participants in Bungoma, Kenya; I used the workbook images as prompts during these sessions. My findings suggest that the design workbook method supports a participant-driven interview process. The workbook images prompted rich responses from participants about the contexts where the ideas would exist. These responses draw attention to the practical problems that might accompany the introduction of the ideas into their communities. Significantly, these responses also included critical feedback. Important information was gleaned from comparing and contrasting the multiple ideas in the workbook; these insights include novel understandings about surveillance and participant/researcher relations. These findings motivate a discussion about how design workbooks support different ways for people to participate in the design process, and encourage different outcomes in ICTD.

CCS CONCEPTS

• Human-centered computing; • Human computer interaction (HCI); • HCI design and evaluation methods;

KEYWORDS

design, design workbooks, HCI4D, ICTD, Kenya, speculative design

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1 INTRODUCTION

Information Communication Technology and Development (ICTD) and the related field of Human Computer Interaction for Development (HCI4D) are broadly defined as research areas which examine

how technologies “can be appropriately designed to (...) address the distinctive needs of users in developing regions” [35]. Within the Human Computer Interaction (HCI) community, HCI4D/ICTD studies have become more central, and efforts to broaden the community’s knowledge of how to design technology for populations not traditionally considered in HCI research—or who have been described as underprivileged—continue to increase [17, 32, 57]. Accompanying the HCI community’s growing interest in designing technologies for these contexts—and spurred by postcolonial computing discourse—are important discussions about which design methods to use in HCI4D/ICTD [37]. These discussions include constructive critiques of the uneven power relations that accompany mostly Western scholars conducting design-oriented research in developing regions; they have also motivated researchers to use more participatory approaches in their work (e.g., design workshops) [3, 60, 61,]. However, these methods have also come under scrutiny. Harrington et al. argue that some of these approaches fall short in supporting equitable engagement in design [32]. In this paper, I ask HCI4D/ICTD researchers to broaden the methods they use, to include design workbooks. I argue that this method can address some of the limitations inherent in other design methods (i.e., interviews and workshops), by providing participants with different ways to participate in design processes and supporting different outcomes in design. More broadly, by integrating design workbooks into my HCI4D/ICTD design process, I present an alternative way to approach design in these fields. This approach prioritizes mutual learning between designer and participants over generating design guidelines or developing prototype systems.

Gaver introduced design workbooks to the HCI community, describing them “both as a method for design and as a design methodology” [28]. Specifically, they are a collection of speculative design proposals that support conversations between designers and the people they are designing for. To demonstrate how this method can support HCI4D/ICTD research, I present a case study that describes a workbook I developed as a part of a five-year research project investigating domestic technology use and design in Bungoma, Kenya. My workbook features 12 speculative design concepts; that is, ideas that offer an alternative to more traditional ones pursued in HCI4D/ICTD, and that—strictly speaking—are not meant to be developed [22]. I then present findings from interviews with 22 participants. I used the images in my workbook as prompts during these sessions. My findings suggest that inserting the workbook images into the interviews gave participants greater agency during the sessions, so that they were more likely to take an active role and direct the interview. The workbook images also prompted rich responses about the social and historical contexts in which the concepts would be adopted. Participants’ reactions to the concepts

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also draw attention to practical problems that might accompany the concepts' introduction into their communities. Significantly, participants' responses also included critical feedback. Finally, the multiple concepts in my design workbook supported new understanding of problems and possibilities in HCI4D/ICTD, by prompting discussions that compare and contrast multiple design ideas. My findings offer new insights about surveillance and participant/researcher relations.

The discussion elaborates on how the design workbook method can benefit HCI4D/ICTD: by supporting different ways for people to participate in design (i.e., which recognize them as experts and encourage them to critique design ideas); and by supporting different outcomes in HCI4D/ICTD (i.e., speculative design proposals and long-term engagement with communities). In the discussion, I also detail limitations of the workbook method, and outline future research that builds upon this study. This paper contributes a case study, based on my experience using the design workbook method in research conducted in Bungoma, Kenya. I also contribute a design workbook with 12 speculative design proposals—a designed artifact that represents contribution in its own right [52]. This study also contributes to a growing body of research exploring how to use participatory methods in design-oriented research conducted in Africa.

2 RELATED WORK: RESEARCH METHODS IN HCI4D/ICTD

Motivated by the growth in HCI research devoted to designing technological interventions for “underserved populations around the world,” Dell and Kumar reviewed 250+ HCI4D publications, to assess the impact of these efforts and to suggest future research opportunities. Their findings include descriptions of where this research is conducted (i.e., primarily South Asia), the focus of scholars' inquiries (e.g., education, access, and health), and what methodological approaches were used in these studies. Roughly half of the publications they reviewed used a qualitative approach [17]. That is, researchers typically use interview and observation methods to understand the communities they are designing for. There are multiple HCI4D/ICTD and HCI studies (including my own) that rely on these methods to produce design guidelines, and related commentary about how to design for the various contexts under study (see [17] and [57] for overviews). These methods are typically integrated into traditional HCI design processes that include user studies, iterative prototyping, and evaluation. Interviews, in particular, are considered useful for learning about communities. However, they do have limitations, especially if a study's ultimate goal is to imagine new technological possibilities [29]. Thus, HCI4D/ICTD scholars have broadened the methods they use to include participatory ones, such as sketching, creating low-fidelity prototypes, card games, and role-playing. These participatory (also described as ‘co-design’) methods are considered especially appropriate for use in underprivileged communities—that is, populations whose “voices have traditionally been marginalized due to their position in society” [32]. Researchers argue that because these methods allow people to visually communicate their design ideas, they elevate people's voices, knowledge, and rights throughout the design process [43, 47].

There has been a recent surge in using design workshops—a specific participatory method—to achieve these goals in HCI4D/ICTD and HCI research conducted in Africa. Design workshops are defined as “spatially situated and temporally bounded coming together of participant groups and researchers to envision new design futures” [32]. In most cases these workshops are part of longer-term research efforts; however, the events themselves are usually short-term, lasting one or two days. During design workshops, participants are frequently asked to evaluate an existing idea, and/or to engage in exploratory and generative activities that result in new design opportunities, often in the form of sketches or low-fidelity prototypes. In Accra, Ghana, Hudson et al., held two design workshops with speech and language therapists to co-design training tools (e.g., a chatbot that uses text or auditory methods to search for information) [36]. Working in Lesotho, Molapo et al. held workshops with community health workers in order to elicit insights into the design of a mobile application to support their work [46]. Wojciechowska et al. held a design workshop at the 2018 African Conference for Human Computer Interaction (AfriCHI) in Windhoek, Namibia. The goal of their workshop was to understand how to incorporate Africans' perspectives into drone design [61]. Outcomes of their daylong event included low-fidelity prototypes of a nurse drone that reminds people to take medication, and a multilingual library drone that encourages people to read. Hamidi et al. held multiple workshops in Kisumu, Kenya; the sessions were part of a longer-term project exploring how to develop “Do-It-Yourself assistive technology”, and elicited participants' feedback about “TalkBox”—a device that provides non-verbal people with a way to communicate [30]. In Kibera, Kenya, Barbareschi et al. held a “co-design workshop” to explore what future technologies Kenyans with visual impairments want; these technologies included a walking cane that could talk to its user [3].

