

Values as Lived Experience: Evolving Value Sensitive Design in Support of Value Discovery

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ABSTRACT

The Value Sensitive Design (VSD) methodology provides a comprehensive framework for advancing a value-centered research and design agenda. Although VSD provides helpful ways of thinking about and designing value-centered computational systems, we argue that the specific mechanics of VSD create thorny tensions with respect to value sensitivity. In particular, we examine limitations due to value classifications, inadequate guidance on empirical tools for design, and the ways in which the design process is ordered. In this paper, we propose ways of maturing the VSD methodology to overcome these limitations and present three empirical case studies that illustrate a family of methods to effectively engage local expressions of values. The findings from our case studies provide evidence of how we can mature the VSD methodology to mitigate the pitfalls of classification and engender a commitment to reflect on and respond to local contexts of design.

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Values, Value Sensitive Design, Methodology, Fieldwork, Empirical Methods, Photo Elicitation

INTRODUCTION

During the past decade, the HCI community has become increasingly interested in accounting for human values in the design of computer systems [3, 16, 18, 19, 23, 40]. One of the more recognized developments from this work is the Value Sensitive Design (VSD) methodology developed by Friedman, Khan, and Borning [14, 15]. The VSD framework draws on a legacy within the broader HCI community aimed at developing a fundamental understanding of how “enduring human values” (e.g., human welfare, accountability, autonomy, and freedom from bias) [15] take shape in,

and are shaped by, computational systems (see [15, 16] for a more comprehensive review of formative work).

The power of VSD comes not only through making values a priority of the design process, but also through codifying a three-part methodological framework that includes *conceptual*, *empirical*, and *technical* investigations that interleave questions about human values, system users, and system non-users. The three-part investigations are meant to guide the design of computational systems along a value-sensitive agenda; however, we think the strength of the VSD methodology derives not from a unique perspective on the design process (which is largely left open ended) but from the analytic space it opens for understanding trade-offs between human values, systems design, and social forces that emerge through system use.

While VSD is the most comprehensive codification of a value-centered design agenda that we are aware of, there are three areas of the methodology that we believe would benefit from additional debate and refinement. These three areas are tightly coupled and do not lend themselves to individual deconstruction. As such, our argument here is fugue-like: discussions of any one point carry the themes of the other two as we explore the connections and interdependencies. That said, our first issue is the twelve “values of ethical import” [15, 16] established within VSD as a heuristic to determine which values to consider within a value-sensitive design. This heuristic privileges a discursive definition of values over values that may be discovered or encountered through investigation, and produces systems that are aligned with these twelve values rather than those aligned with values expressed in the context of design.

Second, VSD provides no guidance on—in fact, explicitly leaves completely open the question of—which empirical instruments are effective or appropriate for engaging a particular context of use in questions of value [15]. Without specific guidance on what a value-sensitive empirical investigation might look like, we are left with poor tools for engaging locally expressed values, which in turn affects our ability to refine the heuristic at issue in the first point above.

Third, by focusing on values of ethical import, VSD’s progression from *conceptual* to *empirical* to *technical* investigations privileges known values over value discovery [14, 15]. Specifically, the VSD methodology states that the investiga-

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tion of values is emphasized in the *conceptual* phase [15], an investigation that gains its analytic power from the heuristic of values of ethical import. This acts to amplify the privileging of the values of ethical import: the empirical investigations serve to *refine* design against a conceptual framing based on known values (the values of ethical import) rather than enabling a process of *discovery* and *engagement*.

With respect to the first two points, the originators of VSD walk a fine line between providing enough guidance to practitioners and researchers wishing to incorporate a more value-centered approach to design, and the need to leave the methodology open and lithe enough to respond to a rapidly evolving digital ecology. We argue, however, that the methodology has gotten it backwards. What is needed is *more* prescription in methods that inform value-centered investigations, and *less* prescription in the kinds of values considered.

In this paper, we first discuss the impact value classification has on a value-sensitive research agenda. We discuss the methodological cost of privileging an abstract heuristic of values divorced from the context of study and argue for a commitment to local engagement and discovery as a way to strengthen value-sensitivity, especially in the novel contexts of contemporary HCI research. We argue that this commitment can be realized by re-ordering the priorities and the investigations defined by VSD. Specifically, we focus on empirical methods, their place within the methodology and the guidance provided with respect to appropriate and effective instruments for researchers and designers working toward value-sensitivity. We then present three case studies that use photo-elicitation [44] techniques to understand values in context. We believe the use of methods such as these can strengthen VSD as a methodological umbrella, helping to align wide ranging work within HCI: from the variety of work presented as “probes” [20, 26, 41], to work that looks to express empathy and accommodate user-created meaning [24, 32, 52], to complimentary design frameworks within the HCI canon [45].

