

Broadening UbiComp's Vision: An Exploratory Study of Charismatic Pentecostals and Technology Use in Brazil

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ABSTRACT

We present results from a qualitative study examining how Charismatic Pentecostals use Information and Communications Technologies (ICTs) in São Paulo, Brazil. This work contributes to the growing body of research that broadens Weiser's vision by exploring technology use in novel and unfamiliar contexts. Our findings reveal how "extreme" and non-rational beliefs frame users' ICT experiences. We argue that if ubicomp is to be global and ubiquitous, accounting for alternative value systems is necessary. We discuss the implications of our findings and present issues the ubicomp community should consider when imagining a future that includes users from parts of the global south.

AUTHOR KEYWORDS

User experience, religious technology, HCI4D

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

More than 15 years ago Weiser's seminal article captured researchers' collective imaginations and instigated the field of "Ubiquitous Computing" [34]. While the world of computing has certainly changed, some researchers argue that ubicomp's vision has not followed. Increasingly, researchers suggest this vision only accounts for a limited number of users' experiences with technology [5,28].

To broaden this vision, researchers are investigating diverse groups of users and presenting findings that expand, and in some cases, challenge aspects of Weiser's vision. For example, research examining homeless individuals' mobile phone use prompted questions about how context aware

computing reconfigures public spaces [20]; findings from a study of Orthodox Jews' technology use suggested alternative ways to envision the smart home [35]; and researchers investigating ubicomp in Singapore argued that Weiser's vision already exists, instead of being decades away [5]. This research reveals the changing experiences made possible by ICT's ubiquity that did not exist when Weiser imagined the integration of information processing into everyday life. We broaden this original vision by exploring novel technology experiences and alternative value systems.

Specifically, we report on how an increasing number of individuals interact with ICTs in a part of the world that ubicomp researchers are beginning to investigate: the "global south."¹ Like other researchers, we recognize that people in the global south have increased access to ICTs, and understanding the varied, socio-cultural groups in these countries can present alternative visions for ubicomp [5].

To illustrate how these differences manifest, we chose a rapidly growing demographic (in sub-Saharan Africa, parts of Asia, and South America), Charismatic Pentecostals [1,17,23]. Followers of this type of Christianity believe in, affirm, and actively promote the experiential presence of the Holy Spirit as part of normal Christian life and worship [1]. Specifically, we examined how Pentecostals use ICTs in Brazil, home to the largest Charismatic community in the world [7,8].

Charismatic Pentecostalism provides a useful lens for broadening ubicomp's vision of the future for the following reasons. First, by investigating Pentecostalism, we account for one form of projected social change in the global south. Indeed, some researchers argue technology drives how the future is conceived and less attention is given to anticipated social and cultural shifts [5]. Examining social and cultural changes surrounding technology provides insights into how individuals and groups negotiate ICT adoption, use, and rejection [4,6]. Second, Charismatic Pentecostalism's emphasis on the mystical and supernatural make it an ideal entry point for understanding technology experiences that challenge assumptions about ICT use. For example, during our fieldwork, we listened to accounts of how ICTs acted as points of contact between users, the divine, and the demonic, rather than how they were used to solve problems.

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The goal of our research was to understand Charismatic Pentecostals' ICT experiences. We cast ICTs broadly to include personal computers, mobile phones, email, televisions and radios. To do this we undertook a six-week qualitative study in São Paulo, Brazil. Our findings demonstrate how "extreme" and non-rational beliefs frame aspects of users' ICT experiences. We argue if ubicomp is to be global and ubiquitous accounting for alternative value systems is necessary.

We make two contributions for the ubicomp community. First, we provide empirical evidence describing how Brazilian Charismatic Pentecostal adopt, use, and in some cases, reject ICTs in ways tied to their religious faith. We also present participants' enchanting experiences with ICTs, or stories about how technology is a mediator between them, the divine, and demonic forces. Second, we discuss the implications of our findings and present issues the community should consider when imagining a future that includes users from parts of the global south.

This paper continues as follows. We begin by discussing previous and related research, followed by a brief overview of Charismatic Pentecostalism. Next, we describe our study site, methods, and participants. We present our findings organized around three themes: Charismatic Pentecostals: ICT rejection and use; Negotiating Technology Use: Blessings and Prayers; and Experiencing the divine and demonic through ICTs. We then discuss four issues researchers should consider when investigating ICT use in the global south: Design, "Body and Soul," Values, and "Translation and Interpretation." We conclude with future research directions.

RELATED WORK: BROADENING UBICOMP'S VISION

Increasingly ubicomp researchers are challenging Weiser's vision, suggesting that it should account for a more diverse range of users' ICT experiences [4,5,28]. We situate our study within these efforts.

