Research Paper
Blended, not Bossy: Ethics Roles, Responsibilities, and Expertise in Design

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Abstract
What are the best ways for design teams attend to issues of power, inequity, trust, and other ethical concerns as they arise in design? Literature on value-sensitive design (VSD) and technology ethics has advocated for a range of design methods that propose different roles and responsibility for ethics during technology development. This paper explores four provocations that imagine different roles and responsibilities for moral and ethical reasoning on design teams: participatory design (in which diverse stakeholders may represent their own values in the design process), values advocates (introducing experts to lead values discussions or conduct ethics interventions), embedding values discussions within design, and encouraging "moral exemplars" within design. Each of these posits different logistical arrangements as well as different levels of expertise in ethical practice. The paper uses examples from the VSD and computer ethics literatures as well as the authors' ethnographic work to explore the advantages, challenges, and consequences of each approach.

Research highlights
- Analysis of the ethical and practical impact of contrasting value-sensitive design models
- Discussion of the responsibility of users, ethicists, social scientists and technologists for design ethics

Introduction
What does it mean for design research to do right by participants, researchers, and the world? This article explores a thorny issue in values-oriented design research: what roles, responsibilities, and kinds of expertise are necessary for tending to issues of power, inequity, trust, and other ethical concerns as they arise in design?

A growing values-sensitive design tradition has advocated for attention to particular values on design teams, whether instigated by diverse stakeholders including users (LeDantec, Poole, & Wyche, 2009; Muller, 2003), designers themselves (Miller, Friedman, & Jancke, 2007; Sengers, Boehner, David, & Kaye, 2005), or advocated by outsiders conducting design interventions (Fisher, 2007; Shilton, 2013a). Within this literature, scholars have debated who can and should be positioned as ethical "experts" within design (Borning & Muller, 2012), whose values are engaged in value-sensitive design (Alsheikh, Rode, & Lindley, 2011; LeDantec et al., 2009), and who gets to define the *right* values for value-sensitive design.

These challenges are something we have debated ourselves, as researchers who sometimes position *ourselves* as ethics experts in design (Shilton, 2013a). In a recent email conversation with a long-time technical collaborator, Shilton outlined her role in an upcoming new project. What followed was this exchange:

Shilton: Am not really a builder but just an FYI that I've added myself to the mailing list in case I can be helpful with the research ethics/consent/IRB. Doing some work in that space now so might be able to contribute. I'll watch for it on the list and chime in as I can be useful :)

Collaborator: Thank you. IMHO INFORMING what gets built and how it is governed is a part of building.

Shilton: Right! Yes. But sometimes being the person who is *just* informing feels bossy.

Collaborator: Embedded, not bossy. Or better: blended, not bossy!

This paper explores the many ways in which ethics in design might be blended, not bossy. It draws on ethnographic experience in three projects: a study of mobile sensing research at the Center for Embedded Networked Sensing (CENS); a study of internet architecture development with the academic Named Data Networking (NDN) project; and a study of research to develop personal biometric technologies with the Public Health, Nanotechnology and Mobility (PHeNoM) project. Shilton has been a participant on all three projects; Anderson is a participant in the third. Work at CENS took place from 2007-2010. Shilton worked in a co-located setting with 20 computer scientists and statisticians to design for privacy, consent, equity, and social "forgetting" in pervasive sensing systems. Work with NDN started in 2011, and is ongoing. Shilton works with a team of computer science faculty and graduate students spread across ten US campuses to account for the social implications of an alternative to today's Internet Protocol. This work focused on NDN's implications for free speech, security, privacy and network neutrality.[1] Work on PHeNoM began in 2014 and is also ongoing. On this project, both Shilton and Anderson work with a team of mechanical engineers and computer scientists at a different U.S. academic institution developing nanoscale chips and mobile phone readers to measure biometric markers for stress and vitamin deficiency in blood. These technologies will enable consumers to take medical-grade blood tests at home. Our research focuses on the ethics and social impacts of a dramatic shift in the availability of personal biometrics, and support for values such as trust and wellness.