Accompanying this growing use of workshops are critiques of them [24]. Scholars argue that this (and other participatory methods) rarely support genuine participation, or legitimately acknowledges and recognizes participants as co-designers; instead, participants tend to remain informants in design processes [15]. Other scholars argue that these methods, which have historically been designed for the developed world, are incompatible with developing world settings [13, 60]. Harrington et al. draw attention to other shortcomings of using design workshops, especially in underserved communities. They argue that these events may “further marginalize” certain individuals, and conclude that some participants might not want to “adopt a language of design” [32]. That is, asking participants to engage in making activities, such as using colored markers, Play-DohTM, and LEGO® bricks, to communicate their design ideas can be viewed as infantilizing. The use of methods that can be perceived as underestimating participants' maturity and knowledge, has also been observed in development research conducted in Africa [7]. Here I build upon this prior research by encouraging design researchers to consider using design workbooks in their studies. I demonstrate how this method can address some of the shortcomings associated with the aforementioned methods, by supporting different ways for people to participate in the design process, and by encouraging different outcomes in HCI4D/ICTD design research.

2.1 Design Workbooks

Design workbooks were introduced to the HCI community more than twenty years ago [28]. The “Alternatives workbook” was an outcome of a collaboration between Bill Gaver and Heather Martin (at the Royal College of Art) and Hewlett-Packard Labs [26]. This workbook was comprised of a range of speculative design concepts (e.g., The Worry Stone, Dream Communicator, and The (De)Tour Guide). Gaver later formalized the process by writing about it (see [27]). Here he describes design workbooks as a method that supports a quasi-participatory design approach. He argues that the method benefits the design process by allowing designers to externalize ideas, by supporting conversations among designers, and by supporting conversations between designers and the people they are designing for [28, 29]. He also offers practical advice on how to create workbooks (e.g., using graphics software and collage techniques). Practically speaking, design workbooks are a collection of speculative design concepts. Although the ideas in workbooks are all technically plausible, strictly speaking they are not intended to be developed and evaluated (unlike in traditional HCI design processes). Instead, speculative ideas “create spaces for discussion and debate about alternative ways of being” [22]. Gaver adds that workbooks are most valuable for supporting ‘safe’ creative explorations, and for documenting the transition from background research to concepts to be (or not be) developed [28]. More broadly, workbooks draw attention to design research artifacts which are not strictly based on findings from user studies; that is, they are an alternative outcome to a design process (i.e., not design guidelines or prototypes) [52]. Significantly, the method also supports a slow design process which recognizes that ideas develop gradually over time, and that important issues emerge from exploring multiple concrete ideas.

Since their introduction, HCI researchers have integrated design workbooks into their work [1, 8, 62]. The method has been used to showcase future domestic spaces [1], and speculative concepts that explore technology’s privacy and surveillance implications [62]. To date, design workbooks have not been used in HCI4D/ICTD research, despite evidence suggesting that workbooks are useful for providing additional understanding of contexts—contexts which are difficult to learn using interviews and observations alone [29]. Although speculative design is increasingly recognized as useful in design, the vast majority of proposals focus on design in so-called developed countries, rather than in contexts similar to the one where I conducted this research [51].

Wong et al. offer a useful case study demonstrating how the design workbook method benefits design research [62]. They used a workbook (comprised of 15 design proposals) to elicit feedback, to prompt discussions about “privacy-related values,” and to broaden the range of possibilities when designing biosensing technologies. They used the speculative concepts from their workbook as prompts in interviews with graduate students, and found that their approach was useful for drawing attention to unanticipated privacy concerns that might accompany the introduction of new technologies. In this sense, the workbook method is similar to photo-elicitation, a method “based on the simple idea of inserting a photograph into a research interview” [31]. In photo-elicitation, research participants can produce the photographs used in interviews, but any visual

images can be used (e.g., paintings, cartoons, graffiti). Further, and as is the case in my study, researchers can produce the images used in interviews [41]. The study presented here was guided and inspired by prior studies that use photo-elicitation in Africa (e.g., [6, 11]), and by Wong et al.’s study [62].

3 SITUATING THE RESEARCH

As previously mentioned, this is part of a five-year project investigating domestic technology use and design in Bungoma County, Kenya. Bungoma County is a rural area, situated in western Kenya’s Lake Victoria basin, an 8-hour bus ride from Nairobi. Similar to other rural and peri-urban areas in East Africa, Bungoma has a bustling town center with streets lined with shops, restaurants, bars, and hotels; brick apartment complexes and houses tend to be located closer to town. Further away are smaller market towns, surrounded by rural villages with clusters of mud-and-thatch houses and *shamba* (small farms). More than half of the 18 households visited were in these rural areas.

To date, I have visited these households three times. My first visit was in June 2016, when I presented the probe activities that inspired the design concepts in the workbook. In May 2017, I returned to these households to discuss their responses (for details see [65]). Between that time and May 2019, I created the collection of speculative design proposals presented here. In June 2019, I returned to the same 18 households and asked participants to review my design workbook.

3.1 Researcher Self-Disclosure

Researcher self-disclosure is essential in design research. Design is a highly subjective process; my identity, personal experiences, biases, and design training are factors that influenced the development of my design workbook and the study presented here. Here—and throughout the paper—I reflect on how some of these factors affected this study. Aside from my obvious status as a white person (“mzungu” in Kiswahili), who was born and socialized in the US, and who enjoys the privilege of being able to travel to Kenya to conduct research, I am also a trained industrial designer and social scientist.