A CRITIQUE OF VSD

In order to move VSD forward, we first need to reflect on the inherent difficulty in talking about values. In discussing values, one might invoke a rhetoric of moral certitude, or refer to a context of economic worth. Values might express a more playful engagement—calling on aesthetics and personal expression—or they may form the foundation of revolution [12].

Design processes further complicate the interpretation of values. As tensions between values of designers and clients emerge, whose values take precedence? How, through the interaction of the design process, can we delineate where one set of values stops and the other begins? Where in some instances designers may inscribe their own values into design [1], the interactions between designers and clients can facilitate a kind of “value transfer” resulting in an artifact that is an amalgam of the values represented by all parties involved [33]. These questions matter in a methodology of value sensitivity because they help lay bare whose values we are being sensitive to and which kinds of interactions we are

privileging; as we provide a platform for some values, we are at the same time obscuring others.

Values Writ Large

One might read the VSD literature as a manifesto of values that the HCI community should endeavor to uphold; this manifesto becomes particularly clear where Friedman and Kahn spell out a collection of twelve “human values with ethical import”: *Human Welfare, Ownership and Property, Privacy, Freedom from Bias, Universal Usability, Trust, Autonomy, Informed Consent, Accountability, Identity, Calmness, and Environmental Sustainability* [16]. These values serve to ethically ground the design and development of complex computational systems and “have moral epistemic standing independent of whether a particular person or group upholds such values” [16]. This list of values is not exhaustive, and Friedman et al. are careful to point out that the list of values of ethical import is open to refinement [15]; however, as we will discuss, the mechanics of the VSD methodology work against the active refinement of this classification of values.

More than just providing a moral bearing, the values with ethical import spelled out by Friedman and Kahn reflect a deeper set of commitments that run through much of the broader field of computing. Historically, computing has been associated with enabling personal expression and collaboration [25], with creating opportunities for new forms of community [5], and with reshaping the world through a new economy of ideas [30]. These commitments have their roots in 1960’s U.S. counterculture and underpin the notion that digital technology plays a unique role in embodying and propagating certain values within society [48].

What VSD has done, then, is help enumerate the commitments that quietly inform much of the work in modern computing. Values like human welfare, universal access, and autonomy are exactly what is necessary to remake society in the image of a shared, common good. Yet, by laying out an agenda tied to values of ethical import, VSD projects itself within the nimbus of morality, cultivating a dogmatic response with respect to which values are worthy of consideration and disengaging from a commitment to understanding the nuanced manifestation of a plurality of values.

The Privileged Classification

Embedded in the discussion of values is a discussion about classifications. As others have pointed out, classifications say as much about what they expose as they do about what they obscure [31, 46], and there is a danger that “as classification systems get ever more deeply embedded into working infrastructure, they risk getting black-boxed and thence made both potent and invisible” [4, pg. 325]. In this case, the working infrastructure is the VSD methodology; as it becomes integrated into the HCI canon as an accepted—even preferred—approach to value-centered design, the way it categorizes values and community commitments becomes black-boxed.

This effect is apparent in the case studies presented throughout the VSD literature [3, 15, 17, 23, 51]. Whether discussing informed consent and web cookie management, or

the use of a video feed to bring a window to an interior office, or designing software for visualizing trade-offs in urban development, the values used to inform design are arrived at via the classification and not the situated context of design [3, 15]. The values of *informed consent* and *trust* are explored in the redesign of web cookie management and can be recognized as values of ethical import [15]; concerns for *human welfare* formed the basis of the conceptual investigations in the design of the video-feed-as-window project [15]; and the *democratization* of the planning process and *freedom from bias* (through exposing sources thereof) are again values of ethical import that informed the design of UrbanSim [3, 15].

In these cases, rather than acting as a methodology for responding to contextual values, VSD has been operationalized as a methodology for refining system design around a set of preconceived values, promulgating an agenda of design on a largely fixed classification of values, rather than *inquiring* about the values present in a given context and *responding* to those values—being *sensitive* to those values—through design. So, although VSD made important contributions by being the first comprehensive methodology to actively introduce ethically grounded values into the design of computational systems, the tensions between responding to empirically observed values versus responding to values of ethical import impinge on its claims of value sensitivity.