Both authors have backgrounds in the humanities and graduate training in the social sciences, with an emphasis on social theory and technology ethics. Neither of us has formal training in design or technical work. Instead, we have used our participation in these projects to work as direct advocates for ethics processes on design teams, and have also studied the ways that design teams engage with ethical questions *without* explicit intervention.

These investigations have highlighted the useful role a values-oriented team member can play in design. But these experiences have also emphasized what an expensive and privileged endeavor such a role can be. This paper contrasts direct interventions with three other modes of values-oriented work: participatory design (in which users are co-designers and bring their values to bear on design), embedded values conversations within design teams (in which technical teams discover conversations and decisions about values and social issues to be part of their work), and development of designers who are experts in ethical reflection (in which technical training emphasizes ethics alongside procedural education). These examples illustrate a range of ways that ethicists, theoreticians, designers, and users can co-construct values for design.

Background

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[1] Additional detail can be found on project goals and methods in (Shilton, 2013b, 2015).

Whose values should be discussed, debated, and incorporated into design practices and decisions is an ongoing topic of debate in HCI. In a review of value sensitive design research, Davis and Nathan (2013) point to debates over universal values, stakeholder participation, and the uneven power of researchers and participants as some of the most provocative work in value sensitive design. Some values-oriented researchers begin from fairly proscriptive values frameworks. For instance, Flanagan and Nissenbaum's Values at Play (VAP) framework, which provides guidelines and heuristics for conducting value-sensitive design, specifies a focus on ethical and political values, with an acknowledged bias for values derived from liberal, egalitarian democratic contexts (Flanagan & Nissenbaum, 2014, p. 7). However, while the authors identify certain "commonly encountered, socially recognized values" as points of departure for the theory, they maintain that their approach does not rely on the universality of any value systems (Flanagan & Nissenbaum, 2014, p. 7). The authors do note that employing VAP presumes a focus on values, but it does not prioritize *specific* values. On the less-specified end, in "Next Steps for Value Sensitive Design," Borning and Muller argue that "there is a set of rhetorical moves in some of the writing about VSD that imply more authority on the part of the researcher than we believe is appropriate" (Borning & Muller, 2012). The authors also assert that VSD should step back from making claims of universal values so that the method can more easily be applied to a broad range of values, enabling the voices and values of diverse stakeholders. Le Dantec et. al have a similar assessment of the problem of values authority in VSD, explicitly critiquing VSD's methodology (comprised of conceptual, empirical, and technical investigations), arguing that it "privileges known values over value discovery" (Le Dantec, Poole, & Wyche, 2009). Le Dantec et al argue that the VSD classification system for values discourages the discovery of values that may not fit into the categories presented. Le Dantec et. al discuss methods the researcher can use to discover the values of stakeholders, focusing on methods to privilege the "respondent as expert" (Le Dantec, Poole, & Wyche, 2009, 1148).

A separate thread of work in the fields of responsible innovation and technology ethics has explored interventions by ethicists and humanists on design teams (Wynsberghe & Robbins, 2013). For example, Fisher has led collaborations focused on collaboration with scientists for responsible innovation (2007; Fisher et al., 2015). Fisher's intervention protocol sought to let the "latent concerns" of scientists surface (Fisher, 2007, p. 163). However, Fisher admits that "while intended to be more descriptive than prescriptive, the act of rendering decisions more transparent to those who made them was necessarily a form of intervention" (Fisher, 2007). Johnson advocates for anticipatory ethics, which engages a values researcher or ethicists in helping to map "moral notions and practices to what is being developed" (Johnson, 2011). Shilton (2013a) has explored methods for ethics intervention on design teams, including identifying and justifying particular values as relevant to the project, and helping to translate identified values into technical affordances.

In the position paper "Whose Values? Whose Design?" Michael Muller identifies challenges associated with the role of "values advocate" (Muller, 2014). Muller argues that the problem lies with "the *undifferentiated* mixture of the researchers' values and the described values of other people" [emphasis original] (Muller, 2014, p. 4). He encourages explicitly collaborative work with stakeholders, and advocacy that either takes a common cause with stakeholders or facilitates their speech and values.