I have been conducting research in Bungoma County since 2011, and in Kenya since 2007. I typically travel to the country once or twice a year, and stay for two to six weeks at a time, to learn about people’s interactions with technology—especially mobile phones [63, 64, 66–68]. This fieldsite has been useful for more broadly understanding technology use in rural parts of Africa; this is one reason I continue to conduct fieldwork there. I am a native English speaker, and my Kiswahili is basic. I require an interpreter when conducting research. Nightingale Simiyu, a Bungoma resident, has worked as my interpreter and field assistant since my first visit to the region. She is trained as a qualitative researcher, and advises me on culturally appropriate ways to conduct research.

3.2 Workbook Development

Gaver writes that producing a workbook is not about “defin[ing] a final design”, but instead “understand[ing] the nature of problems and possibilities” [28]. As such, my workbook includes a range of

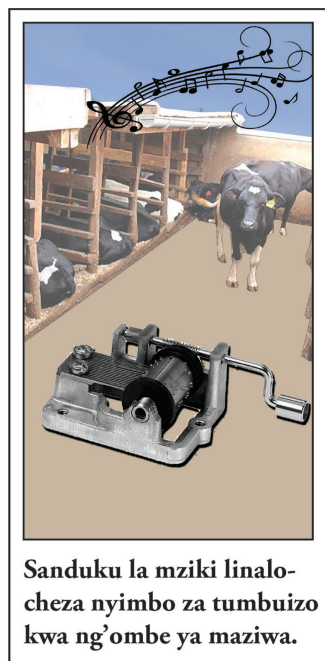


Figure 1: Music Box for Cows



Figure 2: Plastic Chair with Digital Counter

ideas. None of these ideas were intended to be solutions to problems or responses to users' needs, as is typical in HCI4D/ICTD design projects. When developing the concepts, I did *not* account for constraints typically considered when developing HCI4D/ICTD interventions (infrastructural, costs, etc.). Instead, the development of these speculative ideas was largely guided by my desire to imagine alternatives to traditional HCI4D/ICTD projects (e.g., developing mobile applications to address socioeconomic problems). Their inspiration primarily came from a collection of cultural probe¹ returns (i.e., digital photographs and written responses to questions) collected in Bungoma in June 2016 [65]. Observations gleaned from nearly a decade of conducting research in the area also inspired my concepts.

I used collage techniques when developing my workbook. These ideas began as rough sketches in my field notebook. I then searched my vast collection of photographs taken over the course of my fieldwork in Kenya, and interwove these images with others using Adobe PhotoshopTM and IllustratorTM. My concepts are all technically feasible; although some ideas would be easier to implement than others. My illustrations are also intentionally incomplete: the images include just enough information to communicate the idea. Some of the concepts were meant to be humorous (e.g., 1, 2 and 4) and others are intended to prompt discussions about topics I am interested in, such as farmers' access to information (e.g., 8 and 10). Some concepts were attempts at asking provocative questions about the nature of HCI4D/ICTD—especially about the presence in Kenya of Western researchers (like myself) (e.g., 11 and 12). Notably, the

¹Cultural probes are broadly defined as a qualitative research tool, where open-ended activities are given to volunteer participants, so that designers can learn about their daily lives. The returns, or outcomes of these activities, can be used to inspire design concepts [29].

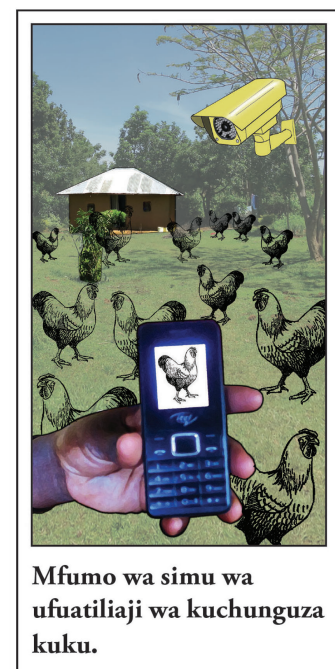


Figure 3: Chicken Surveillance System

design aesthetic used in my concepts differs from those typically seen in workbooks (e.g., [1, 27, 62]). I avoided the minimalist and aseptic style which has been criticized for not reflecting the diverse contexts, people, and global issues explored in design [33, 51, 56].



Figure 4: Money-Dropping Drone

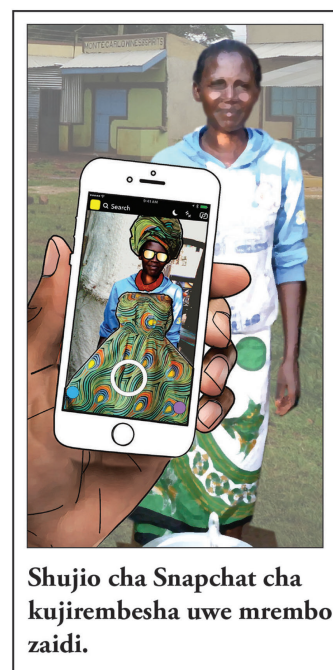


Figure 5: Snapchat Filter

Kiswahili captions also accompanied my images. Here I briefly describe the concepts in each figure and include some information about what inspired the idea.

Figure 1, the “Music Box for Cows”, was inspired by conversations with an older man about taking care of his prized dairy cows. He told me that cows produced more milk if they listened to soft music. The concept shows an antique wind-up music box, that when cranked plays lullabies to soothe dairy cows. The next concept (Figure 2) emerged from a personal interest in plastic chairs—in particular, how they can be the basis for a business which rents them out for use at large gatherings (e.g., weddings and funerals). The image depicts a chair fitted with a pressure-sensing mechanism that monitors how long someone sits on it, and a screen which displays the money earned from that time. Figure 3, the

“Chicken Surveillance System” imagines using a surveillance camera to track chickens. It then relays information about the chickens’ whereabouts to their owner’s mobile phone. The proposal in Figure 4 was inspired by aid organizations’ efforts to use drones to deliver, e.g., medical supplies to rural areas in Kenya. Discussions about the benefits of giving cash directly to rural residents also inspired this concept.

