

Worship, Faith, and Evangelism: Religion as an Ideological Lens for Engineering Worlds

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ABSTRACT

While some in the CSCW community have researched the *values* in technology design and engineering practices, the underlying *ideologies* that reinforce and protect those values remain under-explored. This paper seeks to address this gap by identifying a common ideological framework that appears across four engineering endeavors: the OLPC Project, the National Day of Civic Hacking, the Fixit Clinic, and the Stanford d.school. We found that all four of these communities utilized elements of religious practice to affirm their membership and shared vision. We describe the forms of *worship* we saw in these engineering worlds, their practices of *evangelism*, and the ways in which they *addressed doubt*. We also demonstrate the role mythologies play as ideologically charged narratives. Our discussion of these parallels illuminates the extent and consequences of quasi-religious practices in engineering worlds and illustrates the utility of using religion as a ‘lens’ for understanding ideological commitments in engineering culture.

Author Keywords

Design; doubt; engineering worlds; evangelism; faith; fixing; hackathons; ideology; ideological work; mythology; OLPC; practice; quasi-religious behaviors; religion; values; worship.

ACM Classification Keywords

K.4.0. Computers in Society: general.

INTRODUCTION

Engineers often narrate their activities as empirically grounded, pragmatic, and solidly secular. The worlds that these developers, designers, and analysts create and inhabit through their common practices identify a cutting-edge, scientific, and rational worldview, not one steeped in tradition and focused on faith. A similar emphasis on the primacy of empirical evidence imbues the computer-supported cooperative work (CSCW) community, as it does in many other scientific communities.

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Even researchers who design for spiritual experiences and expose progressive views of automation in religious ritual (e.g. morning prayer, Shabbat) [45,46] use empirically-driven methodologies to develop their claims [6,47].

Empirical evidence suggests, however, that religious metaphors are more entwined with technology than may be generally acknowledged. Scholars in science and technology studies and related fields have explored how technologies become ‘salvific’ or ‘sublime’ [33]. Apple Inc. has been a particularly fruitful target of this kind of analysis, given the religious overtones of its marketing and the zealotry of its users [10,25,32,34,40,41]. Campbell and La Pastina, for instance, show how popular discourse adopted religious terms to frame and define the reception of the Apple iPhone, such as the phrase ‘Jesus Phone’ [10:1192]. Their analysis traces various kinds of narratives linking technological artifacts with redemption, divinity, spirituality, and religious experience [10:1194].

Here, we examine the religious language that animates not just *technologies*, but the *practices* of the engineering worlds that produce these technologies. Though we did not enter our research sites looking for religious parallels – i.e., we did not raise questions about religion in our interviews or observations – we discovered that the engineering and design practices we encountered in our data were steeped in what we call *quasi-religious* behaviors. We define ‘quasi-religious’ as enacting faith-like practices without necessarily following established religious tenets. We understand ‘religion’ moreover to refer to a coherent system of faith outside of the auspices of ‘evidence’ in which certain objects and practices take on symbolic import [17,43]. We found quasi-religious parallels across all four of our field sites: the National Day of Civic Hacking, in which computer programmers volunteer an afternoon or weekend to write code for civically-minded projects; the Fixit Clinic, where volunteer ‘coaches’ help people repair broken devices; the Institute of Design at Stanford (d.school), in which students are trained in design thinking and practice; and the One Laptop per Child (OLPC) project, which designed a laptop meant to overhaul education across the Global South.

In this paper, we describe how the practices and discourses we found within these engineering communities surfaced three quasi-religious behaviors. First, we found that individual and collective practices of *worship* were a central element of performing group membership. Second, we observed the

communities engage in various forms of *evangelism* to convert people to their worldviews. Third, we noted various strategies to *address doubt* among the faithful.

Why does this matter? We assert that recognizing and interrogating the vernacular religiosity within our field sites advances how the CSCW community theoretically engages with engineering worlds in three ways. First, it meaningfully expands how we understand and examine motivations to participate in engineering communities, both for longtime participants and potential newcomers, even in the face of daunting obstacles or counterevidence. Second, it highlights some of the blind spots that particular ideological commitments can raise, which can render these communities less inclusive, less impartial, less evidence-driven, and more hostile to constructive criticism than their ideals often suggest. Third, it demonstrates some of the merits of extending beyond an analysis of ‘values’ to attend to the ideologies (described below) that undergird these values, a point we return to at length in our discussion. Overall, we argue that understanding the ideological frameworks of sociotechnical production could help our field account for the extant faith-based motivations behind our own design and engineering practices, potentially avoiding the pitfalls associated with them or even problematizing the ideological frameworks that are less just or inclusive than the ideals of our profession would suggest.

BACKGROUND AND THEORETICAL DEVELOPMENT

Several concepts from social theory are central to our analysis. In this section, we develop what we mean by ‘religion,’ detail the role that mythologies play in the connection between religion and engineering worlds, and discuss how this is an example of an ideological framework.

Durkheim defines religion as any unified system of beliefs and practices relative to objects considered ‘sacred’ [17]. In our analysis, we contend that both technologies and the processes that create them (e.g. ‘design thinking’) become sacred. ‘Religion’ further refers to a system of faith that is maintained and strengthened outside of the auspices of ‘evidence’, in which ritualized collective practices take on symbolic import [17,43]. While we recognize the diversity of worldwide practices that may fall under the scope of ‘religion,’ we limit the term herein to the scope it generally inhabits in the United States (also the location of all of the engineering communities we studied), which is dominated by Judeo-Christian religious frameworks.

As also discussed in the introduction, scholars of science and technology have uncovered deep-seated connections between technological *objects* and religion, for example pointing to the prevalence of religious language within branding discourse [32,34,40,41] or showing how specific technologies are rhetorically connected to divinity and redemption in use [10,23,25,33]. These scholars have found that technologies can evoke what cultural historian Vincent Mosco refers to as ‘the sublime,’ or feelings of awe, transcendence, and connection to a greater purpose – feelings that, not coincidentally, are also central to religious experience [33].

We further saw that quasi-religious practices and discourses were often enacted with *mythologies* [33], or foundational narratives that were ritualistically circulated within the community and told to outsiders to reinforce collective beliefs. Considering the role of mythologies in the connection between ubiquitous computing and religious experience, Dourish and Bell use Mosco’s formulation of mythologies as narratives that make certain futures appear at once magical and inevitable, straightforward and ‘divine’ [16]. They juxtapose these divine mythologies against the ‘messiness’ and contested nature of everyday life, concluding, like Mosco, that mythologies are much more than simple falsehoods; they “animate individuals and societies by providing paths to transcendence ... [and] the promise of the sublime” [16:4].

Similarly implicating religion in his analysis of techno-utopian mythologies, religion scholar William Stahl shows how the mythologies present in popular accounts of technology’s role in society both reveal and conceal its social influence [41]. Describing these stories as technological utopias and dystopias, Stahl illustrates the salvation, liberation and fear that emerge through technological myth-making, concluding that “our language about technology is implicitly religious” [41:3]. On the other hand, he also identifies counter-narratives that “break the spell of the present,” exposing the ideological stakes that underpin commonly circulated mythologies and suggest concrete alternatives to existing technology practice (a theme that will surface in our discussion of doubt). In doing so, he underscores the ethical dimensions of technological myth-making.