A way clear of this issue might be the iterative process espoused by the methodology. Friedman et al. note in the web-browser cookie case study that “the iterative results of the...empirical investigations...impacted the initial conceptual investigation by adding to the model of informed consent the criterion of minimal distraction” [15]. However, while we agree that iterative design processes are effective tools for developing high-fidelity responses to nuanced user needs, they do not in and of themselves lead to reflection upon or analysis of the first principles that guided the earlier steps. To put it another way, iterating over a known classification will not reveal something not already expressed by that classification.

A response to local values, however, requires an *a priori* commitment to the discovery of the values present, which is precisely the piece missing from these case studies. This commitment in turn works to keep the infrastructure within VSD visible—through constantly refining the classification of values—and configures the “iterative and integrative” [15] investigations around empirical evidence of local values.

Order Matters: Ex Post Facto Value Analysis

Another point of contention with VSD arises from the way case studies using the framework present the exposition of values. Values are presented through reflection on how the system, once designed and deployed, affects stakeholders within the context of study. This *ex post facto* exploration of values in a designed system is well characterized by both the UrbanSim case study mentioned above, and in the analysis of individuals captured on video in the case study that sought to use a high-definition display as a surrogate window [3, 15, 17].

Both cases provide fertile ground for exploring the expression of values in computational systems. By committing to values of *democratic discourse* and *freedom from bias*, UrbanSim created opportunities to expose various forms of bias, motivations, and desired outcomes in a manner that let users of the system reflect on how different stakeholders view a given set of decisions and tradeoffs in urban planning—an activity that is fraught with conflicting interests to begin with.

By viewing UrbanSim in this light, the value-sensitive design is the urban plan, and UrbanSim is an empirical tool enabling the exposure of and reflection upon contextual values. Here we are slightly re-framing the application of VSD; rather than considering the design of UrbanSim as the ultimate output of the VSD methodology, we view the urban design as the output. Thus, what first appears as *ex post facto* exploration of values in the design of UrbanSim becomes, after our reframing, an *ad hoc* analysis of values expressed in the urban plan.

In the second case study, establishing a live video feed of a public space created a similar opportunity for reflecting on values [15, 17]. Ostensibly begun as an application of VSD to address psychological discomfort when working in a windowless internal office, the more compelling investigation of values arose from the opportunity to engage the public in questions of surveillance and privacy while inhabiting public spaces [17]. Here again, by reframing the design activity from the initial technical artifact (in this case a high-definition display and camera) to a larger context that focuses on issues of surveillance, we find that what was initially presented as a *ex post facto* analysis of values associated with the original artifact becomes *ad hoc* value discovery within our reframing.

What we find in examining case studies in the VSD literature is a retrospective presentation of values with respect to the technological artifact. The most insightful discussions of values around UrbanSim and the video window came through appraisal of the social context after the technology was deployed.

The retrospective nature of value assessment in VSD does in fact create rich opportunities for reflecting on values. However, as a *ex post facto* analysis, it does less to inform the value-sensitive design of the systems in question than it does to promote an analysis of values once those systems have been deployed—much in the way various kinds of “probes” have been used to elicit response and reflection on value-centered questions [20, 26, 49]. If VSD is to be more than a technique for developing high-fidelity technology probes, the order of investigations matters; if empirical investigations with greater focus on discovery and exploration are to inform the design process, they need to come at the beginning of the investigation.

This order is especially important given the nature of the three investigations outlined by VSD. According to Friedman et al. it is during the *conceptual* investigations that the exploratory work of understanding the context and the values is done [15]. This is where the discursive values of ethi-

cal import are used to shape the orientation of the rest of the investigations; while on the one hand VSD is careful to make room for subjective conceptualizations of values within the methodology, it equally carefully aligns itself with a specific notion of values of ethical import [16]. By identifying with a set of values imbued with the gravitas of being ethically grounded, and advocating a value-sensitive design methodology whose first step is a *conceptual investigation* of values rather than an *empirical discovery* of values, it becomes easier to fall back on the set of ethical values for conceptual investigation rather than engage in discovery and discourse about values within the context of design.

If, on the other hand, empirical investigations were ushered to the front of the methodological engagement, their impact on value discovery would address our previous two points of contention with VSD. First, by emphasizing contextual study of values, we argue that the privileging of values of ethical import would be mitigated—instead, local value expressions take primacy within a value-sensitive analysis of the design space. Second, an earlier empirical investigation more ably facilitates *ad hoc* value analysis within the VSD methodology, enabling nuanced response to local values while still making room for situating them with respect to values of ethical import.