Figures 5 and 6 are speculative ideas for mobile photography applications. Figure 5 is a ‘Snapchat’ filter—a feature used in the popular messaging application—that allows users to overlay an image on top of another. My concept lets users “look smart”; that is, it superimposes fancier clothing over their original clothing in a photo. Figure 6 was inspired by participants’ desire to travel. It is a mobile phone application that allows users to take pictures of themselves in different parts of Kenya (e.g., Nairobi), the world (e.g., Washington D.C.), or with Barack Obama. The former US president

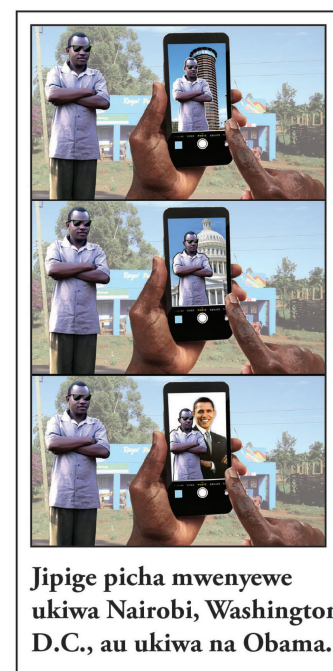


Figure 6: Mobile Travel Application

is popular in Bungoma, because his grandfather’s third wife lived in the region. Figure 7 was also inspired by mobile applications used in Kenya. The figure shows a billboard advertising SportPesa—a mobile application that supports gambling. Gargantuan-sized



Figure 7: SportPesa Billboard



Figure 9: Road Paved with Discarded Mobile Phones



Figure 8: Skywriting Plane delivering Messages to Farmers



Figure 10: Google-funded Library

billboards advertising the service are ubiquitous in Kenya; they typically feature images of people who have won money using the service. My speculative billboard is different, because it depicts a person *losing* money after using SportPesa.

Figure 8 was inspired by Bungoma's magnificent blue skies, as well as a desire to imagine different ways to deliver information to farmers. For example, what if skywriting planes were used to tell farmers when it is time to harvest their maize? Figure 9 is a speculative concept which imagines embedding broken and discarded mobile phones into the ground, so that they become blacktop, or pavement. In parts of Bungoma County, unpaved roads become muddy and impassable during heavy rains. This reality, as well as efforts to recycle plastic by adding it to asphalt, inspired this concept. Figure 10 shows a library located on C33 (one of the main roads in Bungoma). The imaginary library is funded by Google (an American multinational technology company). The company has dedicated significant resources to improving internet access in Kenya, by developing balloons to deliver access to the country's rural areas [45].



Figure 11: mUtafiti



Figure 12: MtafitiOpticon

Figures 11 and 12 were intended to raise questions about Western researchers conducting research in Kenya. Figure 11 shows a mobile system named “mUtafiti.” The concept was inspired by “market information services,” or MIS applications that send farmers crop pricing information via short message service (SMS). Instead of crop prices, mUtafiti sends rural residents information about academic research projects conducted in their area. The messages include information about how participants will be compensated for being in the research. Figure 12 depicts a related system named “MtafitiOpticon” (“mtafiti” means “researcher” in Kiswahili). This concept was inspired by Irani and Silberman’s “Turkopticon,” an “activist system that allows [Amazon Mechanical Turk] workers to publicize and evaluate their relationships with employers” [38]. Here, research participants can use a mobile application to comment on their experiences as research participants, and to rate researchers. They can also use the application to send feedback to organizations who are responsible for protecting the rights and welfare of human subjects in research (e.g., The Institutional Review Board).

3.3 Data Collection: Interviewing with a Design Workbook

In June 2019, I returned to Bungoma, Kenya, and conducted open-ended interviews and observations with 22 people (11 women and 11 men) in 18 households. When possible, we conducted interviews with both husband and wife (4 couples). Nightingale relied on contacts made through her personal and/or professional pursuits to identify participants. Each participant had participated in at least one (in most cases two) prior interviews with us. All participants were adults, aged 25 to 62. They engaged in a variety of income-generating activities, such as driving a pikipiki (motorcycle taxi), small-scale farming, or working as a cobbler, beer brewer, tailor, or fishmonger. Some participants had full-time employment at NGOs or local sugar factories.

The images in Figures 1–12 were printed on cardstock (each image was approximately 4 by 8½ inches). We sent participants copies of these images one day prior to the interview so they could review them. Interviews typically took place in the “sitting room” in participants’ homes, and sessions followed a similar format. We

began by exchanging greetings, and updating participants on our project’s status (i.e., we shared findings from the studies conducted before this one). We then explained the purpose of this visit—to elicit their feedback about design concepts that were inspired by our earlier meetings; in particular, the returns from the probe activities they had engaged in two years prior to this visit. Next we reviewed informed consent and reminded participants that their participation in the study was voluntary. All participants verbally consented to be interviewed, and to having the sessions audio-recorded. Nightingale encouraged participants to answer our questions using the language of their choice. Some interviews were conducted in English, and some in Kiswahili. However, as is typical in Kenya, all participants tended to answer questions using a combination of both languages (i.e., code-switching).

We then asked respondents to spread out the 12 printed design concepts on a table. After participants arranged the concepts we began interviews by asking them to “tell us what you think about the ideas.” We emphasized that there were no right or wrong answers. After participants finished talking about the concepts, we asked them to pick one that they preferred and one that they did not prefer. We then asked them to explain their decisions. We used an open-ended interview protocol (as is typical in photo-elicitation studies). In our prior interviews with these participants (conducted in June 2016 and May 2017), we had used semi-structured interview protocols. I include this information here, because my reflections on using different interview protocols are relevant to the findings.

Sessions typically lasted an hour, some were longer or shorter; this depended on how much (or how little) participants had to say about the design workbook images. At the end of the interviews we answered participants’ questions about the study, including when we would return to their homes. We then paid them 500 KES (about \$5) for sharing their knowledge with us; this was a sum that Nightingale and I discussed prior to the interviews, and consider appropriate for the hour-long session. We received no reactions from respondents that suggested they had negative feelings about providing feedback on the workbook ideas; in fact, most seemed interested in the pictures and had much to say about them.

3.4 Analysis

Data analysis began in the field, and included me taking copious fieldnotes during interviews. Immediately after each interview Nightingale and I engaged in debriefing sessions during which we discussed participants’ reaction to the design concepts and my observations. Nightingale also explained any Kiswahili words and phrases which had been used during interviews and which I had not understood. Notes from these sessions, my fieldnotes, and the transcriptions from interviews were the data collected in this study. The recorded interviews were transcribed verbatim by a transcriptionist who speaks both English and Kiswahili. My analysis continued once I returned to the US. The primary goal of my analysis was to understand how the design workbook method worked (or did not work). A secondary goal was to understand participants’ reactions to the design concepts in my workbook. I used inductive thematic analysis methods to achieve these goals. This is an approach that work towards creating condensed descriptions of the phenomenon

under study; the outcomes of the analysis are concepts describing these phenomenon [23].