These collective beliefs, in turn, make up what social theorists refer to as an *ideology*: a framework of norms, whether conscious or unconscious, that shape thoughts and actions. Cultural theorist Stuart Hall describes an ideology or ideological framework (we use the two interchangeably) as a “system for coding reality” that “becomes autonomous in relation to the consciousness or intention of its agents” [20:71]. Many possible ideologies may be present in engineering communities at the same time – capitalist, libertarian, and individualist ideologies, for example. Hall notes that this concept has been useful in social theory as “a way of representing the order of things which endowed its limited perspectives with that natural or divine inevitability which makes them appear universal, natural and coterminous with ‘reality’ itself” [20:65]. What is important in this definition is the way that ideology fades into the background: an ideology “works” because it “represses any recognition of the contingency of the historical conditions on which all social relations depend. It represents them, instead, as outside of history: unchangeable, inevitable and natural” [20:76]. In this light, the three quasi-religious behaviors we witnessed and mythologies we saw circulating helped establish, negotiate, and reinforce the ideological tenets of the communities we studied. Mythologies furthermore served as a specific mode of reifying and naturalizing these ideological norms through ritualized telling and re-telling of narratives.

A final term that will be useful in the analysis that follows is that of an *engineering world*, of which each of these communities is a part. Strauss [42] describes ‘worlds’ as sets of shared activities connected by a “network of communication,” including creating and negotiating common boundaries, standards, ideas of ‘worth,’ and modes of judgment. Further fleshing out the idea of ‘worlds,’ Becker describes art worlds as “the network[s] of people whose cooperative activity, organized via their joint knowledge of conventional means of doing things, produces the kind of art works that the art world is noted for” [5]. These worlds may be at times ad hoc, temporary, or inter-organizational, but they are ideologically ‘legible’ to one another and recognized from both inside and out as belonging to a culture; to paraphrase Gertrude Stein, there’s a ‘there’ there.

Under the umbrella of ‘engineering worlds’, we include various disciplines involved with the design and development of new information and communication technologies in the larger network of communication, including computer science/engineering, mechanical engineering, and various forms of design. Within these worlds, we argue that designers and engineers understand themselves as ethical agents who assume a responsibility to protect their group’s mission and cohesion, and they consequently propagate practices and mythologies that are in line with the group’s underlying ideological framework. We suggest that these findings are not unique to the groups we studied, but are instances of a quasi-religious orientation across engineering worlds (and possibly beyond) more generally.

DATA SOURCES AND METHODS

Four sites of observation and analysis

We focus here on the practices of four engineering worlds. The first is the National Day of Civic Hacking, in which computer programmers volunteer an afternoon or weekend to write code for civically-minded projects. The second is the Fixit Clinic, where volunteer ‘coaches’ help people repair and re-use broken devices. The third is the Institute of Design at Stanford (d.school), in which students are trained in design thinking and practice. The fourth is the One Laptop per Child (OLPC) project, which designed a laptop meant to overhaul education across the Global South. All four sites we examined involved participants who were drawn to the project because of a conviction that its approach will affect the world in a way that they support. These common elements of *passion* and *conviction* further highlight the religious aspects of their practices. While parallels to religious thought and practice are not unique to volunteer-based communities focused on social change, the communities we studied make such practices more apparent.

We do not use these sites as ‘case studies’ in the traditional sense, but rather empirical and historical materials through which we find commonalities. In the following sections, we instead integrate our findings thematically.

One Laptop per Child Project

MIT professor and Media Lab co-founder Nicholas Negroponte announced the One Laptop per Child project in 2005. He described a ‘mission’ to build a \$100 laptop (a benchmark that proved to be infeasible), with open-source educational material based on the tenets of ‘constructionist’ learning [38,39], for children in developing countries. In practice, there are about 2.5 million in use around the world today, 85% of them in Latin America [3]. The ideas behind the project had been circulating among MIT’s computer science and design faculty and students for at least 35 years before OLPC’s unveiling, starting with a 1971 NSF research grant that MIT professor Seymour Papert received to design computers for education.

The first author has been researching the OLPC project since 2008. Her work includes seven months of ethnographic fieldwork of an OLPC project in Latin America, as well as ongoing archival research on the development of OLPC and the ideas behind it. The latter contributes to the arguments in this paper, focusing exclusively on the Boston-based founding group involved with design and development of OLPC’s XO laptops.

National Day of Civic Hacking

The first National Day of Civic Hacking (hackforchange.org) took place at 95 different locations across the United States on June 1-2, 2013. Local groups affiliated with the national movement independently organized events at each location. They designed the events to gather ‘hackers’ who were interested in applying their programming expertise to civic problems and issues. The event was endorsed by the White House and involved 26 government agencies or institutions that often provided access to datasets.

The third author collected online promotional and post-facto summary materials from events around the country and also conducted ethnographic observations at the ‘Hack the Rock’ event in Rockaway Beach, New York, a Queens neighborhood that was particularly hard hit by Hurricane Sandy. Much of the civic hacking going on that day in the Rockaways involved the design and development of tools to prepare for, survive, or recover from a future natural disaster.

Fixit Clinic

Since 2009, the East Bay Fixit Clinic has hosted ‘pop-up’ events dedicated to “the guided disassembly of your broken stuff,” as their tagline states. Roughly once a month, small groups of tech-savvy volunteers gather at local libraries, museums, and hackerspaces (community-operated workspaces most often dedicated to electronics tinkering) in the San Francisco Bay Area to help residents take apart and learn to fix their broken products.

The second author conducted participant observation at seven repair events hosted by two repair collectives in the Bay Area and spoke with approximately 60 participants. She complemented her ethnographic work with extensive formal interviews with 20 participants, including leaders, organizers,

activists, and attendees, whose repair activities critically informed the development and maintenance of contemporary repair movements. Lastly, she conducted in-depth research in the Fixit Clinic and Repair Café's online archives and in individual participants' collections of artifacts and writings.

Stanford d.school

The Hasso Plattner Institute of Design at Stanford (or "d.school") is an interdisciplinary hub for Stanford students, industry executives, and design professionals to take classes in entrepreneurship and engineering. Affiliated faculty promote principles of 'design thinking,' a human-centered design methodology with origins in mechanical engineering and product design. While the institute itself does not grant degrees or hire tenure-track faculty, its affiliations with the Departments of Engineering and Art enable enrolled graduate students to receive Masters Degrees in design through the Joint Program in Design.

The second author conducted participant observation from December 2012 through June 2013 of a capstone course at the d.school called *d.garage*, and spoke with roughly 50 participants at the Institute. She carried out interviews with 11 program affiliates, including leaders and students of the d.school and the Joint Program in Design.

Methodology

Collectively, this paper draws on archival research, discourse analysis, interviews, and ethnographic observations. The first author analyzed the forty-year development of the ideas behind OLPC's 'Children's Machine' via its documented history, the third author conducted observations and a discourse analysis of the events and media surrounding the National Day of Civic Hacking, and the second author made ethnographic observations of and interviews with participants and hobbyist fixers at the Fixit Clinic and teachers and students at the Stanford d.school. All observations were recorded as handwritten fieldnotes and interviews were audio recorded and transcribed.

To analyze these data, we adopted an iterative, inductive approach common in anthropology and cultural studies, namely to combine a thorough understanding of participants' worldviews with a more critical-theoretical interpretation of these worldviews as 'texts' able to expand or contest broader theoretical questions. This systematic approach is in keeping with the theory-building described in Michael Burawoy's Extended Case Method [8], which outlines a rigorous reflexive alternative to the demands of positivist research. Instead of striving for reactivity, reliability, replicability and representativeness, all of which introduce highly problematic 'context effects' (especially in qualitative research), the Extended Case Method acknowledges the inevitability of the researcher's *intervention*, accounts for the *process* of interpretation given participants' contexts and histories, works toward identifying the underlying forces that structure everyday life ('*structuration*'), and iteratively *reconstructs* social theory given one's findings. Burawoy demonstrates that

this reflexive approach "also seeks generalizable and falsifiable explanations ... but true to its own principles, arises from a critical engagement with positive science" [8:11]. This orientation allowed us to begin reaching beyond a participant's articulated values to identify mechanisms by which the groups commonly deployed ideas to defend the legitimacy of their practices and discourses.