Rogers questions the value of calm and proactive computing as driving forces in the field. She encourages researchers to explore how ICTs are appropriated beyond the desktop, because doing so can reveal how to return the "excitement of interaction" to computing in innovative ways [28].

Accounting for a broader range of users' experiences echoes Bell and Dourish's critique of ubicomp's dominant vision [5]. Specifically, they argue Weiser's vision is a "very American one." Findings from their investigation of ICT use in Singapore and South Korea suggest that rather than being decades away, Weiser's vision already exists, but is different from how the ubicomp community imagined it. Thus, by examining ICT use in a new and unfamiliar context (e.g., outside the U.S. and Europe) they found compelling evidence that challenges assumptions about how ubicomp developers conceive of the future.

Our study also builds on prior real world investigations of ICT use. We distinguish our work from previous research in two ways. First, our investigation takes place in a non-western setting, São Paulo, Brazil. Second, prior research examining secular ways people interact with technology tends to focus on uncovering potential problems ubiquitous computing can solve. Also, implicit in this prior work is an assumption that user groups are willing to adopt and use these proposed ICT interventions. In contrast, we were looking for evidence that could broaden ubicomp's dominant vision to account for an unfamiliar group of users and alternative value systems.

Ubicomp is full of empirical investigations documenting the variety of real world experiences people have with technology. These efforts broadly focus on understanding ICT use in the home [10,11,35] healthcare settings [9,15, 24], and urban environments [3,25]. Yet, these studies take place in the so-called "developed" world with "tech-savvy" and highly educated participants. Further, prior research focused on uncovering problems that ubiquitous systems and devices can fix. Examples include novel capture and access systems [15], applications to help families manage their hectic schedules [11] and devices to monitor older adults [24].

Though this research highlights compelling ways computing can potentially improve our future lives, embedded within it are assumptions that ICTs can resolve problems, and that users want to integrate these systems into their daily lives. Examining how religious groups use technology is one way to explore the complex negotiations embedded in technology adoption and instances where it may be rejected [6]. It is important to understand these issues now as computer scientists begin to investigate computing in the global south.

Other researchers have recognized that religion provides a useful lens for understanding ICTs adoption and for broadening ubicomp's vision. Bell presented examples of the various ways religious groups and individuals use ICTs to support their faith or "techno-spiritual practices." She argued that understanding techno-spiritual practices and designing ICTs to support them was important for ubicomp researchers seeking to understand technology use outside office settings [4]. Motivated by this, Woodruff, Augustin, and Foucault, studied how Orthodox Jews use home automation systems for religious purposes. Their findings suggested alternative ways to envision the smart home, such as the surrendering of control as a design resource [35]. Similarly, we examined how American Protestant Christians' faith affects their domestic life. We used our findings to critically evaluate the "problem solving" approaches dominating the design of future domestic technologies [38].

In this paper, we investigate a religious group whose worldview is shaped by an intense belief in the supernatural (e.g., belief in miracles and the presence of demons), thus

differentiating this study from previous ones in ubicomp and HCI. Findings from our research demonstrate how “extreme” and non-rational beliefs frame aspects of users’ ICT experiences. As ubicomp becomes more global, accounting for these alternative value systems is necessary.

PENTACOSTALISM AS A RELIGIOUS PHENOMENON

Religious scholars find it difficult to define Pentecostalism because it is a new movement with different strains. However, most agree that Pentecostals have a deep personal faith rooted in what is written in the Bible [1,23]. Further, unlike Evangelical Christians, Charismatic Pentecostals routinely receive miracles from the Holy Spirit and have ecstatic experiences such as speaking in tongues, prophesying, and faith healings. This form of Christianity is growing rapidly in the global south. Some scholars attribute this growth to the faith’s ability to bring order, stability, and hope to people who live precarious lives [17,23].

Further, religious scholars argue that understanding Pentecostalism’s rise is necessary for anyone seeking to understand the global south because it influences everything from politics, to women’s rights, to economic growth [17]. Previous research suggests that Pentecostalism’s role in establishing a “Protestant ethic” will spur capitalistic expansion in lower income countries [21]. Other scholars argue that involvement in Pentecostal churches empowers women by improving their community building and negotiating skills [23].

This rapidly growing religious movement has also been a source of controversy because some critics believe it teaches prosperity theology, or a religious idea that God desires material wealth for those he favors [1]. Claiming that religion can solve the spiritual, physical, and financial problems, of vulnerable populations living in the global south is problematic [8,17].