MOVING VSD FORWARD

To advance the development of VSD as a methodology that fosters the discovery of and engagement with local expressions of values, we present three case studies of value-focused empirical work. Each of the following case studies created space for discovery and reflection on a variety of values across diverse contexts of investigation.

In comparing our investigations to a more authentic application of VSD, key differences emerge in how we built our analysis of values through empirical investigations rather than through a conceptual investigation. Where we note findings that touch on values of ethical import, they come directly from empirical evidence and not from an abstract framing. As an example, in the first case study we present work that engaged the homeless. Many of the findings could roughly be placed under a value of *human welfare*, though as we elaborate below, coloring an investigation of pertinent values in this manner masks the nuance and interplay of other factors present in the lives of the homeless. A strict application of VSD might then iterate through a number of values of ethical import, each time learning a bit more of the story; however, we feel that developing an empirical investigation first uncovers relevant values more effectively while still enabling an analysis of those values with respect to a set of ethically grounded discursive values.

The case studies presented here each use a variant of photo elicitation [44] and together constitute a family of related methods that can be effectively tailored to the specific contexts and exploratory goals of a range of research engagements. Developed as an ethnographic technique, photo elicitation leverages the “inherently ambiguous. . . meanings emergent in the viewing process. . . in order to elicit reactions and information. . . which might otherwise never become apparent” [44]. It is precisely the ability of photo elicitation

techniques to broach ambiguity and facilitate co-creation of meaning between interviewer and respondent that leads us to the view that it represents a class of empirical methods that may be highly instructive for engaging respondents in questions about values. Chief among the characteristics conducive to studying values, photo elicitation emphasizes the respondent’s voice in expressing values and value judgments, mitigating the assumption of researcher as authority; photo elicitation provides affordances for researchers to fully “inhabit” the context of study, regardless of how unfamiliar it may be; and photo elicitation develops a richness in response that enables analysis and reflection on a range of values and their interactions.

Another important characteristic of these case studies is their formative and exploratory nature. Each study was conducted to specifically engage our user populations in questions of values to inform technologies we seek to build. Likewise, as an exploratory method, photo elicitation studies do share some features with cultural probes, especially in cases where respondents take the photos that drive the interview [20]. They differ from probes by using the source material to evoke responses from study participants rather than treating that material as a primary source for analysis or inspiration.

Case Study: Technology & Homelessness

Our first case study comes from a study of the perceptions and use of technology by the homeless in a major U.S. city [34]. Through the course of this work, we were able to directly confront values expressed in the homeless community—values that can be grouped under one or more of the values of ethical import, but whose expression and contingency would not have been apparent had we framed the study under that discursive rubric.

To engage the homeless community on their terms, we adopted the photo-elicitation interview (PEI) method from sociology [6, 7]. PEI studies differ from other forms of photo elicitation by having respondents take the photos that drive the interviews. The PEI works well when there is a significant power differential between researcher and subject by shifting the power dynamic toward the participants by letting them shape the direction of the interview through the content they have created. PEI studies have been used in other studies of homelessness [43], as well as in contexts where the respondents are not normally afforded a social voice.¹

During the interviews, we prompted basic questions about each photo the respondent had taken: about what was important in the photo, why it was taken, and about what in the photo typified their experience. This context then informed our questions about technology, its use, and its relationship to their daily lives. By establishing a rich context for the inquiry, the researcher-respondent interaction followed an arc that was uniquely tailored to the individual being interviewed. Moreover, the availability of extra contextual cues in the photos enabled the researcher to more wholly inhabit a context outside their normal sphere of experience. This in

¹<http://www.independent.co.uk/news/world/asia/behind-the-veil-905837.html>

turn helped mitigate researcher bias in what the experience of being homeless was and how conceptions of technology would impact that experience.

Each of the interviews resulted in a rich body of responses from which we were able to determine surprising interactions with technology. One way this manifested itself was through experiences respondents had with mobile phones. For many homeless individuals, staying in contact with family members for support—either financial or emotional—is critical for managing the stress and disorientation of ending up on the street. The challenge for many homeless people in the U.S. is that irregular sources of income preclude them from contract-based mobile phone service; moreover, pay-as-you-go services also impose requirements that are not particularly amenable to irregular income and sporadic use. Despite these difficulties, maintaining a mobile phone was a priority for many of the homeless individuals in the study as it supported a value of *staying connected* [34]. The touch points of connection ranged from communicating with friends and family, to managing employment seeking activities, to coordinating healthcare and social services. In each case, the orientation to the value of staying connected was uniquely expressed through the needs and trajectory of that individual's current situation.