We employed the Extended Case Method over the course of several months in person and via a series of Google Hangout sessions, due to the distributed nature of our team. In early discussions, we analyzed our own and each other's field data and jointly identified a host of common themes that had independently emerged in our projects. We also conducted an extensive literature review drawing in research from many different fields including HCI, media studies, anthropology, religious studies, communication, and sociology. Collectively reflecting on common themes and emergent syntheses, we hypothesized that the existence of these commonalities was due to the shared social context in which all of our field sites operate: American engineering culture. We then turned back to our data, where we iteratively discussed and further identified several forms of quasi-religious practices that appeared in each of our sites – practices, it is worth noting again, that occurred without prompting or intervention from us.

QUASI-RELIGIOSITY IN ENGINEERING WORLDS

Our inductive process of synthesis and theorization resulted in the identification of three common themes across our data: practices of *worship*, practices of *evangelism*, and practices of *addressing doubt*. Collectively, these themes indicate a set of quasi-religious practices that extend across engineering worlds. Below, we show how the motivations and practices of the four engineering worlds we studied, though they may be framed by the participants themselves as 'rational' and evidence-based, resemble religious practice.

Worship: the practices and rituals of faith

Those who participate in the engineering worlds we studied confirm and renew their faith in technological practices via specific forms of worship. By *worship* we mean ritualized practices of homage to particular beliefs important in the community, through either individual or collective rites [43]. In this section, we show how these practices create, reinforce, and highlight the shared experiences in each community, its reason for existence, and the individual reasons community members have for continuing their membership [19]. We also show how the narratives that structure and justify these practices become mythological in stature, doing work to maintain the group's shared ideological framework.

We will further see that by way of continued reproduction, these activities became legitimated and, at times, reified to the point of social exclusion or interactional difficulties with other groups. On the other hand, it is through this collective form of practice that a group comes to define, understand and enact its values and beliefs, which is an essential antecedent to

maintaining a shared ideological framework and ultimately ensuring the sustainability of the group.

Individual forms of worship

Our first example of worship in engineering worlds involves the ritualized articulation of belief by individual members of engineering worlds. Among those involved with the One Laptop per Child (OLPC) project, it is commonly held that computers offer children unique opportunities for passionate play, enlightenment, and a connection to the sublime. This belief, formalized in OLPC's mission statement [36], is legitimated by those in the community through providing ritualized examples of the centrality of computers in their *own* childhoods. This is framed by the community as rational evidence justifying their project (despite its anecdotal and idiosyncratic nature [2]). However, telling the story of a childhood passion (often defiant [2]) for computers – whether on personal blogs, public OLPC mailing lists, or elsewhere – signals participants' motivation for joining the project and the legitimacy of their membership in the congregation. By connecting themselves to a shared mythology that is so central to the community, clearly they belong.

OLPC co-founder Seymour Papert, acknowledged by other founders as the intellectual father of the project, originated the form and substance of this cosmological myth in describing his close relationship with gears as an engineering-focused 'object-to-think-with,' his childhood substitute for the not-yet-widespread computer. "*I fell in love with the gears,*" Papert explains, italics his, in his 1980 book *Mindstorms*. He continues,

"This is something that cannot be reduced to purely 'cognitive' terms. Something very personal happened. ... This book is the result of my own attempts over the past decade to turn computers into instruments flexible enough so that many children can each create for themselves something like what gears were for me." [38:viii]

Though Papert's story does not involve computers, his entire career focused on applying his experience with gears to the computer, which he called "the Proteus of machines ... [that] can appeal to a thousand tastes" [38:viii]. In a later book, *The Children's Machine* (a direct reference to what would later become OLPC's laptop), Papert explains that he came to believe that computers could fulfill this role in his experiences with the nascent MIT hacker community in the late 1960s. This community's passionate play with computers, itself a kind of worship (and described in more detail in [28]), had a profound effect on Papert:

"I had my first experience of the excitement and the holding power that keeps people working all night with their computers. I realized that children might be able to enjoy the same advantages – a thought that changed my life." [39:13]

The continued popularity of Papert's ideas – within OLPC and beyond – attest to the power of the mythology that (some) children's passionate play with computers is a path to the

sublime. Indeed, Papert's book *Mindstorms* could be regarded as a kind of 'bible' for the movement – continuing to circulate among those in the community and to be assigned in design and engineering classes – spreading the group's mythology of finding oneself and connecting to like-minded others through the machine and the ideology underlying it along the way. This mythology served to link the passions of many of those involved with the project, as well as many of its greatest admirers.

Technical practice as a form of worship is made even more overt at the Stanford Institute of Design (d.school) – and in these examples, the participants even stray from the 'rational' commitments to evidence in their unprompted use of religious language, though they continued to justify their passions with language of rationality. Teachers enthusiastically talk about how students "flip" – become converts to design thinking – in what one staff member and graduate of the d.school called a "hallelujah moment," noting the number of people who have described the d.school philosophy as "cultish." The founder of the d.school, David Kelley, himself admits that his belief in *design thinking*, the philosophy undergirding his pedagogical goals at the institute, is religious in nature – a parallel that was entirely unprompted:

"This [design thinking] is my only organized religion in that way. ... It's like whatever religions do for you – whether it's a crutch, whether it makes you feel good, or whether it just gets you through the day, view of afterlife, or whatever else – [for me it's about] this whole notion of helping people through unlocking their creative ability. I mean, it's got *chemical* with me."

'Getting chemical' for Kelley was like falling in love with gears or the engrossing play with MIT's mainframes for Papert: it involved a highly personal passion rooted in a sense of possibility that their object of worship provided them. And just as Papert shared this experience with others, Kelley sought to instill in students a faith that they too could 'unlock their creative ability' through design thinking, and moreover that these creative abilities could change the world. Kelley identified this feeling as his 'only organized religion,' recognizing the role of his faith in design thinking as a source of his motivation.

A third example of worship comes from Chris Witt, a volunteer at the Fixit Clinic who took particular pleasure in reusing and repairing old bikes. He described his attachment to repair work as a kind of religious experience – though with a different kind of motivation. He explained (again, unprompted):

"It took me a long time to realize that I don't have any particular regard for any organized religion, but for me [repair work] has become, in a way, a kind of religious practice that I evolved without ever thinking of it that way. So there's an amorphous mass of earth worshippers out there, and that's not what I would call [repair work], but it's as close as it gets."

Here, Witt admits that his repair work involved expressing adoration for the earth and the environment – he does not see himself as the same as ‘earth worshippers,’ but still, his devotion to repair is ‘as close as it gets.’ As a volunteer at the Fixit Clinic, he enacted this passion both with other volunteer ‘coaches’ and with the visitors that he was there to help. This process enabled him to publicly sanctify his respect for the environment as a kind of religious practice. Though Witt’s interests lay resolutely outside organized religion, like Kelley he saw commonalities between his volunteer repair work and more traditional forms of faith-based worship.

Communal forms of worship

While some devotional practices – like Papert’s gears or Witt’s repair-work – are expressed individually or asynchronously, worshippers often value collective religious practice, whether expressed in thoughtful collective silence like the Quakers or exuberant songs like the Baptists. Thus, while worship is an individual religious expression, it is often enacted, strengthened, and shaped in the company of others [43].