This paper investigates the challenge of incorporating, and also moving beyond, the values advocate through four provocations. What does it mean for various design stakeholders to bear the responsibility for investigating ethics during design? Where do different arrangements

fall on a spectrum from commonsense ethical practice to treating ethics as a specialized domain of knowledge? And what are the consequences of more or less ethical expertise on design teams? Provocation 1 explores techniques to privilege the values of technology users. Provocation 2 explores techniques to privilege the values of advocates with specialized ethics knowledge. Provocations 3 and 4 explore two techniques which privilege the values of designers themselves.

Provocation 1: Participatory Design as Values-Sensitive Design
Techniques to privilege the values of technology *users* during the design process generally draw from the practice of participatory design. Participatory design is a design approach that incorporates users as full participants in software development (Muller, 2003). PD techniques incorporate prototyping, storytelling, games, photo elicitation and descriptive artifacts.

Using participatory design techniques to elicit the values of technology users, and placing those values at the center of a value-sensitive design practice, is clearly an empowering and democratic approach to VSD. The values of potential users may be the single most important source of values for a future technology. If these values can be elicited in a meaningful way, they should undoubtedly be used as a basis for ethical decision-making in design.

A challenge, however, for using participatory design techniques to shape the values of a technology is helping participants become expert enough to understand the full range of technical implications of a system. This question of expertise is highlighted by the slippage that can occur between fully participatory design practices and user-centered design practices. An example of this challenge arose during Shilton's work at CENS. The CENS team used user-centered design techniques including prototyping during focus groups to engage cyclists in the city of Los Angeles in the design of a cycle route-planning and tracking application (Reddy et al., 2010; Shilton et al., 2008). In focus groups, very few cyclists expressed concerns about privacy, despite the location tracking features built into the system (which would document their homes, workplaces, and routes to work each day). Some CENS developers used this evidence to argue that users didn't care about privacy for this application. However, the prototypes presented focused on interface design, and neglected to illustrate back-end storage challenges and security threats. The fact that such data could easily be shared, stolen, or sold was not evident in the prototypes. Users may have had a different set of concerns if fully engaged in the design process.

A second challenge for participatory design is pointed out by Sengers et al. (2005). Shared values and assumptions are shaped by larger social forces of which we are often less aware (e.g. race, gender, economics, and power differentials in all of these spaces), and when the values of developers and users do not come into direct conflict, these assumptions may remain unexamined. In addition, attention only to user values risks what van Wynsberghe and Robbins identify as the naturalistic fallacy: "By discovering what *is* valued according to stakeholders, they turn this into what ought to be valued" (2013, p. 953). They point out that values like sustainability were long ignored by the public until the scope of inquiry was broadened by practitioners of environmental ethics.

The expertise differences highlighted by the difference between participatory and user-centered design raise a final challenge for using participatory design for VSD. Despite its emancipatory potential, fully participatory design remains a relatively rare practice, particularly in commercial software development. Other methods to solicit the values of users, from surveys to machine learning techniques (Fleischmann et al., 2012; Fleischmann, Oard, Cheng, Wang, & Ishita, 2009), may make user values more accessible to commercial design. However, these approaches, in which values become fixed or hardened qualities of individuals to enable

measurement (Schwartz, 1992), lose some of the contextual nuance important in participatory design. Understanding the values of users is not in itself a solution for VSD.

Provocation 2: Values Advocates and Interventions
If soliciting the values of users is an imperfect method for VSD, perhaps we should turn to a different form of expertise. Ethicists and humanists working directly with design teams is an alternate model for conceptualizing who might be responsible for ethics in design (Wynsberghe & Robbins, 2013). Shilton and Anderson have now participated in at least three large-scale technology development projects as "values advocates" on a design team. Comparing these projects, it has become clear that a values advocate, or more gently put, a values facilitator, can bring several advantages to design. They can bring knowledge of an ethics and values literature that may not be familiar to everyone on the team. They can also serve as a translator, making bridges between abstract social values and concrete technological affordances. They can serve as an interdisciplinary voice, inspiring new forms of creativity on the team. And they are rewarded for thinking about values (through job structure, related publications, or teaching), meaning that they are encouraged to spend time on reflection. But there are disadvantages to incorporating this role as well, including potentially limiting the values considered, and a risk of moving beyond expertise towards values elitism.