I initially listened to the audio recordings from the interviews, and read each transcript (three to four times) to immerse myself in the data and to identify categories. I then created codes that were based on specific words and phrases from the interviews (e.g., practical problems and criticism), and wrote memos that connected these emerging observations with these codes. After this, I made comparisons between interviews and codes representing similar ideas, and then grouped these into thematic categories. During my analysis, I also reviewed my fieldnotes to inform the development of these categories. I then took quotes from the interviews and placed them in the appropriate category to illustrate the themes, and to ensure that they were grounded in the data. I then developed the final categories presented here. Comparing my findings with those reported in prior research also informed and strengthened my analysis.

4 FINDINGS

My use of the design workbook method seemed successful. I begin by describing how the method supported a dynamic that differed from traditional interviews. In particular, my approach gave participants greater agency during the sessions. Participants led the interviews and asked me questions, rather than the other way around. The workbook images also prompted lengthy stories that draw attention to the social and historical contexts of participants' communities. Their reactions to the concepts included discussions about the practical problems that would affect the potential adoption of my ideas. Significantly, these responses also included critical feedback. Important information was gleaned from comparing and contrasting the 12 workbook concepts. Participants' overwhelming enthusiasm for the concept shown in Figure 3 (Chicken Surveillance System), and their limited interest in Figures 11 and 12 (mUtafiti and MtafitiOpticon) provide novel understandings about surveillance and participant/researcher relations in HCI4D/ICTD.

4.1 Participant-Driven Interviews and Rich Responses

Inserting images into interviews challenges the 'question-answer' and 'turn-taking' structures which underlie words-alone interviews [41]. Participants tended to direct sessions—instead of me and Nightingale. In fact, we said little during sessions. Instead, we watched as respondents carefully arranged the images on their tables; typically picking them up one by one, looking, and then thoughtfully commenting on them. Participants determined the order of the concepts they wanted to discuss (or not) and how much (or little) they wanted say about them. The process was not linear, and an advantage of putting images on a table was that it allowed participants to choose what they wanted to talk about, and then return to those images if they wanted to elaborate on their comments. If participants had nothing to say about an idea—as was frequently the case for Figure 5 (the Snapchat Filter) and Figure 6 (the Mobile Travel App)—they did not talk about it. Participants exercise control in interviews by choosing what they do, and do not, want to talk about [54].

Instead of Nightingale and me asking questions, the workbook images prompted participants to ask us questions. In many cases, they asked us to elaborate on ideas, some asked us if the design concepts existed in the US, and others asked critical questions about the nature of the concepts, a finding we elaborate on later in the paper, for example:

So how does this benefit the local people? What does it do to benefit the local people? Does it bring information that is relevant?

In addition to prompting questions about who benefits from the ideas, inserting the design proposals into the interviews elicited different kinds of information than traditional interviews—a finding also observed in photo-elicitation studies. When reviewing concepts, participants reflected on the various technologies depicted in them, and their accounts frequently included memories triggered by the concepts. When viewing the Money-Dropping Drone (Fig. 4), participants regularly recalled politicians who would “use choppers to drop money.” Oscar², an older man, elaborated on this occurrence when talking about Fig. 4:

This is a good idea, but at the same time, it could bring some challenges and disagreements. I remember some years back, we had vying candidates for a parliamentary election. We had one famous man in Kenya called Elijah Mwangale, who was from Bungoma, and a Minister of Agriculture in the Moi's Government. In his dealing with Moi, he expected to be rewarded with a higher office in exchange for his support. When this did not come his way, he complained loudly and this might have contributed greatly to the decline in his fortunes after the 1992 general elections. In his dealings with his constituents, he employed a lot of resources in exchange for their support. According to him, leadership was synonymous with wealth and vice versa. He would campaign with an airplane and would come here and throw money, then people hurried to get it and they would fight (...). So according to me, this one no, it is not for this country.

Elijah Mwangale was a notable politician from the area, who in addition to being Kenya's Minister of Agriculture under Daniel arap Moi's (Kenya's second president between 1978-2002), also served as Minister of Foreign Affairs and as a member of parliament. Mwangale worked to improve access health services in the country. He was also known for carrying briefcases full of money and distributing it to constituents [42], sometimes dropping it out of an airplane. This is a form of “vote buying”: using money to influence voters, a phenomenon observed in many countries [10]. Oscar's response, and others like it, demonstrate how the design concepts prompted responses that draw attention to historical figures and events in their communities.

Figure 7 (the SportPesa Billboard) was another concept that generated lengthy responses that drew attention to the associations participants made between my imaginary ideas and broader issues in their lives. SportPesa subscribers place bets on sporting events (frequently football) using their mobile phones; they can win (or

²All participants' names have been replaced with pseudonyms to preserve their anonymity.

lose) money based on their predictions. At the time of this study, SportPesa was the dominant mobile gambling platform in Kenya. Tremendous growth in use of the platform has been attributed to widespread access to mobile phones and use of mobile money in the country. For some Kenyans, the service is perceived as a fun activity that has the potential to offer financial promise, while for others it can be a “source of pain”, especially for those who lose their meager resources after placing losing bets [48]. Participants’ reactions to this concept captured this tension between the perceived benefits and dangers of using SportPesa. In Eric’s words:

Here is a poster telling you that by engaging in gambling you might be losing a lot of money, without knowing. This SportPesa really hurts us. I spent at least 100 shillings on betting every day. At times I can place three or more bets expecting that if one fails I will win the rest but I find that all the money is lost. So I have really lost a lot. Since I started playing I have never won. I would just encourage people to work hard. Do something you are sure of, and not this.

His comments were similar to those of other participants, who had also lost money using the mobile application. Jonathon offers a counter-perspective, shared by some other participants:

Let me say jobs are scarce in this world. To the person who sacrificed to bring SportPesa here, thank you. He has made people play, get money to buy food and sustain their families. Even to pay school fees, someone can play and get money just like those who have been said to have won millions.

Other participants told us about people who had turned their fortunes around using SportPesa, and that the system offered the possibility of earning money in communities where job opportunities were “scarce.” Figure 7—like other concepts in the workbook—prompted multiple and competing interpretations. Participants’ stories, triggered by looking at the design workbook, draw attention to the messiness and complexity that underlie the introduction of new technologies into their communities.

4.2 Practical Problems and Critical Feedback

In addition to altering the dynamics of the traditional interviewing process and eliciting rich responses from participants, the workbook method had other benefits. When discussing the ideas, participants frequently noted the practical problems that might accompany the introduction of these technologies into their communities. These responses also included critical feedback and laughter.