In addition to practical concerns of staying in contact with family or finding employment, mobile phones had important social functions when dealing with concerns of identity management and stigma [21, 22]. Here a value of *identity control* was expressed through reflections of how others' perceptions of them would affect their ability to successfully navigate the world. The simple possession of a mobile phone—working or not—was a potent “assessment signal” [11] indicating a measure of independence and capacity for personal responsibility. This social legitimacy indicated by ownership of a mobile phone was not derived from the technological function of the phone but by how the mobile phone has been socialized in contemporary culture. We found this technology and value interaction surprising in that the social function of the mobile phone had as much, if not more significance than the technological function.

Another example of the complex relationship between human values and technology comes by way of the public transportation used by the homeless. Over the last two years, public transportation in our study site converted from being token-based to using an electronic debit system. In the new system, computerized readers in buses and train stations deduct fares when passengers swipe reusable debit cards. The net effect on all users is an inability to know how many ride fares remain on the card prior to use. This in turn affects an individual's ability to plan, budget, and effectively use the transportation system.

The underlying value that was not being addressed by the fare system is one of *independence* (or *autonomy*). For some, independence may be a return to a home of their own and steady employment; for others it may come in a form of living “off the grid.” In either case, independence is achieved through a combination of social interaction, often through various service organizations, and technological

interaction. A challenge for marginal members of society—whether they are the homeless, or disabled, or otherwise disadvantaged—is when the technological infrastructure of basic services undermines their independence. With the public transportation system described here, the inability to plan created tension with the value of *independence* by causing situations where homeless individuals might be subject to humiliation, denied service, or put at medical risk because of a missed appointment.

The values discussed here are only a portion of what were discovered through the course of the PEI study. As a single study within a larger formative investigation, we found that by approaching the values of the homeless community as something to be discovered, we became more sensitized to the nuance expressed in each of the values. Undoubtedly, each of the values we have presented, here and elsewhere [34], could be connected in some manner to values of ethical import; however, by focusing first on discovery and exploration we were able to build a situated understanding of values that articulated the primacy of values expressed by the homeless rather than reflecting on homelessness in relation to values we may have preferred.

Case Study: Perceptions of Ubicomp

The second case study began as an instrument to understand the public's perception of risk with Radio Frequency Identification (RFID) technologies. Through the course of the analysis, we found strong associations of values that spanned interaction with the technology itself, with other individuals in society, and with government institutions perceived as underpinning aspects of both technology and society [42].

RFID is a widely deployed technology allowing for the unobtrusive sending and receiving of data; it is small enough to be embedded into everyday objects such as product packaging, clothing, documents, or even in living beings [50]. Through the study, we sought to learn what the general public believes RFID is and what it is capable of doing, as well as any concerns they had about the technology. Uncovering these beliefs was a formidable task; because the technology is invisible in use, people may not realize that they have interacted with it. To overcome this difficulty, we used a variant of photo elicitation that originated in public policy. The technique uses semi-structured interviews in combination with photo elicitation to help participants relate complex concepts (for instance, the risks of having radon in one's home) to everyday objects and events [39].

During the interview and photo-elicitation exercise, participants were first asked to describe what they knew about RFID. The interviewers probed for additional information until the participants had exhausted their understanding of the technology. Participants were then shown a series of photos representing a broad spectrum of objects, places, and situations people might encounter in their daily lives. For each photo, participants were asked to say whether they thought the object, place, or situation depicted had anything to do with RFID and why.

Unlike the homeless study discussed previously, photos used in this study were preselected by the research team. We

made this decision to cue participants' knowledge and beliefs about RFID since they were unlikely to have given much thought to the technology prior to the interview. We wanted to ensure that the discussions covered particular topics that had received significant popular media coverage, such as the use of RFID in passports, credit cards, and by retailers such as Walmart. These pictures helped participants orient themselves to the technology and exposed a range of "folk theories" [29] about how the technology worked and how it might be relevant or not to whichever photo they were currently considering—even by those who claimed they had never heard of RFID.

The folk theories expressed by the participants in turn led us to a better understanding of values that informed the accounts of how the public views ubiquitous computing technologies. Unlike the other two case studies described in this paper, this research primarily uncovered values of ethical import, in particular those related to ownership, privacy, freedom from bias, informed consent, and autonomy. However, we also found other values within certain contexts of use. One such value was that of *justice*.