Characteristics of Pentecostalism relevant to our study include, “spiritual warfare,” “faith healings,” and belief that the supernatural shapes everything. Spiritual warfare encourages believers to view daily life as an ongoing struggle between divine and demonic spirits [12]. Pentecostals frequently engage in deliverance rituals (e.g., exorcisms and “strong prayers”) to rid their possessions of evil influences and to cure physical illnesses. The practice of healing is a strong theme unifying Brazilian Pentecostal churches and is one reason this faith is appealing to middle and lower classes who typically lack access to adequate healthcare [8,17,27]. Some of our participants relied on faith healings to cure themselves of physical and mental health problems. They also held an intense belief that “bad accidents” or “good luck” do not exist because an invisible power regulates everything for good or ill.

STUDY: SITE, METHODS, AND PARTICIPANTS

Site: São Paulo, Brazil

Catholicism is Brazil’s dominant faith, however the number of Catholics is declining and the number of people who

identify as Protestant—most commonly Pentecostal—is dramatically increasing. During the last decade Brazilian Protestants and Pentecostals grew from 9 to 15 percent of the country’s population, while Catholics fell from 84 to 74 percent [7,17]. Pentecostalism’s early growth was largely comprised of poor and disenfranchised individuals, but now it includes middle-class converts. Those who convert tend to find the faith’s lively services and their focus on faith healings more appealing than Catholic services [7]. São Paulo is the birthplace of the country’s Pentecostal movement, home to the region’s most vibrant Pentecostal community, and headquarters to some of Brazil’s largest churches [8].

Brazilian Pentecostalism borrows from the *espiritismo* or spiritism (the belief that the dead communicate with the living) movements. These movements include Candomblé (an African-originated religion) that combines West African and Amerindian beliefs (pre-Columbian inhabitants of the Americas) to create something uniquely Brazilian [1,8]. Indeed, those we interviewed exhibited a religious zeal not seen in prior studies investigating religion and ICT use (e.g., [35,36,38]). Manifestations of the divine—typically in the form of miracles—pervaded every aspect of our participants’ lives. To put this in context we present an example from our interviews:

I used to sew clothes and a client needed a special kind of thread that was very difficult to find, this thread is impossible to find and this was a very important job. I only had 300 grams and needed 900 to finish the job. So I prayed and when I finished the project, I had enough thread, and an additional 300 grams left over. This can only be explained as a miracle.

Given that São Paulo is home to the largest Charismatic Pentecostal community in the world and the region’s growing professional and middle class—those more likely to be early ICT adopters—São Paulo was an excellent “edge case” for understanding Pentecostalism and technology use.

Methods and Participants

We used a combination of semi-structured interviews, in-home tours and observations during our fieldwork. Qualitative methods were appropriate because of our study’s exploratory nature and our desire to understand participants’ subjective experiences with technology. Over a period of six-weeks we interviewed 23 churchgoers (6 men and 17 women—we interviewed both husbands and wives in 4 homes, sisters in one home, and a mother and daughter in one home); and 11 leaders of different Pentecostal churches (10 men and 1 woman). To complement our interviews we attended 22 worship services at 10 different Pentecostal churches in São Paulo. Christian church services typically take place on Sunday mornings in the U.S.; however, in Brazil it is common for churches to have 3 or 4 services a day, each lasting 1-2 hours.

We recruited participants by meeting them at church services. Initially, it was difficult to recruit individuals, because many worshippers were wary of interacting with foreign researchers because Pentecostal churches have received negative attention in the press. We gained participants' trust by attending multiple services at selected churches and getting to know their leaders and worshippers. Once we achieved this trust, we used snowball sampling to achieve a larger sample of individuals willing to let us interview them in their homes.

Participants' households were distributed throughout São Paulo, with some living an hour outside the city center. We toured 13 different homes and apartments. Four participants did not want to be interviewed in their homes so we interviewed them in at shopping malls. All interviews with church leaders took place in their churches. Participants were compensated 50 Brazilian real (R\$) (approximately \$26 USD) for their time. Interviewees were working adults holding occupations such as domestic workers, an art collector, cosmetics sales representative, seamstress, nurse, and a college student. We asked all participants about how their faith and religious activities interact with their daily life and technology use. Sessions lasted between 1½ to 2 hours and included a tour of relevant parts of participants' homes or apartments.

As our participant numbers suggest, men continue to monopolize leadership positions in churches, but Pentecostalism is sustained and spread by women. Indeed women account for nearly three quarters of practicing Pentecostals in the global south [17]. All participants identified as Pentecostal and attended Brazil's largest and most prominent Pentecostal churches. These included *Igreja Mundial do Poder de Deus*, *Igreja do Evangelho Quadrangular* and *Igreja Universal do Reino de Deus*.