Collective practices of worship occurred at a spring 2013 Fixit Clinic meeting at the Albany Community Center, which found the Clinic’s founder and lead organizer, Peter Mui, standing on a chair, his arms raised. “Ladies and gentlemen, start your repairs!” he called out after introducing the afternoon’s activities. The cacophony of repair activities fell to a hush during Mui’s introduction, and all eyes turned toward him. A similar speech marked the official beginning of each event, ritualistically transforming the crowd into a congregation with a common purpose. Mui later said he consciously used these introductions to set a particular tone for the meeting.

Meeting together was similarly a critical part of the National Day of Civic Hacking. Organizers spoke of the need for “citizens” (primarily software developers) to be co-located in the ritualized practice of the hackathon as they strove to pound out viable and innovative solutions together. In Palo Alto, the convening was organized to not only to bring people together but to celebrate the city as well. Their hackathon took place outdoors in the beautiful California weather and was accompanied by family-friendly activities, a stage for TED-like talks from local technological dignitaries, and a techie ‘farmer’s market’ where developers wandered among the stalls to exchange ideas or receive feedback from technologists rather than buying local produce. The ritualized forms of worship at work here were quintessentially Californian, bucking centralized and formal worship for outdoor marketplaces and egalitarian collaboration.

Worship within engineering worlds thus takes place both at the individual and the community level. Engaging in shared rituals such as hacking, tinkering, designing or fixing together collectively motivates participation in the world, reinforces beliefs, and expresses devotion to the group. These moments also allow stories to circulate that can take on the form of mythologies, expressing on-the-surface values as well as tapping the underlying ideological framework of these groups. For programmers, a day of hacking with fellow coders is

simultaneously a time for reinforcing a mythology about the power of technical problem solving and the virtue of civic-mindedness. Papert and his colleagues celebrated their devotion to computers together and younger contributors ritualistically connected their ecstatic childhood computer experiences to this culture, many of them wanting to give those same experiences to children around the world via OLPC, as we will see in the next section [28,39]. And at Stanford’s d.school, the communal practice of design, in and of itself a powerful example of worship, was further sanctified by its location in two highly ritualized spaces at the school, the classroom and design studio. These classes and studio spaces served to gather and connect students from across campus (through class enrollment) and across the world (through the design master’s program). Yet, given the high demand for design training, they also excluded individuals and groups that did not fit the school’s idea of a promising design student.

We turn next to understanding how these individual and collective practices of devotion also produced tactics for spreading messages of faith beyond the bounds of these communities.

Evangelism: bringing more people into the fold

Members of engineering worlds are often ready evangelists with a zeal for converting non-believers to their worldviews. These practices are one of the normative aspects of an ideology [20]. The four engineering worlds we analyzed each engaged in practices of evangelism, including education, recruiting, and publicity, making this a goal within their respective communities. In contrast to faith, which is a personal, inward-facing and sometimes exclusionary way of adhering to a set of beliefs, evangelism orients communal beliefs outward with an eye toward propagating the ideology through associated practices. Understood this way, our analysis of evangelism bears resemblance to sociological studies of social movements (e.g., see [11,13]).

Fixit Clinic founder Peter Mui explained some of his more evangelistic techniques in an interview. He said,

“We also do that celebratory thing when people fix stuff. Okay? Because we want, we want to give this affirmation. This sort of ‘come to Jesus’ moment [laughs].”

For Mui, coming to the Fixit Clinic meant learning to embrace an ideology of economic empowerment in which one could feel confident taking apart devices, figuring out how they were produced, and maybe even suggesting alternatives. He wanted participants’ experience of tightening a screw in a toaster that no longer heated, adding a bead of solder to a Bluetooth device without signal, or sewing a new buckle to a tattered leather boot to enable them to think differently about their consumption practices. If a person came away from the Clinic with additional technical skills as well, all the better. Using a triumphant disposition, Mui wanted to inspire a “moment” of change in people’s thinking that promoted a particular set of countercultural beliefs – an ideology – around consumption and engineering.

A second example showcases the thin line between evangelism and worship. Stanford d.school founder David Kelley's desire to see students "flip" into being design thinkers is at once an act of worship – tied to rituals of the classroom and design studio – and one of evangelism. He further explained the evangelistic aspect by discussing the magic of that conversion moment:

"When students come up and I see their eyes sparkle and they say, 'Oh my god. You know, when I came to Stanford I didn't think this way at all and now I think this way...and I'm making better decisions and I'm going to change my job [...]' And they cry and whatever. That's what I'm after. That's the selfish part of this religion. It's that I get to witness this kind of 'flipping' to feeling positively about themselves. So, if it's not a religion, then it's this kind of selfish gratification thing of as many people flip[ping] as possible."

More explicitly discussing his evangelistic ambitions, Kelley explained that he wanted to teach as many people as possible about design thinking because he considered it to be a powerful tool, again bringing up religious parallels without prompting:

"I really believe that this can help people and so I want them to know that it exists. It is not religious in that it is forced – that this is the right one compared to any other. [...] It's religious in the sense I want everybody to know about it."

The blurred boundaries of evangelistic worship at Stanford can be contrasted with the case of the all-night programming sessions that Papert and others in OLPC shared at MIT. There the practices of worship had no evangelizing function; they were comprehensible only those who were already steeped in the ideological framework of the community.

Evangelism at the National Day of Civic Hacking was less overt than with Mui or Kelley, but the mythologies at play there still affected the tone of the whole event. Invitations to participate encouraged all citizens to get involved, irrespective of their technological abilities. At the same time, organizations with names such as Code for Good and Rally for Impact sponsored the events, and these names influenced participants' interpretations toward a mythology central to hackathons that code ideated and (at least partially) developed in an afternoon *could* have a lasting impact, perhaps even more impact than the incremental results of long-standing nonprofits or advocacy groups. Altogether, this branding had a proselytizing influence promoting code as salvific, and moreover encouraged the involvement of a crowd self-selected to believe in such a mission.

During observations at the Rockaways hackathon in Queens, New York, a steady stream of tech-sympathetic community members, like missionaries, came into the school to share their stories of devastation from Hurricane Sandy and to promote their latest ideas about what technological services might have been useful at the time. Their appeals helped to dissuade

skeptical voices and set the tone for a charismatic afternoon. During the coding spree itself, the tenor of activity celebrated the value of efficient production, not deliberation. The motto set from the organizers -- "less yack, more hack" -- kept people on the right path and dissuaded critical views or ongoing discussion. In this way, the timed and goal-driven structure of a hackathon helped to symbolize the tenets of this faith as ordered and rational – something driven by passion but kept in line by constraints. Nothing here was too unfamiliar, critical, or disruptive, which was meant as a welcome invitation to tech-curious neophytes.

In the case of One Laptop per Child, the project's central mission was one of evangelism. However, this proselytic drive ended up doing more than recruiting new members to the cause. Rather, some in the project allowed their zeal to make them less evidence-driven and more hostile to constructive criticism. After the OLPC project was announced in 2005, a number of journalists and academics (e.g. [4,29,44]) questioned whether money would be better spent on ensuring adequate food, sanitation, or other basic necessities instead of buying laptops for children. Responding with the same kind of "disruptive" rhetoric that portrays new technologies as being a "radical break from history" that many techno-utopian projects use in legitimating themselves [33], many of those leading or involved with OLPC talked about how their laptop was uniquely qualified to change the world by remaking children across the Global South in their own image [24,30,35]. Their laptop would let children learn how to program computers, which would naturally facilitate their becoming the same kind of 'hackers' as the developers themselves – a subject position they considered powerful, freeing, and altogether desirable to have, as we saw in the ideology undergirding their faith. This, in turn, would naturally lead to economic growth, no matter how disadvantaged or infrastructure-poor the area started. OLPC co-founder and leading evangelist Nicholas Negroponte articulated this view succinctly in a 2008 video OLPC posted on YouTube (<http://youtube.com/watch?v=o97UD78s6iM>):

"[The XO laptop] is probably the only hope. I don't want to place too much on OLPC, but if I really had to look at how to eliminate poverty, create peace, and work on the environment, I can't think of a better way to do it."