Participants in the study noted that ubiquitous computing technologies—such as RFID—could be used for enforcing justice in two oddly coupled ways. First, by removing freedoms of individuals who have committed crimes through tagging those individuals with tracking devices.² The second was through fitting *non*-criminals with tracking devices so that they might prove their innocence via a record of their whereabouts. Both of these orientations to justice are entangled with *accountability*, a value of ethical import, but they are also distinct as local expressions of what ubiquitous systems can and should track and the implications that has on common notions of mobility [47].

Additional values emerged when discussions with our participants turned to questions of public discourse about RFID and related ubiquitous technologies. Participants expressed reluctance in raising objections about the technology. Two values emerged as motivating these concerns, the first was *being knowledgeable* and was expressed as a worry that limited technical knowledge meant any concerns the participant might raise would be ill-founded or easily dismissed. The second value that was expressed through this hesitation to question RFID was best characterized as *being normal*. Where some participants would not raise objections because they felt they were not knowledgeable enough to do so in an informed manner, others were worried that by raising objections they would be associated with social groups they did not identify with, such as members of a cult or conspiracy theorists.

Photo elicitation provided a unique opportunity to engage our study participants in an exploration of the complexities of how RFID impacts their lives. Despite the fact that understanding RFID requires a kind of specialized, expert knowledge, our method changed the dynamic in the interviews so that the participants could respond as experts in their lived

²For a more thorough treatment of the folk theories and lay perceptions of technical details that lead participants to these ideas see [42].

experiences rather than looking for guidance from the interviewer about the capabilities and limitations of RFID. It was through this dynamic of empowering the participant that we were able to evoke rich responses that exposed the multifarious values, whether identifiable as values of ethical import or not, that informed how they conceptualized an invisible and pervasive technology.

Case Study: Domestic Technology

Our final case study describes a historical investigation of domestic technology conceived to inform the design of future domestic technologies [54]. In this study we were interested in understanding how history could inform the design of domestic technologies and how an emphasis on efficiency in home production has undermined important "felt" aspects of home life [38].

Where part of the investigation into the history of domestic technology included a survey of documents—from period magazines to patents of domestic technologies—the backbone of the research was a photo-elicitation study with a group of older adults (60+ years). We chose to work with older adults—in this case women who self-identified as homemakers—to incorporate oral histories into our developing analysis of how domestic technology has evolved over the past 40 years. To evoke a rich discussion around the trappings of housework throughout our participants lives, we created a "memory scrapbook." The physical design of the scrapbook was itself an intentional feature meant to be recognized as an object stimulating discussions of the past and formed a kind of cultural probe [13, 20]. Within the scrapbook we placed a collection of historic images and advertisements related to housework including cleaning supplies for toilets, counters, and floors, laundry related items, dish detergent, and silver polish.

As another variation on photo elicitation, the memory scrapbook was meant to focus the subsequent interviews on the respondents' direct experience with housework throughout their lives. Where the previous two case studies used photo elicitation that ranged from highly personal photos to photos best described as generic and mundane, this study focused on images that were specifically situated in the history of domestic work. The format emphasized the voice of the respondents as experts in how the technologies and products depicted in the scrapbook fit into their lives; their responses provided us with detailed accounts of how domestic work had evolved over various technologies and time.

The values that emerged through the course of the interviews provided a unique account of how homemakers viewed the work they did and how changes in domestic technologies, while making some tasks easier, did not fundamentally alter their orientation to domestic work. An example of this is best characterized as a value of *work ethic*: even with the introduction of the floor mop and its more recent disposable brethren like the Swiffer™, the respondents talked about the physical work that was required to sufficiently clean a floor. Where the modern accoutrements of domestic work made everyday-maintenance work faster, the need to get down on their "hands and knees" to properly clean the floor remained. Associated with this value of *work ethic* were feelings of

satisfaction in having done a difficult job and an appreciation for the exercise that accompanied physical labor [54].

Related to the labor of cleaning the house are the tools by which the respondents accomplished their work. Here again, by reflecting on items from an earlier era of U.S. household tools, the respondents reflected on values of *quality* and *durability*. There was a sense that the items of yesteryear were built to last in a way no longer appreciated in contemporary times where disposable products are favored for their efficiency and reduced maintenance. These values certainly can be connected to *sustainability*, a value of ethical import (and of growing interest to the HCI community), but their expression does not necessarily follow if *sustainability* is the starting point. While durable products can certainly play a role in environmental sustainability, the motivation was not from an intrinsic desire to act in an environmentally friendly way (though we would not rule that out) but from a mix of social values informing how products fit into their lives and the evolution from reliability to disposability within certain kinds of everyday domestic products.