Within HCI4D/ICTD, and related fields some promising interventions have been developed, such as Okeke et al.’s mobile system that lets patients provide feedback about their experiences at health clinics in rural Kenya [49]. There are also multiple projects that have been less successful, or that have failed outright. These failures have various causes (see [20]), including designers’ limited understanding of the contexts where their interventions will be used [19]; this has been described as the “design-reality gap” [34]. According to this explanation, designers’ incomplete or inaccurate understanding of context contributes to the failure of ICTD intervention. When talking about the workbook images, nearly all of the participants imagined how the concepts might exist in their

communities; they also focused on the practical problems which would affect the concepts’ adoption and use. When commenting on Figure 1 (Music Box for Cows), Dorcas told us:

This one will only be for the rich. What about a poor person who can’t afford a music box, even a cow?

Her straightforward comments draw attention to an assumption underlying many commercial and academic ICTD/HCI4D systems: that the proposed beneficiaries have the resources necessary to invest in the technologies [68]. Other participants’ comments detailed additional factors that might hinder the use of other speculative systems, such as Figure 3 (Chicken Surveillance System). In Mary’s words:

Some people do not have phones, or some do not know how to use the phone (. . .) they live in the rural areas. Some people may be too old and some may be blind. Using a phone to count their chickens will be a challenge for them. This idea will not be fair to those who don’t have phones.

Widespread access to mobile phones throughout Africa is a common refrain typically used to motivate the development of mobile HCI4D/ICTD interventions (e.g., [49])—including the concept in Figure 3. Although there is indeed widespread access to mobile phones in Kenya, disparities in access persist. People living in rural areas, especially older women, are less likely to have a mobile phone than are their urban counterparts. Mary also correctly notes that even if someone has a mobile phone, they may not be able to operate it. Her comments are similar to findings about access to phones and “device literacy” (the ability to use mobile phones for purposes other than making and receiving voice calls) that have been reported in prior studies [64, 66]. Mary continues by saying that some people “may be blind”; indeed, presbyopia (an eye condition associated with difficulty in seeing close objects) is widespread in rural Kenya [55]. This condition is rarely considered when developing HCI4D/ICTD mobile interventions (i.e., apps), although it affects how people use them. Mary adds that the “idea will not be fair” to these people. She recognizes the ways that technology interventions can amplify existing social inequalities in her community [58]. Her response, which was similar to others elicited by the workbook images, summarized findings reported in multiple HCI4D/ICTD studies of mobile phones [44, 58, 68]. However, many of these findings are reported after the fact—that is, following the development and deployment of a mobile phone application [68].

In addition to drawing attention to practical problems that would prevent people from using some of the systems shown in my workbook, participants provided critical feedback about my ideas. Their responses included disapproving comments. Participants told us they “disagreed” with the concept in Figure 2 (Plastic Chair with Digital Counter), and that “it was not good” because it would result in people whose livelihoods depend on renting out chairs losing customers. Participants also laughed at my design concepts—a response I interpreted as them thinking the ideas were absurd, nonsensical, and would be out of place in their communities. Figure 9, a Range Rover travelling on a road made of discarded mobile phones, elicited the most critical feedback and laughter. Although some participants appreciated the idea, and told me there were environmental benefits

that would accompany recycling old phones, the vast majority were skeptical of this concept, for example:

This one where they were using old phones to construct the road. This has not interested me. I am not convinced. Do you really think a spoiled phone can make a road? This is a complete lie and an impossibility. Do you want to tell me these small pieces can be used to make a road to be used by vehicles, it is not possible. According to my views, I disagree with the idea.

These findings are significant because they challenge those from prior research which suggest that it is difficult to elicit negative feedback in HCI4D/ICTD studies. Anokwa et al. write about a reluctance among participants in HCI4D/ICTD studies to offer critical feedback to foreigners like myself [2]. Dell et al. similarly argue that “demand characteristics”—subtle cues that make participants aware of what the experimenter expects to find (typically positive reactions to ideas)—make it difficult for “foreign researchers” to obtain negative reactions to their design ideas [18]. Participants in my study critiqued and mocked the concepts in my design workbook, and openly questioned the feasibility of other ideas.

4.3 Popular and Less Popular Concepts: The Benefits of Exploring Multiple Ideas

As previously mentioned, the primary purpose of developing a design workbook is not to identify a final design, but to understand the nature of problems and possibilities [28]. One way design workbooks support this understanding is by including multiple design concepts. Important information is gleaned from comparing and contrasting different ideas, and from learning what issues are more—or less—important to those who look at them. All but three of the 22 participants chose the Chicken Surveillance System (Figure 3) as their most preferred concept. Further, although I thought that Figures 11 and 12 would promote discussions about the nature of my research relationship with participants, this did not actually happen.

In nearly every interview, participants expressed excitement for the Chicken Surveillance System; ultimately, it generated the most comments of my 12 ideas. When holding the image, participants smiled and frequently told us it was “good thing!” They described its benefits at the beginning of interviews, returned to the idea after commenting on the others, and elaborated on why they preferred it. When talking about this concept, participants frequently focused on its multiple benefits. The idea was perceived as one that could “actually help” and was especially valued both for the possibility of supporting poultry production, for surveilling one’s property, and—as shown in this quote—for educating people about how to raise chickens. George explains:

I would take this idea, this will actually help me—myself first, by just keeping these animals, these birds, I will get money, eggs, meat and there is no day I will lack money and I will maintain this project all through so as to get money. I can also educate my friends on how to keep these birds. Even by using this gadget here, you are guarding them and might know where they are.

In western Kenya, free-range chickens (“kuku” in Kiswahili) are widely kept. It is common to hear them crowing at the break of dawn, to see them underfoot in households, and to eat them for dinner. In Bungoma, poultry production is a significant activity, because chickens are a source of protein for households. Further, and as George explains, sales of their eggs and meat can also be sources of income. Participants valued the idea in Figure 3 because it had the potential to help them start an income-generating scheme, or “project.” Furthermore, because chickens could be stolen, lost, or even eaten by dogs, Figure 3 was also highly valued because it could be used for surveillance, or as a “watchman”:

This is a good idea as you find people with very many chickens but they get lost time after time and if you get such you will be able to know if there is any loss of chicken. To me this is like a watchman because when you go somewhere you have left home, you can’t be worried of anything, even if someone comes to steal and go with it. You will just see the person and you can follow up and get whatever has been taken.