Project co-founder and then-software director Walter Bender explained in a 2007 Radio Open Source interview how the machine could have these world-changing effects simply by children "be[ing] able to reach inside the machine ... and touch it, and transform it, and explore it as deeply as they want to" [30]. What lay behind the evangelistic (not to mention technologically determinist) mythology that ameliorating issues of economic, cultural, and environmental import can be achieved by giving children open-source laptops is less a rational examination and more a highly personal, quasi-religious set of worship practices between developers and their computers that they sought to spread.

That spreading this worldview would also be a *shortcut* to cultural and economic change was another notable feature of

OLPC's evangelistic beliefs [24,30,35]. In the same 2007 Radio Open Source interview, Bender explained that OLPC was an "end-run around the status quo [to] move a little bit quicker to reaching more children" [30]. Both Bender and Negroponte referred to the project as a "Trojan Horse" [30,35], Bender elaborating that it was "a backdoor into overhauling the entire education system of a lot of the countries that we are talking about" [30], and Negroponte further explaining, "We need to reach the most children possible and leverage them as the agents of change" [35]. Here, again, we see this rhetoric framing a technological solution as radically breaking the rules that governed and constrained previous interventions, even when in reality it differed from other development projects only in hubris. This blind spot – the mythology that simply reaching children with OLPC's laptops would overhaul national economies – anchors an ideology of technological determinism with a specific idea of how learning (or fixing or hacking) should be accomplished: in a very personal relationship between an individual and a computer, just as Papert, Negroponte, and others wrote about experiencing themselves in their practices of worship.

Whether the ideologies in these communities reflected the belief that design thinking or programming can effectively solve problems that other approaches have not been able to, that fast action is preferable over careful deliberation, or that tinkering with electronics can usher in new worldviews, each group used some form of evangelism to celebrate the power of their engineering practices. Each of the communities we examined sought to spread their faith and practices of worship to new members, from community participants to university students to children in the Global South. Their zeal often led them to overstate the power of their solutions and ignore challenges or complications, even when their claims lacked evidence. Indeed, a common theme across these worlds, and in engineering worlds more generally, is that computer technologies represent such a radical break from the past and from other approaches that historical or comparative data provide nothing useful in understanding them. On the contrary, exploring the limits and ideological commitments of these groups serve to reconnect them to history and contextualize their "disruptive" rhetoric [33].

Both worship and evangelistic practices can be challenged or internally rejected, however. We next turn to examine the origin and nature of these challenges and to document the reparative practices these communities took on in response.

The ideological work of addressing doubt

Practices of worship and evangelism were not always met with complete acceptance, and sometimes particular events shook the faith of the group. While doubt was sometimes part of the ideological framework of the community itself – in other words, certain kinds of doubt were 'orthodox' – there were other instances where neophytes or even long-time acolytes lost their faith and challenged the ideological underpinnings that motivated the community, even asserting that the community was based more on faith than fact.

Doubt highlights the translation-work that must occur between ideologies and the 'messiness' of everyday life, which may not always conform to ideological norms [16]. Cultural historian Bennett Berger develops the idea of *ideological work* to describe this process. Ideological work can take the form of "selling out" (adjusting one's beliefs to match circumstances) or "realizing" (adjusting circumstances to match one's beliefs), but more often is instantiated as "accommodating," or meeting in the middle [7:18–22]. In this section, we focus on the ideological work that doubt created, describing the responses the faithful made to shore up or reconcile their beliefs. This analysis also reveals that the responses of both doubters and the faithful lay bare additional blind spots around inclusivity and partiality in these engineering worlds.

At the National Day of Civic Hacking, one kind of doubt was very much part of the fabric of the events themselves: doubt in the efficacy of government institutions. The hackers involved were, however, not cynical about state of affairs: they optimistically saw themselves as saviors for the perceived failures of today's government structures, and their solutions as a path to civic redemption. They viewed an ability to hack as not only an opportunistic way to 'act,' but really the only way to have agency in civic matters. As with OLPC, technological solutionism was more akin to finding faith after having been tested in the wilderness: here, finally, is the way to move mountains; here, finally is a more direct channel to the sublime.

Some voices, however, questioned this techno-fetishistic zeal, allowing us to observe how doubt and disbelief unfolded and was attended to. In a blog post entitled "Hacking for Good" (<http://homecookedtheory.com/archives/2013/06/07/hacking-for-good>), Melissa Gregg, a scholar at Intel Research, challenged the premise behind the National Civic Day of Hacking event she attended, wondering what made hacking in concert with government agencies and community members necessarily good. The larger community behind the event chose to simply ignore these critiques – likely something possible only because of the distributed nature of this engineering world and not a viable long-term form of ideological work – organizing a second event around the same ideological message (i.e., hacking as a civic virtue) for the summer of 2014.

Like Gregg's doubt of civic hacking, one of David Kelley's students expressed doubt about the value that design thinking may actually provide at the Stanford d.school. While admitting that design thinking was 'fun and interesting,' he questioned whether it could have the amount of impact in the world that d.school teachers promised to their students. Bringing in religious language – again, without prompting – by comparing his teachers to preachers and their message to proselytizing, this student raised the heretical thought that their religious devotion to design thinking might be obscuring its limitations:

"[Design thinking,] it's preaching. It's creating a religion that needs followers. It already has leaders but the leaders need people to follow them. So that I think [design

thinking] does carry well [to other contexts] and it does do that, but it also doesn't necessarily recognize how difficult it is to be good at it. ... It seems like it's not nearly that hard to be a priest. You stand in front of a group of people. You read a gospel. You have a book that tells you what to do. But there's a lot to it I guess. Not just preaching, but doing the work. There's a lot of design out there where people think they can do it, try to do it and it seems fun and interesting but it doesn't really work as well... And to some degree I think the proselytizing may be masking that fact."

While this student's doubt arose in the normal course of his studies, a community's faith can also be shaken in response to a particular event, as was the case for OLPC. A defining moment for the OLPC community, one that tested the conviction of many involved, occurred in spring 2008. Negroponte had announced the '\$100 Laptop' three years earlier and the project had garnered gushing praise from engineering communities and the press [4], if not the rush of country-scale orders that were expected. Still, the project's commitment to open-source software, their focus on passionate learning with computers [39], and their bold rhetoric about overhauling education worldwide attracted a large and loyal following of employees, volunteers, and corporate contributors.

Then, in a stunning reversal, Negroponte announced in spring 2008 that he was in negotiations with Microsoft to put Windows on the XO laptop instead of Sugar, the in-house open-source platform built on Red Hat Linux. This unexpected move towards proprietary software undercut the faith in open-source that had inspired many participants' involvement in the project. Some participants fought back, publicly re-affirming their motivations for joining the project, while others quit the project altogether. Collective sentiments were summed up on the Free Software Foundation website (<http://fsf.org/blogs/rms/can-we-rescue-olpc-from-windows>) by technology pundit and self-styled open-source 'evangelist' Richard Stallman, who had previously been a vocal supporter of OLPC:

"Since the OLPC was first announced we have envisioned it as a way to lead millions of children around the world to a life in which they do computing in freedom. ... Proprietary software keeps users divided and helpless. ... You might as well introduce the children to an addictive drug. If the XO turns out to be a platform for spreading the use of proprietary software, its overall effect on the world will be negative."