We attended services at these churches and smaller satellite ones occupying former supermarkets and theaters throughout São Paulo. During our fieldwork, we encountered what others describe as the "spectacle and staging" of power in Brazilian Pentecostal churches [19]. This included exorcisms—the sequence of action that dramatizes the manifestation, interrogation, and expulsion of demons in the possessed. We also witnessed laity claiming to be healed after contacting the minister (e.g., being able to walk after being confined to a wheel chair; blind individuals reporting they could see), speaking in tongues, and partook in the "strong prayer ritual"—a demon removal process—that was part of the services.

Brazil is a Portuguese speaking country. The first author (a native English speaker) collaborated with a Brazilian anthropologist from São Paulo, who also speaks fluent English (the second author). We agreed on an interview protocol prior to meetings with participants. Initial interviews were unstructured, but as we learned more, they became more directed and semi-structured. When possible we took digital photographs to document sites and our

participants. Following each interview and church visit, we collaborated on fieldnotes. These notes were comprised of translated parts of interviews we deemed important and detailed accounts of our interactions with participants. We wrote fieldnotes on a daily basis.

Our findings are based on 140 pages of fieldnotes and over 500 photographs. Standard techniques for extracting analytic points, thematic clustering, and intermediate memo writing were used during our analysis. We analyzed fieldnotes, transcripts and photographs together. This was useful in assessing the mutuality or uniqueness of each researcher's perspective. When we encountered instances of terminological confusion (e.g., there was no direct translation from Portuguese to English) we discussed them until we came to a shared understanding of the term.

One of the challenges throughout our fieldwork was avoiding judgment and maintaining our identity as researchers. Thus, we set aside our metaphysical assumptions so that we could describe what we observed and heard. Admittedly, our worldview was stretched because we had never listened to participants describe demons entering their homes through the television or participated in exorcisms during our prior research experiences.

FINDINGS: BROADENING UBICOMP'S VISION

In this section, we discuss the findings from our data analysis. First, we present accounts demonstrating the complex value interactions underlying our participants' appropriation of ICTs, including instances of individuals and groups rejecting technology because of their religious beliefs. Second, to further illustrate how religious groups negotiate ICT use in Brazil, we describe the blessing and prayer rituals some participants performed prior to interacting with their computers and other technologies. Finally, we focus on how our participants understood ICTs as mediators between themselves, the divine, and the demonic. Collectively, these findings highlight understudied ICT experiences.

Charismatic Pentecostals: ICT rejection and use

The Pentecostal churches we visited, leaders, and laity we interviewed, fell into two categories, those with a more conservative doctrine and those with a less conservative one. Specifically, participants who attended *Deus é Amor Deus*, *Assembléia de Deus* and *Igreja Mundial do Poder de Deus*, observed strict rules that dictated everything from their interactions with technology to how they dressed and interacted with non-believers. In contrast, those who attended "second wave" Pentecostal churches (they were founded after 1970) such as *Igreja do Evangelho Quadrangular* and *Universal do Reino de Deus*, shied away from these "rigid" doctrines. This distinction is in line with Chestnut and Freston's research on Brazilian Pentecostals [8,14]. They argue that Pentecostals' use of television and the Internet represents a significant shift in the followers'

technology attitudes. Classic Pentecostalism is associated with a strong holiness ethic that is suspicious of anything modern or that promotes “worldly” values. This attitude persisted among participants who affiliated with the older Pentecostal churches in São Paulo.

We interviewed five individuals who subscribed to the strict doctrines imposed by *Igreja Evangélica Assembléia de Deus* and *Igreja Pentecostal Deus é Amor Deus*, and engaged in informal conversations with laity during our visits to these churches. All reported not watching television or listening to the radio, unless religious programming was broadcast. None reported using the Internet. When we asked why, participants told us it was because their church leaders instructed them not to, because it could distract them from their faith, and interacting with ICTs could make them susceptible to demonic influences.

Limiting interactions with ICTs because of their religious values affected these participants’ behaviors. One woman, who worked as a domestic servant, told us when her family watched television she avoided the part of her house where secular content was broadcast. Another participant talked at length about how difficult it was to no longer watch her favorite television programs after joining *Igreja Pentecostal Deus é Amor Deus*. All of these participants told us they had no desire to have access to the Internet because of stories they heard about receiving unsolicited email with pornographic content. These were examples of how the devil used ICTs to “gain access to peoples’ homes.” Although individuals who rejected or limited their access to technology were a small part of our sample, they represent a number of people, Pentecostal and otherwise (e.g., Amish and Orthodox Jews) who reject ICTs because they encroach on their traditional religious boundaries [6].