When discussing this concept, participants frequently focused on the “CCTV”, or closed-circuit television shown in the illustration. These systems are commonplace in Kenya’s urban areas. They are assumed to aid in detection (through their ability to surveil), to be useful for protecting people and their property, and to reduce theft by providing evidence of it [50], as illustrated in this quote:

If you have CCTV and you have chicken, sometimes you can go somewhere and when you come back you find one of your chickens is no longer there and you don’t know how it went. But if you have something like CCTV, it will be easy to know what happened because it monitors your homestead. If a thief comes and steals it’s easier to identify them— making it easier to recover your lost assets.

Surveillance is a topic that is increasingly examined in HCI4D/ICTD literature. In Vashistha et al.’s review of the emerging body of research about the topic in developing countries, they described surveillance as an issue of “growing concern” and something that users in these regions “lack awareness of” [59]. Reactions to my concept for using cameras to surveil chickens suggest an alternative understanding of this topic, one which has not yet been captured in the HCI4D/ICTD literatures. Rather than being concerned with the perceived consequences of surveillance, participants considered being able to surveil their property as desirable. Their frequent comments about CCTV also suggest they understand how technology can support surveillance. Vashistha et al. conclude that researchers must work to develop a “local” understanding of surveillance and related topics (e.g., privacy) in developing regions. This finding suggests that workbooks can elicit such knowledge. More broadly, participants’ consistent reactions to this speculative concept draw attention to new technology possibilities that have not been fully considered in HCI4D/ICTD, such as domestic security systems [14].

In contrast to the chicken surveillance concept, MtafitiOpticon and the related mUtafiti (Figures 11 and 12) generated little enthusiasm and discussion among participants. My motivations for developing these concepts was to promote discussions between myself and the participants about my presence, and more broadly

to critically reflect on the power imbalances that come from a western researcher entering their homes, asking them questions, and doing work that for the most part will likely not result in significant long-term benefits for participants. Indeed, this topic has gained more attention with HCI4D/ICTD, and in HCI more broadly [9]. However, these comments never developed into an interest in, or commentary on, the research-participant relationship that I considered to be represented in the design concepts. Instead, participants' reactions to these ideas mostly focused on the technology in the images; for example, many commented on the benefits of having a smartphone like the one in Figure 11, or on how they would like to have a laptop like the one in Figure 12

These findings suggest that, indeed, workbooks can support different understandings of problems [28]. This knowledge emerged from participants talking about 12 different design ideas, which depicted a range of technologies spanning from plastic chairs and analogue music boxes, to the more sophisticated drones and surveillance systems. More broadly, these findings draw attention to issues that are important in people's lives, but which are not strictly related to the topics HCI4D/ICTD researchers have primarily devoted their attention to (e.g., education, access, and health). These findings also serve as a reminder that differences exist between how *participants* understand topics, such as surveillance and researcher/participants relations, and how *researchers* understand them.

5 DISCUSSION

Here I return to the argument presented in the introduction. The design workbook method can benefit HCI4D/ICTD by addressing some of the limitations inherent in interviews and design workshops. Findings from this case study suggest that integrating a design workbook (which would include multiple speculative design proposals) into interviews supports a dynamic between researchers and participants that differs from the dynamic in words-alone interviews. Participants tended to lead interviews, by asking me questions and critiquing my ideas. The design concepts prompted lengthy responses that conveyed their expert knowledge about past and present technology use in their communities. Such knowledge might have remained dormant in a traditional interview. Further, this knowledge might not necessarily be communicated in a sketch or low-fidelity prototype created during a one-day workshop. Here I elaborate on the ways design workbooks address limitations inherent in interview and workshop methods, and—more broadly—how greater use of them in HCI4D/ICTD can benefit these fields. I draw attention to how design workbooks and speculative design support different ways for people to participate in design (i.e., which recognize them as experts and encourage them to critique design ideas), and support different outcomes in HCI4D/ICTD (i.e., design workbooks and long-term engagement with communities).

5.1 Supporting Different Ways to Participate in Design: Recognizing Users as Experts and Critique

Design workbooks support participation in design in different ways—that is, ways that interviews and design workshops may not. I have relied on words-alone interviews to learn about Kenyans' perspectives on technology in prior studies. However, the workbook

images were useful for obtaining knowledge “above and beyond” what might be obtained in a traditional interview; this phenomenon has also been observed in photo-elicitation studies [31, 41]. Participants' reactions to my workbook concepts proved useful for demonstrating how they are not *just* informants being mined for information, or for their design ideas (as can be the case during interviews and workshops). Instead, they are interlocutors expressing their opinions about design. More broadly, these discussions about design demonstrate how these participants are the authoritative sources of, and experts on, their cultures. I observed this in many of their responses to the workbook images, but especially in our discussions about the Money-Dropping Drone—a concept that consistently sparked stories about technology's relationship to the economic, historical, and socio-cultural factors in their communities. Participants' reactions to the SportPesa billboard provide nuance to how mobile phones are mostly understood within HCI4D/ICTD communities. Although the ‘boom’ in mobile phone ownership in Africa is lauded for the ways it has improved people's lives, participants' comments about this speculative concept draw attention to less explored ways that these devices have affected them (i.e., using mobile phones to gamble). Participants talked at length about the practical problems which would accompany the introduction of the concepts into their communities. Some summarized findings from years of research about mobile phone use in rural Africa. These are findings that researchers have claimed as novel, but are in fact well understood by people in Bungoma and elsewhere in rural Africa. Finally, I observed other ways that the conversations sparked by the workbook images provided deeper and novel understanding of other topics of interest in HCI4D/ICTD (e.g., surveillance and participant/researcher relations).

Designers' limited understanding of the contexts they are designing for contributes to the design-reality gap in HCI4D/ICTD [34]. However, my findings suggest that this gap in understanding may also result from designers not deeply and carefully listening to people and, more broadly, not recognizing them as experts on how to design for their communities. Acknowledging and appreciating participants' voices in the design process demands that designers minimize theirs. One way to achieve this would be to think differently about how participants are characterized in most HCI4D/ICTD research. “Underprivileged” and “marginalized” are terms too frequently used in these studies—often uncritically, ill-defined, and without acknowledging the ways these words perpetuate the asymmetrical relationship between researchers and participants [32, 53]. Instead, and as Harrington et al. argue, we must recognize participants as “living experts of the research areas we explore” [32]. They—not we—are the domain experts in design, and should be characterized as such.