Stallman's statements – equating proprietary software with an addictive drug – may seem extreme, and he was in fact ridiculed by some in the press for it. However, many others in the engineering worlds that had been supporting OLPC agreed with his statement. OLPC co-founder Walter Bender echoed Stallman in a post on the OLPC News blog (independent and often critical of the project; http://olpcnews.com/software/sugar/confessions_of_a_fundamentalist.html), articulating what OLPC should represent with a distinctly religious tone.

Bender pushed back on a statement from Negroponte that the project was too full of open-source 'fundamentalists' by claiming that he was only a 'fundamentalist' about learning – but that the learning they wanted to enable was only possible with open-source software:

"I am a fundamentalist – but in regard to what? Not software. I am a fundamentalist about learning! That is not to say I am not passionate about FOSS [free and open source software], but as the means, not the end, towards a 'constructionist' learning model."

Bender echoes the religious language of 'fundamentalism' that Negroponte used as critique, but appropriates it as a positive trait, simultaneously drawing a boundary around what he understood as OLPC's mission. After all, who could argue with being a 'fundamentalist' about learning?

Here, Stallman and Bender both demonstrate the kind of ideological work faithful community members felt compelled to perform in order to defend their views of the OLPC project against challenges to the community's ideologies. While some were puzzled by their urgency and vehemence, these statements, if interpreted with a religious lens, make sense: not only was the project under attack, but so too were the mythologies, the ideologies, the very faith of its true believers.

Around the same time, one early and previously evangelistic employee [24] left OLPC. In a blog post (<http://radian.org/notebook/sic-transit-gloria-laptop/>), he publicly questioned not only Negroponte but the whole premise of the project. This man's crisis of faith resulted in the need for a different type of ideological work – work that ultimately rejected OLPC's mission in light of the project's new reality. He said,

"My theory is that technical people, especially when younger, get a particular thrill out of dicking around with their software. Much like case modders, these folks see it as a badge of honor that they spent countless hours compiling and configuring their software to oblivion. Hey, I was there too. And the older I get, the more I want things to work out of the box."

These examples showcase how faith in the engineering worlds we studied was repaired, adapted, and even abandoned in response to challenges from without and within. The role of and response to doubt in these communities highlight the quasi-religious fervor that doubters can both uncover in their questioning and elicit in response. The ideological work that took place around incidents of doubt further enriches our understanding of how engineering worlds enforce mythologies that are used to motivate and reinforce their central ideologies.

DISCUSSION

These themes illustrate the ways in which quasi-religious practices substantively inform and facilitate many of the ideologies of engineering worlds. We have illustrated how our subjects inform their goals and discourses through practices of worship, evangelism and the ideological work of addressing doubt. Our data show that volunteer participants in fixing

events and hackathons promote evangelistic messages extolling the virtues of rapid action and praising the ways that exploratory electronics tinkering can uncover new ways of seeing the world. In parallel, One Laptop per Child (OLPC) project adherents articulate their approach as the “one true path,” believing that programming and computer use is capable of solving problems that other approaches cannot. Finally, we note how Stanford Institute of Design educators are enraptured by the moments of conversion that their design thinking myths produced in their students, even as some in their flock questioned how zealous proselytizing might be concealing the limits of the method.

These findings suggest not only evidence of quasi-religious behaviors and mythologies but also a rationale for seeking this evidence out. Understanding how forms of worship, evangelism and faith operate in engineering cultures can help scholars unpack the sociality, organization and praxis of engineering worlds in new ways. Identifying ideologies, in particular, which may otherwise be as invisible to those familiar with those worlds as water is to the proverbial fish [15:123], is especially important. Our intention is not to advocate for an eradication of ideologies; just as it is impossible to escape the bounds of our own subjective points of view, so too is it impossible to operate entirely outside of the frameworks of ideologies. However, a large body of Marxist theory (e.g. see [20]) notes that becoming cognizant of the ideological frameworks in which we operate allow us to evaluate whether they are really serving the purposes we hope or assume they are. Only by way of this cognizance can we shift them if they are not.

So what have we learned about engineering worlds? Our religious framework surfaced faith-like practices that link aspects of technology innovation to worship, evangelism and ideological work. While the volunteers and contributors we studied may discount or overlook these insights, we contend that these practices reveal an understudied but *necessary* part of technical work, namely the need within engineering worlds – particularly those building new tools and services – to establish foundational mythologies and modes of worship, influence anticipated beneficiaries, and test and reinforce values against doubt.

The role of quasi-religious practice in engineering worlds

Throughout our findings, we saw examples of how quasi-religious practices (worship, faith, evangelism) provided benefits to the communities in which they were enacted. For students at the Stanford d.school, for example, Kelley’s formulation of design thinking marked an evangelistic turn to user-centered product development. Contributors to the OLPC project used evangelism to affirm their belief in the power of computers in childhood and to push back against doubters, even in the face of what might otherwise feel like overwhelming odds. The use of quasi-religious behaviors not only contributed to community-building and other world-changing activities, it also imposed coherence on situations that helped people persevere in the face of doubt and tackle

seemingly impossible issues. In the groups we studied, this faith-based coherence played a positive role and demonstrated a unique generative power *vis-à-vis* organizers’ beliefs.

On the other hand, we saw that these behaviors could also restrict and narrow group membership, goals, and design possibilities, delimiting what engineers viewed as accomplishable and/or important. The same utopian zeal for design thinking, learning with computers, or democratizing technology that inspired our participants had a blinding effect when it prevented them from recognizing or appreciating ideological diversity, much less constructively confronting problems of socio-economic disparity, racial and gender bias, or other issues of social justice beyond most of their everyday experiences.

Such limitations were most noticeable in the trenches of technology development. There, engineers who were largely male and upper or middle class envisioned cultural programs that reflected their own worldviews and ultimately served their own interests. In the groups we studied, this entailed helping those who already had leisure time and environmental convictions repair their own devices, building applications that reflected the civic identities of an entrepreneurial middle class, or trying to remake students at Stanford or children around the world in their own image. Echoing work by Oudshoorn, Rommes, and Stienstra [37], we found that the engineers involved in each of the projects we discussed adhered most passionately to tenets that mirrored their own ideologies, that echoed their own mythologies. These proclivities shaped the design of subsequent events, laptops, and software, but failed to account for the needs and diversity of ‘users’ who may have different views.

It may appear that our findings apply primarily to zealous, volunteer-centric engineering communities, since three of our four field sites were such (with the exception of the d.school). We disagree. Based on ongoing interactions with a number of other engineering worlds, we posit that these practices can be found across American engineering culture more broadly. Indeed, given that the CSCW community is itself an engineering world, we wonder what this framework can tell us about ourselves as researchers and designers. To address this question, we turn next to the ways in which these quasi-religious practices can extend CSCW’s analytical possibilities.

The case for attending to ideologies in CSCW

A number of frameworks within CSCW examine the values or practices of organizations, such as Values in Design (VID), discourse analysis, and Actor-Network Theory (ANT). While each of these approaches enables us to identify and reflexively account for the kinds of practices we have explored here, even collectively they overlook part of our story.