Participants who attended Pentecostal churches founded after 1970 actively used technology in ways connected to their faith. For them, modern technology was compatible with their desire to live in accordance with “God’s plan.” Their adoption and use of ICTs was an important way for them to communicate this. For example:

Many Evangelicals and Catholics think believing in Jesus means being poor, no TV, no music, they think these are the devil’s creations, this is not true, you can’t give the devil credit for creating everything, you have to be your own judge, if it doesn’t feel good when you are watching it don’t watch it.

The phrase “using your own judgment” was one we repeatedly heard during our interviews with these Pentecostals. Rather than having their spiritual leaders make choices about their ICT use, these participants made their own decisions. Although these individuals did not resist using ICTs they articulated complex rules about what media they could and could not access. Many avoided secular content that conflicted with their values such as *telenovelas*—popular Latin American soap operas—known for their dramatic and often sexually charged content. Like

participants from the older churches, these individuals also believed the devil used certain forms of media to infiltrate their lives.

The church leaders we interviewed primarily came from newer Pentecostal churches. Like their laity, they used ICTs for functional purposes, but also viewed them as symbols of being modern. Church leaders also shared with us a desire to use the Internet for evangelizing and growing their church membership in Brazil and abroad.

Others researchers argue that non-functional criteria—like the ones we described here—should be accounted for when developing ICTs [26]. These researchers also ask, “How can designers uncover these non-functional beliefs and associations?” Our findings suggest that investigating how religion shapes ICT use can provide insights into end-users’ non-functional needs, values, and expectations.

Our findings broaden Weiser’s vision in three ways. First, his picture of calm technology seamlessly integrating into our environments overlooks the complex negotiations underlying users’ acceptance of ICTs into their environments. Our participants’ historical and cultural orientation shaped the meaning they gave technology and affected how they used it. Many of our participants did not use ICTs to solve problems, instead they used them to communicate that their charismatic faith was aligned with their desire to be modern. Second, our findings question the universal appropriateness of having access to media anywhere and anytime. We found that this might be problematic for those who believe media promotes unwanted cultural values, like those participants who avoided telenovelas and other secular media. Finally, ubicomp offers few considerations for the inevitable users who will resist computing’s presence into every aspect of their lives.

Negotiating Technology Use: Blessings and Prayers

During our interviews, we asked participants how their faith affected their daily lives. All described their belief in God and everyday activities as inseparable. For example, participants told us about conversing with God and listening to gospel music throughout the day. Others described asking God to “protect” them as they drove in their cars or traveled on a bus, while others related stories about seeking guidance from “above” about daily decisions such as spending money and taking medications.

Another way faith affected our participants’ lives was through a blessing or anointing ritual. More than half of our participants anointed domestic artifacts using blessed olive oil (Figure 1). Church leaders bless the oil, thus distinguishing it from other kinds of olive oil (e.g., oil used for cooking). Participants understood that a few drops of this substance would diffuse Satan’s influence and aid in resolving their problems. For example:

I anoint the entire house once a week with this oil, I also anoint the car. If my daughter is sad or anxious, I will go and



Figure 1. Blessed oil and items placed on radio.

bless her room. . . After I go to the grocery store and put food away I will bless the cabinet, with oil, and pray for God to bless the food. I also bless the fridge, the oven, and the microwave.

We saw glistening surfaces on these appliances indicating the area she repeatedly touched with oil. Participants also placed oil on their televisions, computers, and mobile phones. In the rest of this section, we discuss participants' motivations for blessing ICTs.

One reason was to ensure these objects did not project their designers' religious beliefs. For example, a mother and daughter told us they blessed their computer because they feared those who made it might not be Pentecostal, or have a value system that differed from theirs. This quote was similar to others we heard:

I use oil to bless things after I buy them because the manufacturers might be from another faith so I bless it so it won't bring evil into my life.

This statement highlights the complex value interactions that exist between designers and users. Of course this has always been the case, but we were surprised by participants explicitly acknowledging the differences between their faith and the manufacturer's faith. By blessing objects they were diffusing the manufacturer's influence and making the objects fit into their home's "moral economy" [30]. Like our other examples, this illustrates how religion guided participants' interactions with ICTs and other domestic artifacts. Uncovering these processes provides valuable insights into understanding how religious individuals negotiate ICT use [6].