While the practice of ethics is of course something anyone can (and should) engage in, it is also an area of study with a deep and dispersed literature. Applied ethics in HCI incorporates professional ethics (Hollander & Steneck, 1990), technology ethics (Verbeek, 2006), critical technical practice (Agre, 1997; Sengers et al., 2005), and value sensitive design (Borning & Muller, 2012; Friedman, Kahn, & Borning, 2006). Attention to a broader social justice literature might also be constructive, as well as knowledge of the history and philosophy of science and technology, parallel movements like environmental and accessibility movements, and ethics practices in other fields. While a broad education and attention to ethics in graduate work might provide pointers to some of these literatures, *expertise* in these literatures requires years of exposure. There's a case to be made for bringing this literature and background to design, and such a role is best served by someone who has had the time and space to develop this expertise. This is the assertion of van Wynsberghe and Robbins in "Ethicist as Designer: A Pragmatic Approach to Ethics in the Lab." They argue that "one job of the ethicist is to broaden the scope of the debate; to discover values that have not been considered by the relevant stakeholders but nonetheless should be considered" (Wynsberghe & Robbins, 2013, p. 953).

Because of this expertise in the history and practice of ethics, a values advocate can serve as a translator between abstract ethical ideas and concrete design decisions and affordances. Fluency in ethical debates, and how they've been applied in technological settings, helps values advocates and design teams make the difficult conceptual leaps from ethical theory to practice. A values advocate can also help a team express, weigh, and debate explicit commitments to ethical theory (e.g. utilitarian, deontological, or virtue ethics perspectives), addressing critiques leveled at VSD of problematic ethical neutrality (Davis & Nathan, 2013).

In the Named Data Networking (NDN) project, for example, Shilton led a multi-year effort to write a paper translating the design affordances of NDN into ethical and political impacts (Shilton, Burke, claffy, & Zhang, n.d.). The work of thinking through how changes to the way data is transmitted on the Internet might impact intellectual property, privacy and free speech, or network neutrality and fairness, was surprisingly difficult. It required calling on literature from network policy (e.g. Braman, 2011; DeNardis, 2009), privacy law (e.g. Citron,

2010; Solove, 2010) and theories of justice (e.g. Rawls, 1999; Sen, 2009). This sort of analysis would have been difficult without a combined technical expertise (brought by lead technologists) and ethics expertise (by Shilton in the role of the advocate).

A deep background in ethics and technology studies can also help a values advocate spot ethical challenges during design. It's useful to know reflexively where two design affordances are likely to conflict, for example. Openness built into a system frequently can compromise privacy or security (Landau, 2014; Onsrud, 2003), for example, and an awareness of this history of values conflicts in systems can help surface the issue on design teams before decisions are finalized. We have found that technologists appreciate having someone to point out potential values conflicts, so that we might brainstorm how best to achieve both goals, or balance the two.

As both a representative of a different background and a translator, a values advocate also increases the interdisciplinarity of a design team. A consistent finding in Shilton's ethnographic work has been that interdisciplinarity of any type encourages values conversations on design teams. At CENS, statisticians on the design team helped developers think through problems in data representations and meaning-making (Shilton, 2013b). In Named Data Networking, a legal scholar introduced conversations about the power of developers relative to existing law (Shilton, 2015). In the PHeNoM project, the inclusion of a values-oriented team in regular project meetings provides an opportunity for values to enter the discussion at points relevant to the progress of the project. As the technical team updates the group on hardware and software development of a device that reads blood test strips and provides personal biometric data, the values-oriented team has a chance to reflect upon ethical issues such as data representation, privacy and security, and trust in medical technology. Inclusion in ongoing team meetings also allows the values team to ask questions about the design process and better understand the motivations and values of the technical team. Perhaps most importantly, the forcing function of providing updates to the technical team encourages the values team to better articulate their own work and goals, giving the technical team the opportunity to provide feedback.