For example, Value Sensitive Design (VSD) [18] and value discovery [12] have helped expose the articulated values and commitments extant in many engineering worlds. The VSD approach generally focuses on human values of “moral import” as classified by deontological and consequentialist

moral philosophy [18:13], such as privacy, informed consent, human welfare, sustainability, and justice. Within this work, researchers have tended to interpret the concept of values (cognitive, moral, aesthetic) as deep or sacred properties of one's humanity. However, we find that the ideological commitments that undergird these values often remain taken-for-granted and underexposed. Furthermore, these frameworks have trouble explaining the processes of value production and maintenance – values in collective praxis.

Our perspective augments the core work of attending to values in design by recognizing the importance of focusing on how such values emerge from practice. Rather than values-in-*design(ed) objects*, the notion of values-in-*(design) practice* helps explicate the ideological norms that make certain cultural values natural, commonsense, or even invisible – just as the 'Protestant Ethic' makes certain values-in-practice such as industriousness seem natural and inevitable in American culture more broadly. As with attending to the underlying 'design ethos' that drives (certain kinds of) innovation in engineering worlds [22], a values-in-practice perspective regarding technology design and development yields insights even when values do not clearly make it "into" designers' and developers' products. In fact, our approach attends to values even when they may not even be clearly articulated as 'values.'

Discourse analysis likewise exposes how actors discursively construct a particular reality to reify common ideals, influence outcomes, and shape shared ideological structures [14]. Though this approach accounts for the deployment of ideology in discourse, it largely overlooks the explicit connections between discourse and ideology-in-action – in our case, how ideologically-motivated practices co-constitute modes of innovation and social organization, as well as social cognition [14]. Though our analysis often draws on the rhetoric of leaders and other highly visible members of the engineering worlds we studied, this rhetoric illuminates practices of these individuals and groups, such as the passionate computer play or 'fundamentalist' re-appropriation in OLPC, or the 'come to Jesus' moments in the design classroom or repair clinic.

Conversely, engagements with ANT often emphasize the mobilization and enrollment of actors (both human and nonhuman/technological) in the form of actor-networks, but here too the beliefs, values and mythologies that underlie these networks often go neglected, especially if these ideas do not take material form [27:2]. Indeed, Callon's ethnomethodological turn to advocate the use of actors' own categorizations of the world to structure research [9] may obscure these actors' ideological commitments via categorizations they may not realize they are making, just as VID favored explicitly recognized over implicit values. Finally, while an ANT framework provides constructive tools for analyzing the 'scripts' that designers build into technologies [1], it falls short of providing the means to account for how these ideological frameworks animate or inhabit these practices or products, making this aspect of the actor-network easily overlooked and thus uncritically assumed.

In contrast, our work reveals not only how illustrative but important it is, especially politically, to expose the ideologies in play in engineering worlds. This is a subject that Maher, a scholar of the open-source software community, claims "is all too often limited to impoverished discussions that emphasize instrumental efficacy at the expense of critical and rhetorical awareness" [31:369]. The kinds of ideologies we have detailed in this paper not only expose our participants' beliefs and related practices, but they also help make sense of them within broader ideological movements in which they are situated – oftentimes movements that participants may not actively articulate or even be aware of. In other words, we show that our subjects are embedded in the wider ideological space of American engineering culture, which informs the local ideological space instantiated within disparate engineering communities. The common quasi-religious behavior across all four of our otherwise quite different 'congregations' serves to illustrate the existence and organizational reach of this shared ideological creed.

While it may seem difficult to identify ideological frameworks when our subjects and participants are themselves not aware of them, we believe that it is strategically possible to do so. Indeed, we have some tips for interested researchers. Attending to points in the data where participants fall back on ritualized stories or behaviors that cannot quite be explained 'rationally' – instances that might be considered types of worship, evangelism, or ideological work/faith repair – provides a fruitful avenue to start. In particular, we suggest that researchers zero in on points of friction or doubt within a community (as well as the concomitant response) as a way of bringing ideological commitments to the surface.

It is also wise to follow where the data take you. To our surprise, some participants (e.g. Kelley of the d.school, Witt of the Fixit Clinic) drew their own direct parallels between their work and religious practice, whereas others made use of religious metaphors to explain their goals (e.g. Mui of the Fixit Clinic), especially when their belief systems were challenged (e.g. Bender of OLPC). While these participants may or may not recognize the norms undergirding their statements as ideological in nature (recall Hall's emphasis that ideologies often appear natural and inevitable to those immersed in them), their unprompted words gave us clues for what to attend to in our analysis. Moreover, their religious statements could be interpreted as themselves assertions of the faithful in the face of (potential) doubt – from us as researchers. We drew connections between these empirical results and the sociological and critical scholarship on ideologies and engineering worlds to surface the ideological undercurrents at play in these communities.

Our attention to the *mythologies* that circulated in the communities we studied – of the computer-obsessed child or the empowered designer – also showed us how communities strengthened and spread their belief systems through narratives. We could then follow these threads throughout our fieldwork, interviews, and archival research to uncover broader

ideological frameworks. Attending to these mythologies is thus another strategy for examining the ideologies of engineering worlds.

Within CSCW, attending to ideologies can help researchers identify important mechanisms through which groups cohere and validate themselves or disband and dissolve, as it has in the social sciences. Emerging social movements increasingly draw on engineering discourses to legitimate their claims, so understanding these ideologies is particularly important. Still, the tacit nature of many ideologies can make them more difficult to ‘harness’ productively: the jump from these identifications to productive suggestions can be especially difficult, and something with which social science has wrestled for decades [20].

Future work could explore this avenue, along with other questions such as: what fosters greater commitment among participants in a ‘hackathon’ and how might the event’s branding undermine or reinforce participants’ own experience of their work? Or how might the ritual display of ideological commitments help support the growth and maintenance of social movements? Are there more direct parallels between the strategies of organized religion and social organization, and if so, what might we learn from those parallels?

Overall, we hope that our results can serve to ‘make the familiar strange,’ as Stuart Hall would say [20], for researchers in CSCW to address these and other questions raised by attending to ideologies. While concrete design suggestions are not the goal of this paper, we also hope that this work helps designers – who often hope to ‘do good’ through technological intervention in ways similar to those in the communities studied here – identify their own ideological commitments.

CONCLUSION

A central goal of this work has been to investigate, articulate and demystify the ideologies of engineering worlds, as demonstrated through common quasi-religious behaviors and mythologies. With this lens, we interpreted the empirical data from four research sites to identify the beliefs and meanings espoused by our participants. Analysis of each project revealed that religious sentiments such as passion, conviction, and belief serve as forces that help participants express core convictions, recruit followers and maintain motivation in the face of great odds, critique, or conflicting evidence. Our point in this exposition is not to reduce ideology to an ‘objective’ religious formulation or undervalue its cultural power, nor is it to suggest that with quasi-religious behaviors these communities are somehow ‘wrong’ or ‘non-modern’ [26]. After all, Berger writes, “religion is perhaps the strongest example of symbolic meanings exercising causal force in private and public life” [7:151–152]. Rather, we have looked to religion as an important, culturally salient framework too often overlooked in the attempt to discuss the ideologies inherent in the seemingly neutral tenets and practices of engineering and design.

If we were to turn our gaze to our own field of CSCW, might these kinds of religious inclinations be equally prevalent?