In addition to blessing ICTs, some participants told us they routinely prayed prior to using the Internet. They did this to avoid encounters with demonic media and as one participant told us to ensure she would only visit websites that "belonged to God," or were affiliated with her church of other trusted religious organizations. Some participants also prayed while using the Internet, for example:

I was searching for a website and every time I searched for it, I ended up on a another website, and I wondered what I was doing wrong, this is not what I want, and I tried several times, then I realized God was there all the time, then I realized God might be trying to speak to me by taking me to this other website.

Bell and Dourish argue that Weiser's vision of the future is here, but it is just not what we expected [5]. Indeed, this participant's Internet experience suggests that an intelligent system, or one that predicts her needs and reacts accordingly, already exists. Rather than being a computational algorithm, it is a divine source. Nguyen, Kobsa, and Hayes similarly found that some users understand intelligence as being connected to a "higher power" in their research investigating users' attitudes towards surveillance cameras [25]. Their findings, like ours, suggest that instead of attributing intelligence to a machine, religious users may believe that a higher power guides their technology use. Understanding the unexpected ways intelligence manifests in individual's lives can promote exciting and enchanting interactions with ICTs [31].

Experiencing the divine and the demonic through ICTs

When we asked participants about their faith and ICT use we heard stories about how technology mediated divine and demonic forces. In this section, we present those instances and describe how they contrast more familiar technology use scenarios. What fascinated us about these findings was how participants' interactions with ICTs had little to do with usability and functionality; instead they centered on wonder, or *enchantment* with technology, an element of users' ICT experiences some researchers argue is lost in ubicomp [22].

ICTs and mediators of good: All of our participants believed God could appropriate anything, including ICTs, to communicate directly to believers. For example:

In the Bible, God used different kinds of things to talk to people, a donkey, a rock, so he can use a mobile phone or a computer.

Those participants who watched television described, and in some cases demonstrated, how God communicated to them through their television. For example, they placed their open palms on their TV screens to fill themselves with the Holy Spirit's blessings. Pentecostal churches dominate televised Christianity in Brazil. Some churches aggressive use of media has contributed to their rapid global growth and increased their visibility and prominence [7,19]. Participants told us that church leaders ask viewers to place their hands onto the television screen so they can receive blessings from the physical services. These individuals believed that by placing their open palms onto the screen, there was a transference of "healing powers" [33].

The practice of healing is one of the strongest themes unifying Charismatic Pentecostal churches [1,8]. Participants seek healings when experiencing envy, worry, hate, and physical health problems. Whether received in a church or via the television these blessings counteract the evil forces causing individuals' problems. These healings "work" because after receiving the blessing our participants told us they felt "better." For example:

I feel my heart beating faster, before the blessing, I feel sad, but afterwards I am flooded with happiness.

Another way participants received healings was by placing a glass of tap water on top of their televisions during religious programming. In addition to transmitting healing powers into one's body—via their hands—this energy can be channeled into water. This 40-year-old seamstress described this, as did others we interviewed:

I put the water on the television because it transforms the water, it blesses the water, it changes the water and makes it sacred water. This can be done through television.

There was a sense that this process physically changed the water and gave it “curative powers.”

After being blessed the water changes its physical constitution, the water molecules are more agitated. It is a scientific fact. I give the water to my family to drink after it has been blessed.

She added that this ritual was important because it protected her and her family from the demonic forces they battle in their daily lives.

Radios had a similar ability to transmit healing powers from physical settings. We observed a participant who placed artifacts on her radio while religious programs were broadcast (Figure 1). She permanently tuned her radio to *Igreja Pentecostal Deus é Amor's* 24 hours, 7 day a week broadcast. We learned that the church continuously broadcasts services from their main sanctuary in São Paulo and this participant found it comforting and useful to know that family photos, unpaid bills, and pieces of paper with names of people in need of prayer were continuously infused with the church leader's message. She kept the volume low when she was not physically in the room where the radio was located, but never turned it off. While all participants were familiar with these practices, only half reported engaging in them.

The idea that healings and miraculous powers are transmitted through the airwaves is an extension of a sacramental perception, that is, the mediation of the invisible through the visible [33]. Our participants viewed radios, televisions, and computers as transmitters of an invisible grace, and these technological artifacts appeared to acquire a talismanic status in their homes.

Finally, many participants' experiences with ICTs prompted self-improvement. Those we interviewed commonly described listening to religious broadcasts or gospel music throughout the day while cleaning the house, working at their paid jobs, or riding the bus from the city's outskirts to its center. We found that listening to religious broadcasts and music provided a link between themselves and the invisible, untouchable, and spiritual realm that forms the center of their religious attention. For example:

I feel blessed and fulfilled by being in touch with God's words. And God can speak to me through the music. I try to be surrounded by God's words as much as I can. It makes me feel blessed, special, and chosen and that God is always with me.