Finally, a values advocate who begins as a disciplinary outsider can aid design by highlighting the already-existing moral ecology of the laboratory or team. No team is ethics or values-free. Professional organizations, standards, social norms, and institutional norms can all contribute to an existing moral ecology (Huff, Barnard, & Frey, 2008a). But because standards and norms tend to be tacit knowledge, this ecology can be less visible in a design lab. Adding outside perspectives, particularly those focused on ethics and values, to the design team can highlight that existing moral ecology because outsiders are more likely to ask about assumed norms (as such norms conflict with their own assumptions) or call assumed norms into question. For example, on the PHeNoM project, HCI researchers interested in trust have questioned tacit assumptions about data representation for vitamin levels in blood. They've asked the engineering team discuss the implications of presenting measurements on smaller and larger scales (which compress or expand deviation from the norm), and are testing a variety of interfaces for not only user understanding, but user trust. In the NDN project, Shilton began by considering the core values of the NDN team before beginning her intervention. She performed a thematic analysis of project publications and grant documents to identify values expressed by the team before she began her intervention (Shilton, 2015). For example, the original NDN publications discuss both security and privacy frequently, but without explicit definition of those terms. Shilton used this investigation as an opportunity to unpack privacy into components like anonymity, information obscurity and hiding, and forgetting (Shilton, Burke, claffy, Duan, & Zhang, 2014).

Each of these examples illustrates the value in expertise in design ethics. A values advocate brings particular expertise to teams: not of the *correct* values for design, but of a larger values conversation which might be useful to a design team.

However, there are several serious challenges posed by the intervention of a values advocate. First, evidence from our project and others shows that such advocates tend to bring a prescriptive list of values to the project: the critique made by LeDantec (2009) and Muller (Borning & Muller, 2012; Muller, 2014). This list of values may limit the range of values considered or discussed during the intervention. In particular, areas of failing include a systemic bias towards Western values and values framings (Alsheikh et al., 2011), and the danger of values advocates becoming the single authority on ethics in design. Values advocates may also serve as a crutch which enables design teams to exclude the meaningful or active involvement of users.

A second major challenge posed by the intervention of a values advocate or values team centers on the amount of time and energy required by successful integration into design teams. There is a substantial time commitment required to become familiar with an emerging technology upon beginning a new project. Becoming fluent enough in the technical affordances of a system to understand where values are concretized in its design can take months. Fitting in with the design team and being part of the development culture takes additional time and energy. Physical distance complicates the building of trust and rapport further (Shilton & Koepfler, 2013). Interactions with both the NDN and PHeNoM teams have been primarily at a distance, mediated by conference calls and occasional travel to in-person meetings. In both cases, the time to build sufficient trust between the advocates and the design team is measured in years, not months.

Provocation 3: Ethical Reflection Embedded in Design
The challenges of time and expertise – the *expense* of serving as a values advocate – has led the consider ways to incorporate ethical reflection directly into design processes, so that values and ethics become part of the design discussion without the explicit intervention of experts. Building ethical reflection into the daily practice of design may be a more sustainable route to design ethics. This is an approach Flanagan and Nissenbaum advocate in their Values at Play framework, which aims to provide designers with "backup – prior evidence, support materials, and methods" in order to concretize abstract value concepts identified through heuristic evaluation (Flanagan & Nissenbaum, 2014, p. 13). Van Wynsberghe and Robbins, however, caution that ethics work in design, such as values discovery, is "no small task, and requires expertise in areas outside of engineering" (Wynsberghe & Robbins, 2013, p. 952).

Shilton's work has focused on a particular type of cue to ethical action referred to as *values levers*: development practices that open up new conversations about values, and build consensus around values as important to design (Shilton, 2013b). Schön has described design as "a reflective conversation with the situation" (Schön, 1988). He writes:

> As a designer brings understandings, strategies, and images to a particular design situation, conducts a dialogue with that situation, and constructs in it a version of a more or less familiar design world, he instantiates a particular set of things to think with (Schön, 1988, p. 183).