Acknowledging participants' expertise means creating spaces where they can ignore, question, laugh at, and more broadly critique design concepts. Design critique can be understood as “a sustained, interpretative evaluation of an object” [4]. Critique is a staple of design education, and a fundamental part of design studio culture and the broader design process [12]. The process traditionally involves designers displaying (“pinning up”) their work on a wall, and asking others to look at and respond to it. Asking participants to spread my 12 design concepts out on tables, and to talk about them, mimicked a studio critique. Similar to these critiques, the process

encouraged discourse and reflection between me and them. It also forced me—as the designer—to question my sensibilities, and to confront the limits of my understanding. This reflection is important in any design project, perhaps even more so in HCI4D/ICTD where—like me—most designers are not members of the communities they study, nor are they based where they conduct their research. Critique is a process rarely if ever mentioned in HCI4D/ICTD studies using interview and design workshop methods. Eliciting critical feedback from participants about design interventions is described as a persistent problem in HCI4D/ICTD [18]; the design workbook method is a way to address it. Greater critique of ideas can benefit all HCI4D/ICTD design projects, regardless of whether speculative or more traditional design concepts are being explored.

5.2 Supporting Different Outcomes in HCI4D/ICTD Design: The Value of Workbooks and Long-term Engagement with Communities

Traditional design processes in HCI and HCI4D/ICTD tend to result in the familiar outcomes of design guidelines and/or a prototype system that can be evaluated [17, 57]. This approach has resulted in some successful interventions in Africa (e.g., [49]), and many failed ones [20]. My case study draws attention to different design outcomes that merit attention in HCI4D/ICTD. These include design workbooks (with speculative concepts), the discussions they inspire, and long-term engagement with communities.

The significance of design workbooks as a research outcome is recognized in HCI more broadly, because the method supports the documentation of design processes [5], and allows designers to explore ideas that are beyond the eventual outcomes of a design project [28]. To date, the method has not been used in in HCI4D/ICTD. My findings demonstrate their value to these research communities. My workbook included speculative possibilities that broaden these communities' concerns beyond the traditional socioeconomic ones. The speculative concepts illustrate non-digital—and even absurd—technology interventions that are not bound by the constraints typically considered when developing HCI4D/ICTD interventions. The conversations sparked by the speculative concepts in workbooks are another significant outcome of this research. These conversations drew attention to participants' local concerns (e.g., domestic security); these concerns might have gone unnoticed if participants were asked to answer questions about existing technologies.

In this paper, I focused on using design workbooks in interviews conducted with people living in Bungoma, Kenya; however, my hope is that publishing these 12 concepts will also generate discussions among HCI4D/ICTD designers and researchers. Although it did not bear out in my interviews (e.g., participants' reaction to MtafitiOpticon and mUtafiti), there is value in using design to ask questions about the power relations inherent in HCI4D/ICTD research, about who benefits from American technology companies' efforts to increase internet access in Africa, and about what interventions should (and should not) be developed. Design workbooks, and especially speculative design concepts, can be useful for sparking discussion and debate about these important topics in the HCI4D/ICTD fields.

Valuing alternative design outcomes—especially ones that are not systems to be implemented—has broader implications for HCI4D/ICTD. Toyama writes that most researchers in these fields would “like to see wide-scale application of their work,” and imagines that this will happen through “commercialization of their artifacts” [57]. However, such outcomes are aligned with the technocentric and market results that have been criticized within HCI4D/ICTD (and in development more broadly [25]). Kleine and Unwin argue these outcomes lead to significant flow of financial resources away from countries in the Global South, and ultimately strengthen these countries' dependency on external actors [40]. Instead, Kapuire et al. argue that the goal of HCI4D/ICTD projects should not just be the “sustainable implementation of technology”, but also “sustainable relations” with communities [39]. I strongly agree with Kapuire et al.

The case study presented here emerged from nearly a decade of intermittent engagement with Bungoma, Kenya. My familiarity with the community contributed to the success of using the design workbook, as did the fact that nearly all participants had already participated in multiple interviews with me. Participants recognized that I was more than just a one-time visitor, and that we could indulge in mutual curiosity about each other during interviews. Design workbooks support a methodological approach that stresses the importance of initial design exploration, and of talking to participants more than once; this approach works to avoid prematurely committing to building a prototype. It is a slow approach to design, differing from the one-off workshops and short-term interview studies that are more common in HCI4D/ICTD [16]. Given that many large-scale ICTD projects tend to fail, it may be worth embracing a slower approach to design that results in design concepts which are not necessarily meant to be implemented, and that—instead—support conversations between designers and the communities where they work.

6 LIMITATIONS, FUTURE RESEARCH AND CONCLUSION

Like all methods, the design workbook method has limitations. Although I argue that a benefit of the approach is that it allows participants to share their knowledge of their communities and how technology affects them, ultimately I am the one who developed the design concepts, primarily conducted the research, analyzed the data, and presented the results. This illustrates the difficulty of implementing design methods that truly decenter Western perspectives throughout design and research processes, especially during the post-fieldwork process (e.g., writing up the results). There are no simple solutions to this concern; however, there is value in continuing to work towards minimizing the power imbalances inherent in HCI4D/ICTD and HCI research. Design workbooks appear to be another method that can support researchers' efforts to do this.

It should also be noted that a significant limitation was my own lack of proficiency in Kiswahili, which posed restrictions on the conversations I could have with participants (even though many also spoke English). I am working to improve my Kiswahili, so that when I return to participants' homes I can better converse with them. When I return to Bungoma, I will ask these participants

to reflect on our conversations about the design workbook concepts, and—more broadly—about their participation in the five-year research project. Although empowerment and user benefits are central to the participatory design process, few attempts ([21,60] are exceptions) have been made to analyze participants' perspectives about what they gain from participating in these endeavors. I will also continue to develop design workbooks that are inspired by my fieldwork, and explore using methods that support participants developing their own speculative design concepts (e.g., [33]).

The purpose of this study was to demonstrate how design workbooks can benefit HCI4D/ICTD. This case study is part of a five-year project investigating domestic technology use and design in Bungoma County, Kenya. I have shown the benefits of adding design workbooks and speculative design to HCI4D/ICTD researchers' methodological repertoire. My findings suggest that these methods can address some of the limitations inherent in design methods more commonly used in the field, especially interviews and design workshops. The design workbook method was also useful for addressing issues of power and positionality in design processes by allowing participants to question and critique design ideas. I ultimately offer a case study that demonstrates an alternative approach to design in HCI4D/ICTD. My conclusion is that HCI4D/ICTD, and HCI more broadly, must continue to re-examine traditional design processes, and challenge the status quo; in this way, we can avoid more of the same failed interventions, and work to better understand the communities we study, and to allow them to better understand our research.

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