This suggests that the soundscapes created by sacred audio programs paired with the regular practice of listening reminded our participants to monitor their behaviors. This occurs among other groups who regularly listen to religious programming [16]. It also speaks to ICTs' transformational character because listeners reported changes—some in the form of miracles—because of listening to the broadcast message.

ICTs and mediators of evil: Participants described instances of artifacts also transmitting demonic forces. We listened to stories describing how the devil uses televisions, radios, and computers to enter participants' homes. Some described ICTs as “windows” used by the devil. For example:

Television is a window to hell, because everything that is broadcast is bad, soap operas teach you bad values, and news shows you disasters and tragedies, services are made by some ministers with corrupted values.

This was perhaps the most expressive account of how some participants explained how the devil enters their lives. Others focused on the devil's appropriation of media to communicate to them.

Novelas are clever work of the devil, sex, drugs and infidelity . . . people must be able to judge. I worry that Brazilian soap operas are broadcast all over the world . . .

Participants expressed concern about secular media and worked to avoid it. They felt that these programs legitimized activities that conflicted with their religious beliefs and worried about transmitting these ideas to other countries. These ideas included worshipping false idols, engaging in premarital sex, and feeling jealous. The devil manifests in people through these negative behaviors in turn this makes believers possessed. Indeed, this is one reason exorcisms are such common occurrences at Pentecostal worship services.

Religious scholars argue that modernity has rationalized the world and that a “profound loss of awe and reverence pervades contemporary culture” [17,23]. Ubicomp researchers have noted this, arguing that technology developers and the systems they build have lost any sense of wonder, or *enchantment* [22]. McCarthy and Wright describe enchantment as an experience of being caught up, carried away, and disorientated. They lament that these experiences are largely missing from our accounts of how people interact with ICTs and in our visions of future ones. Our findings suggest that joyous ecstasy is compatible with contemporary life, and that technology can support it even in our modern secular world. Indeed, joyous and ecstasy are terms Pentecostals use to describe their encounters with the divine [1,8]. We believe that understanding these interactions can point to design opportunities that support enchantment in western contexts.

DISCUSSION: TAKING UBICOMP BEYOND THE WESTERN WORLD

Our findings contribute to ubicomp by presenting empirical evidence describing technology use in a context that is unfamiliar to most. Thus, our results pose an interesting question, *What might one non-western vision of ubicomp be?* In this section, we discuss the implications of our findings focusing on issues to consider when imagining a future that includes users from parts of the global south. We group our discussion into the following sub-sections: *Design*, *“Body and Soul,” Values*, and *“Translation and Interpretation.”*

Design: Slim, flat-panel screens, and projected displays currently appear in offices, homes, and public spaces. These ultra-thin devices are in line with ubicomp’s vision of making computers “invisible.” Yet, our findings point to instances where invisibility is less central to some users’ experiences with displays.

For example, we interviewed and observed individuals who took advantage of their television’s visibility and dimensionality. They placed glasses of water and paper prayer lists on objects’ surfaces because it infused these artifacts with sacred messages from their churches’ leaders. This suggests that making ICTs unnoticeable may not be desirable in contexts where technology acts as a physical point of contact between believers and the supernatural. It also points to opportunities to incorporate tangible elements into flat panel screens. More broadly, this finding highlights how culturally dependent product design can be and how investigating unfamiliar contexts can point to radically new ways to imagine technology. These may include computational devices and applications that support Pentecostals’ belief in mystical causality.

Body and Soul: Recently ubicomp researchers have developed persuasive technologies to encourage positive physical behaviors, such as exercise (e.g., [9]). We uncovered ways Charismatic Pentecostals are already using ICTs to promote positive behaviors in their lives. These included playing gospel music in their work environments, placing Bible verses on their mobile phone’s wallpaper, and searching for faith related materials online. When we asked individuals why they did these activities many told us that CD players, mobile phones’ screens, and the Internet were useful because they prompted them to stay mindful of their faith, or to live the positive lifestyle prescribed by the Bible (e.g., avoiding drugs, alcohol, and eating well). Indeed, Pentecostalism provided many participants with guidance, comfort, and in some cases a “will to live.”

Ubicomp researchers can apply this finding to their work by accounting for individuals’ physical *and* spiritual needs or—body *and* soul—when developing applications to promote healthy behaviors in western and non-western contexts. Medical researchers and psychologists have long debated religion’s role in promoting healthy behaviors (see [18] for overview). Most agree that strong religious faith contributes to a reduction of stress, depression, and can

encourage individuals to abandon unhealthy behaviors such as smoking [13]. One way HCI researchers have suggested accounting for religion in ubiquitous computing is by incorporating sacred imagery into applications’ interfaces [37]. Beyond design implications, our findings suggest that some ubiquitous systems and devices designed to promote healthy behaviors should acknowledge the spiritual dimension in peoples’ lives.