The differences between individual and group work were also brought up through talking about domestic work in light of technologies presented in the memory scrapbook. Once electric clothes dryers and dishwashers became a part of the respondents lives, they noted that the social work that usually accompanied doing laundry or washing dishes changed. These then-new technologies created individual work out of group work and displaced some of the built-in social outlets in domestic work. In response to this, the respondents pointed out that many of their best memories were of sharing chores with family members and experiencing the value of *togetherness*. So while the work done prior to luxuries like clothes washers and dryers was more labor intensive, it was also more social and supported the household in ways not readily apparent if the situated expression of values is ignored, a point we feel is complementary to Cowan's analysis of industrialization in the home [9].

Values like *work ethic* and *quality* might better be encapsulated under a notion of *pride*—the pride one has for their work, for their tools, and ultimately, if we are examining the home, their family. Likewise with the value of *togetherness*, there is an orientation toward the values that support and promote the family. While we hesitate to use the phrase “family values” for the way it has been co-opted by a specific political orientation, that is exactly what is being referred to here: the respondents were all reflecting on how various forms of domestic technologies affected how they related to their families and how those relations were projected outward. Of interest here is that the advertisements and cultural pressure to adopt these new technologies were heavily wrapped in a rhetoric of doing what is best for (a particular notion of) the family [10, 36]. Only in hindsight do we see where these technologies had fundamental impact on family work and where they disrupted some of the values we recognize as important to supporting a sense of family.

The hindsight that affords us a clear-eyed view of how values are intermingled with domestic technologies also provides guidance for how we approach new forms of domestic

technology. For the same reasons we believe photo elicitation works well in the other case studies, here too we were able to develop a rich account of how existing technologies and social values co-mingle within a given context. By focusing on the respondents, by providing an opportunity for reflection, and by treating their understanding and expression of values with primacy, we gained insight into how to best begin a value-sensitive design intervention such that the locally held values would provide a point of departure for subsequent conceptual and technical investigations.

DISCUSSION

Dynamic Classification, Contextual Heuristic

Throughout our critique of VSD we have touched on the issue of classification; specifically, the classification of values and the role that classification plays in the design process. We focused on the prominence within the VSD literature of the classification of twelve values of ethical import and how this classification has become the *de facto* standard for informing value-sensitivity [23, 51]. We believe that while expressing a classification of ethically principled values was an important first step, there is more to working in a value-sensitive way, and that central that value sensitivity is a commitment to an on-going reclassification.

This kind of ongoing reclassification comes as a direct result of a more proactive engagement in value discovery, defamiliarization [2], and a reorientation toward values as they are lived *in situ*. In looking at the varied contexts of the three case studies we presented here, we argue that the classifications of values divined from the empirical work are more effective and relevant for informing the design of computational systems for those contexts than are conceptions of values in the abstract. Where VSD has taken a discursive approach to values, we argue for an exploratory approach where empirical investigations treat values as local phenomena, expressed in a local vocabulary. This in turn enables the development of a local classification of values which begets a local heuristic against which to evaluate systems and social interactions that arise from their use. These local heuristics, as tools of privileging one set of judgements, are naturally calibrated to promote value-sensitivity within the context of design.

What gets lost when we talk about values in the abstract—as the values of ethical import do—is the visceral relationship to values as lived experience. By approaching a design space under a rubric of engagement and value discovery—as our photo-elicitation studies enabled—we were able to reconnect the lived experience in each of the contexts we investigated with the values that shape and are shaped by that lived experience. This is not to ignore values of ethical import as consequential for framing design; such a classification remains a relevant and useful tool within VSD, to the point where many of the values that were expressed locally in each of our case studies can be connected to one or more of the values of ethical import. Instead, we argue that the more general and abstract classification of values of ethical import are more useful after local values have been identified. In this way local expressions can be captured and honored within the VSD methodology and the values of eth-

ical import can be used as an analytic tool with respect to the locally expressed values.

Re-ordering the priority expressed by VSD toward privileging the locally relevant over the globally defined has far-reaching impact on an agenda of value-sensitive design. The case studies presented here all concern design within a Western setting, but in the expanding field of HCI design focused on the developing world, there is a growing need to understand and design for the local [8]. It is based on these needs that we see an opportunity for a reshaped VSD to guide the design of diverse systems and infrastructures (e.g., [28, 35, 53]); not as technology exports to support Western notions (values!) of development or advancement [27], but as a means to support appropriate technology, amplifying their values, not ours.