Might the analysis of those tendencies enable us to recognize the prioritization of particular populations or identify central blind spots within our field? If we were to follow Donna Haraway – a scholar known for her defining feminist critiques of science and technology – we might answer yes. “All Western cultural narratives about objectivity,” she writes, “are allegories of the ideologies governing the relations of what we call mind and body, distance and responsibility” [21:583]. While we chose to examine other engineering groups in this paper, understanding the ramifications of quasi-religious practices within the engineering worlds *we* inhabit could shed further light on the underlying ideologies at stake, such as how design practices privilege and prioritize certain types of users. To do this, we might take into account not only the identity [37] of community members and their professed values but also their often taken-for-granted systems of belief, foundational myths, strategies for keeping their faith, and motivations for evangelizing their views – in other words, their ideologies-in-practice. While this discussion could be very important to our field, it is beyond the scope of our analysis here and we leave it to future work.

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REFERENCES

1. Akrich, M. The De-Description of Technical Objects. In W.E. Bijker & J. Law, eds., *Shaping Technology*. MIT Press, 1992.
2. Ames, M.G., Rosner, D.K. From Drills to Laptops: Designing modern childhood imaginaries. *Information, Communication & Society* 17, 3 (2014), 357–370.
3. Ames, M.G. Translating Magic: The Charisma of OLPC’s XO Laptop in Paraguay. In E. Medina, I. da C. Marques, and C. Holmes, eds., *Beyond Imported Magic: Essays on Science, Technology, and Society in Latin America*. MIT Press, 2014.
4. Ananny, M. The \$100 Laptop: Trojan Horse, Piñata or Social Movement? *Europe*, (2005), 1–16.
5. Becker, H.S. *Art Worlds*. U. California Press, 1982.
6. Bell, G. No More SMS from Jesus: Ubicomp, Religion and Techno-spiritual Practices. *Proc. UbiComp 2006*, ACM Press, 141–158.
7. Berger, B. *The Survival of a Counterculture: Ideological Work and Everyday Life Among Rural Communards*. Transaction Publishers, 1981.
8. Burawoy, M. The Extended Case Method. *Sociological Theory* 16, 1 (1998), 4–33.
9. Callon, M. Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Briec

- Bay. In J. Law, ed., *Power, Action and Belief: A New Sociology of Knowledge?* Routledge, 1986, 196–233.
10. Campbell, H.A., La Pastina, A.C. How the iPhone Became Divine: New media, religion and the intertextual circulation of meaning. *New Media & Society* 12, 7 (2010), 1191–1207.
 11. Cohen, R., Rai, S.M. *Global Social Movements: Towards a cosmopolitan politics*. In *Global Social Movements*. Athlone Press, 2000, 1–17.
 12. Le Dantec, C.A., Poole, E.S., Wyche, S.P. Values as lived experience. *Proc. CHI 2009*, ACM Press, (2009), 1141.
 13. Dearden, A. and Walker, S. Designing for Civil Society. *Proc. HCI 2003*, 157–158.
 14. Van Dijk, T.A. Discourse Analysis as Ideology Analysis. In C. Schäffner and A. Wenden, eds., *Language and Peace*. Dartmouth Publishing, 1995, 17–33.
 15. Dobrin, S.I. *Constructing Knowledges: The Politics of Theory-Building and Pedagogy in Composition*. SUNY Press, 1997.
 16. Dourish, P., Bell, G. *Divining a Digital Future: Mess and Mythology in Ubiquitous Computing*. MIT Press, 2011.
 17. Durkheim, E. *Elementary Forms of Religious Life*. George Allen & Unwin Ltd, 1915.
 18. Friedman, B., Kahn, P.H., Borning, A. Value-Sensitive Design and Information Systems. In P. Zhang and D. Galletta, eds., *Human-Computer Interaction in Management Information Systems: Foundations*. M.E. Sharpe, Inc., 2006.
 19. Gerber, E. *Devotion to an Innovation Process: The Case of Human Centered Design*. Unpublished doctoral dissertation, 2007.
 20. Hall, S. The Rediscovery of ‘Ideology’: The Return of the Repressed in Media Studies. In M. Gurevitch, T. Bennett, J. Curran and J. Woollacott, eds., *Culture, Society, and the Media*. Methuen, 1982, 56–90.
 21. Haraway, D. Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies* 14, 3 (1988), 575–599.
 22. Irani, L. *Designing Citizens in Transnational India*. Unpublished doctoral dissertation, 2013.
 23. Kelly, K. Nerd theology. *Technology in Society* 21, 4 (1999), 387–392.
 24. Krstic, I. Google EngEDU Tech Talk: Ivan Krstić. 2007.
 25. Lam, P.-Y. May the Force of the Operating System be with You: Macintosh Devotion as Implicit Religion. *Sociology of Religion* 62, 2 (2001), 243–262.
 26. Latour, B. *We Have Never Been Modern*. Harvard University Press, 1993.
 27. Law, J. Notes on the Theory of the Actor Network: Ordering, Strategy and Heterogeneity. *Systems Practice* 5, 4 (1992), 379–393.
 28. Levy, S. *Hackers: Heroes of the Computer Revolution*. Anchor Press Doubleday, 1984.
 29. Luyt, B. The One Laptop Per Child project and the Negotiation of Technological Meaning. *First Monday* 13, 6 (2008).
 30. Lydon, C. One Laptop Per Child? 2007. <http://radioopensource.org/one-laptop-per-child/>.
 31. Maher, J.H. The Technical Communicator as Evangelist: Toward Critical and Rhetorical Literacies of Software Documentation. *Journal of Technical Writing and Communication* 41, 4 (2011), 367–401.
 32. Mickey, S.F. *Constructing The Prophet: Steve Jobs and the Messianic Myth of Apple*. 2013.
 33. Mosco, V. *The Digital Sublime: Myth, Power, and Cyberspace*. MIT Press, 2005.
 34. Muniz Jr., A.M., Schau, H.J. Religiosity in the Abandoned Apple Newton. *Journal of Consumer Research* 31, (2005), 737–747.
 35. Negroponte, N. Email attachment. devel, sugar, community-news mailing lists, 2008. <http://lwn.net/Articles/279288/>.
 36. OLPC staff. OLPC Mission: Frequently Asked Questions. OLPC Website, 2012. <http://laptop.org/en/vision/mission/faq.shtml#faq5>.
 37. Oudshoorn, N., Rommes, E., Stienstra, M. Configuring the User as Everybody: Gender and Design Cultures in Information and Communication Technologies. *Science, Technology & Human Values* 29, 1 (2004), 30–63.
 38. Papert, S. *Mindstorms: Children, Computers, and Powerful Ideas*. Basic Books, 1980.
 39. Papert, S. *The Children’s Machine: Rethinking school in the age of the computer*. Basic Books, 1993.
 40. Robinson, B. Apple and the religious roots of technological devotion. *LA Times*, 2013.
 41. Stahl, W.A. *God and the Chip: Religion and the Culture of Technology*. Wilfrid Laurier University Press, 1999.
 42. Strauss, A. A Social World Perspective. *Studies in Symbolic Interaction* 1, (1978), 119–128.
 43. Weber, M. *The Sociology of Religion*. Beacon Press, 1993.
 44. Winters, N. and Ananny, M. Development Ideologies of the One Laptop Per Child (OLPC) Programme. 2007.
 45. Woodruff, A., Augustin, S., Foucault, B. Sabbath Day Home Automation: “It’s Like Mixing Technology and Religion.” *Proc. CHI 2007*, ACM Press, 527–536.
 46. Wyche, S.P., Aoki, P.M., Grinter, R.E. Re-placing faith: Reconsidering the Secular-Religious Use Divide in the United States and Kenya. *Proc. CHI 2008*, ACM Press, 11–20.
 47. Wyche, S.P., Grinter, R.E. Extraordinary Computing: Religion as a Lens for Reconsidering the Home. *Proc. CHI 2009*, ACM Press, 749–758.