Values: In our prior work we argued that as ubicomp and related communities develop ICTs for cultures where religion has a central and public role in daily life they will encounter dilemmas regarding the nature of what constitutes appropriate ICT design and research [38]. This dilemma stems from developing ICTs for users, like Charismatic Pentecostals, whose values differ from users in western contexts, where the mystical and supernatural are less common features of everyday life. Our findings highlight a potential design opportunity that may conflict with some developers and designers personal value systems, take ICTs for evangelism.

Creating technologies to extend individuals’ abilities and current practices is a prominent theme in ubicomp research. Specifically researchers have developed applications that help people with loss of vision, older adults, and children with special needs, to navigate a world that was not designed for them. Rogers suggests attention has been given to these groups because their technology needs and ICT’s potential benefits can be readily identified [28]. During our interviews with church leaders, we asked them how they would like to use ICTs in the future. All expressed a desire to use technology to evangelize, or to change nonbelievers into believers. Thus we identified a need among our users—wanting to evangelize. Indeed, some Pentecostal churches aggressive use of television and radio to convert people to their faith has been credited as another reason for the faith’s rapid growth [2]. Using mobile phones and social networking sites for evangelical purposes and to extend churches’ current evangelizing practices, is a logical extension of these prior practices.

Yet, this prompts complicated questions about how ubicomp research agendas are framed, what technological advances are motivated, and which remain unexplored. For example, *What if individuals want to use ICTs to support activities that contradict some technology developer’s personal value systems?* In turn, this poses even more complex questions such as, *Whose user needs are marginalized at the expense of furthering a western normative agenda about appropriate ICT use?* There are no simple answers to these questions, but by introducing them to the community, we want to add values—in addition to privacy and control—to Weiser’s list of social problems surrounding ubicomp’s development.

Translation and Interpretation: English remains the dominant language in ubicomp and related disciplines. The predominance of the English language in user studies and

ICTs may change as individuals in China, India and Brazil, move online and conduct research. Thus, as ubicomp advances researchers must continue to develop ICTs that account for a range of languages.

However, doing this requires researchers to conduct studies that like ours, involve acts of translation between languages (e.g., Portuguese to English). This process has spurred much debate in the fields of anthropology and sociology (see [32] for an overview). Questions concerning the introduction of bias into the research process, the power relationships between researchers and translators, and privileging some languages over others, are just a few of the issues that must be considered when conducting fieldwork that involves translation [32]. One way we addressed these issues was by treating our translator as a co-researcher, rather than someone who interpreted our questions and participants' responses to them.

Given ubicomp and related disciplines desires to give users a "voice" in the design process exploring ways to navigate the complications posed by translation is important for future research. In our prior researcher investigating ICT appropriation in the global south we presented design sketches [36] to our participants to advance our understanding of issues to consider when designing technology for Charismatic Pentecostals. We do not present findings from this phase of our research here, but believe this approach shows potential for overcoming the limitations posed by not speaking the same language as a study's participants.

FUTURE WORK AND CONCLUSIONS

We are continuing to explore religion's role in broadening ubicomp and related research communities' understanding of ICT use. Specifically, we plan to focus our future investigations on answering the following question: *How does the adoption of new ICTs (e.g., smart phones, digital cameras, and ultra mobile personal computers) relate to and possibly transform the relationship between religious practitioners and the divine?* These new ICTs were not readily available to those we interviewed in São Paulo. We hope by exploring communities more likely to have access to them—Charismatic Pentecostals living in the U.S.—we can continue to understand the complex negotiations involved in technology appropriation and uncover enchanting and exciting ICT interactions.

There are differences between the ICT experiences we described and those that typically appear in Ubiquitous Computing research. Our findings reveal how "extreme" and non-rational beliefs frame users' interactions with technology. If ubicomp is to be truly global and ubiquitous, an understanding ICT use in unfamiliar contexts (e.g., Newfoundland fishing villages [29]) is necessary. We hope our research will inspire the community to imagine a richer and arguably more accurate vision of the future. As Bell and Dourish write "the ubicomp community's vision of the future tends to extrapolate familiar conditions from today"

[5]. In other words, the imagined future looks like the present. By examining radically different users and understudied contexts insights into the diversity and difference that shape ICT appropriation can be accounted for and lead to a vision of the future that is more inclusive than the current one.

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