Empirical Tools to Enable Reflection

We have also argued for a stronger program of empirical investigation within the VSD methodology, and specifically a reshuffling of the tripartite framework to place empirical work at the beginning of the value-sensitive design process. This reordering addresses our concern that much of the way VSD has been presented relies on established values of ethical import rather than on developing a grounded analysis of values from the context of design. This asymmetry of privileging the known classification of values can be remedied in part by moving empirical investigations to the beginning of the design/research process.

In so doing, we make a subtle but important shift in how the empirical and conceptual investigations are configured within VSD. With an empirical investigation shaping the understanding of values, the conceptual investigation becomes a tool through which the designer can reflectively evaluate the values presented through the empirical investigation and those that may be expressed through a more generally defined classification like the values of ethical import.

A related critique of VSD was the perception from the literature that the analysis of values was most potent when conducted retrospectively [3, 17, 15]. We raise this point not to disparage the utility of retrospective analysis, but to point out that considered reflection within a domain greatly benefits from having a body of empirical evidence to reflect upon. If empirical engagement comes late in the process of developing a design—even within an iterative process—the point at which one can conduct a deeper analysis of relevant values also comes late. Where each of our case studies investigates relationships with technologies that already exist, and are in effect *ex post facto* analyses of those technologies, the studies were conceived and conducted as formative investigations. Our view of these investigations is that by grounding our value-sensitive work in empirical evidence from the beginning, each of the remaining steps in the VSD methodology—the conceptual and technical investigations—will more closely follow the value contours within the context of design.

A Method in Support of Methodology

Finally, each case study demonstrates how the family of photo elicitation techniques can be deployed to answer spe-

cific questions about values in different contexts. Whether the investigation was targeted at understanding values within highly personal experiences, or at unearthing folk theories and the values they incorporate across a broad social sampling, or through evoking values by prompting respondents with familiar and nostalgic images, photo elicitation provided both flexibility and specificity that fostered a rich engagement with the respondents. In turn, those rich engagements revealed how values situated within the context were interwoven with existing technologies and social interactions, providing a solid ground truth upon which future innovations could be built in response to those values.

Our call to evolve VSD toward a more rigorous commitment to empirical investigation has some parallels in user-centered design (UCD) practice. But more than UCD, which evolved out of the philosophical and political commitments of Participatory Design and is predicated on the assumption that the users involved in the process have a fairly robust grasp of digital technologies and how those technologies fit into their lives [37], an empirically grounded VSD can become a methodological tool for engaging users who have no effective point of reference against which to judge “use.” This orientation is already expressed through the methodology in its concern for non-users. We would point to our case studies as showing how VSD can be extended to include what we might call *pre-users*: individuals and groups who do not have well developed notions of how digital technologies fit into or affect their lives.

We see photo elicitation as an exemplary—but in no way solitary—instrument by which the researcher can *defamiliarize* what may be common or mundane expressions of values [2]. This defamiliarization complements other characteristics of photo elicitation—privileging the respondent as expert, inhabiting the context of study, and developing a rich narrative response—and further facilitates an exploratory investigation of situated values. Through this process, researchers can reorient themselves to the context in a manner that reflects the orientation of the stakeholders, whether they are conceived of as users, non-users, or pre-users.

CONCLUSION

One of the more potent benefits of building a value-sensitive methodology like VSD is the invitation to expose and re-examine the classification of values upon which we build, assess, and theorize about HCI systems and interactions. Disappointingly, this re-assessment has seemed to slow after an initial period of soul-searching within the HCI community. As a result, the application of VSD has not engendered continued reflection on values so much as defined and entrenched the field into a particular notion of values. Where the coherence and care expressed by VSD moved the community forward toward understanding how to incorporate value-sensitivity in the design of computational systems, the mechanics spelled out within the framework and the lack of scaffolding for guiding empirical investigations of values has limited its reach as a methodology capable of dealing with values as local phenomena.

Our aim here has been to encourage debate about the VSD methodology so that it may mature through the crucible of

discourse within the community. Focusing on value discovery, reworking VSD to place empirical investigations at the fore of the methodology, and moving to provide more guidance on effective empirical instruments in order to enable constant reflection and refinement of the classification of values moves VSD forward. Importantly, by evolving the design methodology to place an emphasis on the discovery of values we can derive system designs that reflect the values of the people they are meant to serve rather than the values of the system designers.

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