Values levers function by bringing social concerns into the set of things developers think with. Shilton's research has shown that particular work practices, such as working on interdisciplinary teams, navigating institutional mandates, imagining users and use cases, and working with users,

can change the tenor of design conversations from primarily instrumental to ethics and theory-driven by surfacing underlying social norms and highlighting the relationship between social concerns and design decisions (Shilton, 2013b; Shilton & Koepfler, 2013). In this way, routinized development practices influence the values selected for incorporation into new technologies.

For example, CENS developers reported discovering privacy, consent and equity concerns while engaging in the work of testing prototypes of their applications and those of their colleagues. As in many development labs, it was common practice to test prototype systems internally before conducting testing with outside users. Experiencing using the system, and in particular, contributing the kinds of data under request (for example, location as well as questions about eating, sleeping and exercise habits) allowed the participants to imagine what inferences might be made about their behavior, and made ethical concerns concrete. Participants' prototype testing experiences contributed to a group consensus around privacy as a design principle for CENS systems.

In NDN, a work practice that served as a values lever was imagining users and use cases. NDN developers were redesigning a familiar technology: the Internet. As a result, much discussion of use cases was grounded in familiar (to American network architects) uses of the Internet: checking the *New York Times* webpage, sending email, conducting conference calls, using Facebook, and streaming video. Discussion of these familiar social contexts tended to elicit particular values salient to those contexts. For example, discussing NDN applications for email or conference calls, or retrieving the *New York Times*, tended to generate concerns about provenance and trust in content. Research on vehicular networks, or communications between cars, led to discussions of constrained resources for sharing data. Efficiency became a value salient to this context, as did equity, because researchers had to decide which data was the most important to send in a constrained situation. Equity became part of conversations about data exchange in constrained environments, including data congestion management. Imagining the constraints imposed by the context of vehicular networks helped bring this value to light.

Constructing and testing prototypes also served as a values lever within the NDN project. For example, developers of a prototype file sharing service grappled with challenges verifying users' identity, struggling to determine who had the rights to use particular identities. As a result of experimenting with file sharing, the team discussed how best to handle identity management, and participated in nuanced conversations about identity in the digital age. And as at CENS, using prototypes encouraged developer discoveries of relevant ethical issues. Staff who deployed NDN-enabled webcams in their office reported realizing that the pervasive caching inherent to NDN, in which data is replicated indiscriminately across servers, raised privacy concerns when combined with office webcams. Staff members dealt with these privacy issues through simple workaround (such as pointing the cameras at the ceiling or out windows), but the use of the camera prototypes helped concretize the ethical issues bound up in pervasive caching.

A common thread among the most successful values levers is that they helped developers to imagine their technologies in relevant social contexts. Many ethical issues (for example, privacy, consent, and equity) are impacted by social and cultural contexts which dictate norms (Nissenbaum, 2009; Schwartz, 1994). As evidenced by both CENS and NDN observations, privacy concerns were raised by contexts in which data was shared in new and surprising ways; equity concerns were raised by contexts in which constrained resources dictated limitations on what could be accessed. Imagining use contexts helped engineers discuss the social norms and ethics relevant to their design. In addition, successful techniques for anticipatory ethics helped

engineers embody the experience of using their technology (Dourish, 2001). Embodying the technology—discovering what it's like to use a technology in context—helped developers experience ethical concerns as personal and relevant. Techniques ranging from prototype self-testing to interdisciplinary work encouraged engineers to feel and act like a user, and embody some of the concerns future users might have.

Software engineers often face a tension between firm grounding in particular contexts, and a more abstracted model of design (Rosenberg, 2008). Values levers are work practices that push back against abstraction, helping to ground discussions about ethics and social impact. This insight can help researchers interested in technology ethics think about values levers in diverse engineering workplaces. Though workplaces may have different work practices and technological foci, finding methods to counter abstraction can help introduce values levers. Looking for the work practices which ground technologies in a social context and help developers embody their technologies can improve the embedded practice of technology ethics.

The embedded, work-practice-based approach to technology ethics introduces challenges as well, primarily revolving around a loss of expertise. While developers can absolutely attend to ethical concerns, they will miss issues that someone trained in ethics as a specialized form of knowledge would spot. As both Sengers et al. (2005) and the Values at Play framework (Flanagan & Nissenbaum, 2014) point out, shared values and unconscious biases on a team often go unexamined. An embedded approach suffers from many of the same flaws as relying solely on participatory design: without specific expertise of the role of power and politics in design, it cannot be assumed that these practices will attend to all possibly problematic ethical challenges.

Provocation 4: Moral Exemplars
The challenge of ethics *expertise* within design points to the potential for training developers in ethics as a specialized form of knowledge. The idea that technical experts can also serve as ethical experts has been particularly developed in the work of Huff and others (Huff et al., 2008a; Huff, Barnard, & Frey, 2008b) on *moral exemplars*. Moral exemplars are computing professionals nominated by their peers for long-term excellence in ethical leadership. They are, as Huff et al. write, "the sort of person who was able to recognize an opportunity for moral action, to make a good decision, and then able to carry it out…" (Huff et al., 2008b, p. 248). Huff and his collaborators found multiple types of moral exemplars in their work, including "reformers" who tried to change longstanding systems, as well as "craftpersons" who tried to build systems that would help and benefit people. They have grouped the characteristics of exemplars into a combination of personality characteristics (including social and technical skills), an acknowledged moral commitment, recognition of a wider moral ecology, and moral skills and knowledge (Huff et al., 2008b).

At CENS, several leaders demonstrated how influential moral exemplars on a design team can be. The project leadership structure was clearly defined, with faculty members (principal investigators or PIs) setting project vision and direction while working with graduate and undergraduate students to accomplish design goals. Shilton observed at least three project PIs purposely influence the ethical conduct of research projects using a combination of persuasiveness, authority, and control over funding (Shilton, 2013b). PIs with a dedication to ethics in design also established internal procedures—in this case, a mandatory ethics check before using CENS equipment—that routinized consideration of ethics on the team. In NDN, a project lead with an interest and growing expertise in design ethics invited Shilton to join the project, and constantly helped to legitimize her role on the project. He also led ethical

discussions within the team, prompting much more attention to users (and the values of users) in a design setting in which the end user could be difficult to imagine.

When practiced by moral exemplars, values decision-making becomes an integrated part of technical decision-making. This may be the most efficient and sustainable model for practicing design ethics. And it has a major advantage: the behaviors of moral exemplars can be taught. Technology ethics education can facilitate the presence of more moral exemplars on design teams (Hollander, 2001; Huff & Furchert, 2014). However, developing technical leaders who are also experts in ethics is a significant and ongoing challenge for both ethics education and technical fields. Ethics education too often consists of cursory (and sometimes ineffective) online modules such as those required for research ethics certification at universities (Antes et al., 2010). Few graduate programs in computing, for example, require full courses in ethics. Achieving meaningful participation of moral exemplars within design would take a multi-discipline commitment to teaching technology ethics, particularly teaching ethics in a way that specifically encourages development of moral character aligned with technical work.

Conclusion

We have discussed these four provocations separately because they are often employed independently of each other, and because they help to illustrate many of the current tensions around design ethics in the HCI and technology ethics literatures. Though separating these methods is useful for considering a range of roles, responsibilities and expertise within design ethics, ultimately, these methods cannot stand in isolation. We need participatory design techniques to elicit user values. We need technology ethics experts to engage constructively with design teams. And for maximum impact, we need design teams to be responsible for ethical design, both through ethical practice and cultivation of ethical selves. In addition, there almost certainly models for ethical expertise not explored here. We welcome researchers engaged in design ethics to build upon this work by exploring roles and responsibility within their approaches.

Separating the four provocations, and discussing their strengths and weakness does illustrate that some techniques are better suited for some design settings. And attention to each kind of ethics role can help to ensure that ethics in design is *somebody's* job. These four provocations also help to elucidate the point that controversies about roles in design ethics center on questions of expertise: the "bossy" in the opening anecdote. Users, values advocates, and designers all bring different kinds of expertise to the practice of design. This is how ethics in design can be blended, not bossy. Recognizing these forms of expertise – and recognizing when a team faces a gap in that expertise – is critical for practicing ethical design.

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