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# Spirituality: There's an App for That! (But Not a Lot of Research)

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**Abstract**

The iTunes App Store contains over six thousand apps related to spirituality and religion. The ACM digital library, however, contains only 98 works that address this topic from an HCI perspective. Despite high-profile calls for research in the area, the HCI community has produced only 19 research papers focused on the topic, almost half of which are the work of one person and her colleagues. In this paper we provide an overview of the relevant HCI research in this area, a partial inventory of spiritually oriented apps in the iTunes US App Store, and a comparison of research and real-world developments. We discuss the gaps in the HCI literature on techno-spiritual practices and speculate about some of the difficulties and challenges that face the HCI community in conducting research in this area.

**Author Keywords**

Spirituality; religion; techno-spirituality

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**Introduction**

For about a decade, Intel anthropologist Genevieve Bell has urged the human-computer interaction (HCI) research community to devote more research to the

use of technology in spirituality and religion (e.g., [2], [3], [4]). In her keynote plenary address at CHI 2010 [4], Bell mentioned spirituality as one of the most important underexplored areas of HCI research, and as long ago as 2003 she reported [2] that approximately as many Americans had searched the Internet for information on religion as had downloaded music.

Recent data give additional weight to Bell's injunctions. Spirituality and religion are a part of life for the vast majority of people: more than 80% of the world's population describe themselves as affiliated with a religious group [21]. The use of technology in religion and spirituality is also high: Thumma [25] reports that in 2010, 69% of American religious congregations had websites and 90% used email; and our own exploration of the iTunes US App Store (described below) leads us to estimate that at least 6,000 iPhone and iPad apps exist to support various aspects of spirituality and religion. Bell uses the phrase "techno-spiritual practices" [3] to characterize the use of information and communications technology (ICT) in religious and spiritual practices and experiences.

Yet techno-spirituality continues to receive short shrift from the HCI community, lagging behind the closely related areas of aesthetics, emotion, affect, and other components of subjective user experience. What is HCI research missing, and why does the community seem reluctant to explore techno-spirituality?

In this paper we study the gaps in HCI research on techno-spirituality and explore some possible reasons why it lags behind related research and existing technologies. We identify three themes of techno-spiritual ICT in HCI research and list several uses for it

among the apps we found in the iTunes US App Store. Our goal is to map directions and challenges for further research in this area.

### ACM Papers

The field of HCI continues to expand its scope beyond work environments and cognitive task orientation to where it increasingly, as Bødker [6] urged several years ago, "embrace[s] people's whole lives" (p. 6) and, as Cockton [8] suggested, focuses on "the worthwhile, that is, things that will be valued" (p. 168). These concerns include emotion and other aspects of subjective experience, as well as contexts such as home, play, and the arts. As Bell [3] explained, they also include spirituality, as evidenced by "techno-spiritual re-purposing" (p. 142) of ICT to support spiritual practices.

### Method

This study began with a full-text search of the ACM Digital Library (ACM-DL) on six keywords: *religion*, *spiritual*, *spirituality*, *faith*, *numinous*, and *transcendent*. We searched on the full text, rather than on author keywords, to ensure that we obtained items that addressed the topic even when it was not a primary focus. We limited our search to publications from ACM and affiliated organizations because we were looking at the work of SIGCHI and sister communities.

For each keyword, we downloaded the papers and articles whose abstracts indicated that they might be relevant (the item appeared to address some aspect of techno-spirituality from an HCI perspective); then we read the items we had downloaded and selected those that were appropriate for use in the analysis. Papers considered not appropriate often used the terms in

Class	Count	Years
Focused	22	1996–2012
Covering	10	2007–2012
Finding	14	2008–2012
Peripheral	33	2002–2012
Design	7	2007–2011
Meta	12	2002–2011
<b>Total</b>	<b>98</b>	<b>1996–2012</b>

**Table 1.** Items from ACM and affiliated societies (as of 20 December 2012) that relate to HCI and techno-spirituality

Date Range	Total Items	Research Items
Pre-1996	0	0
1996–2000	1	0
2001–2004	3	2
2005–2008	8	8
2009–6/2012	10	9
<b>Total</b>	<b>22</b>	<b>19</b>

**Table 2.** HCI papers directly focused on techno-spirituality

ways other than what would indicate religious and spiritual life — e.g., “in good faith” or “the spiritual successor to {X} project” or “the religion of open source”. We also eliminated items that mentioned spirituality or religion in passing but not as an important factor in the work — e.g., several studies looked at many facets of a culture but listed “religion” or “spirituality” only in the list of facets and did not go into further depth.

We categorized the final corpus into six classes (see Table 1):

- *Focused*: Directly and primarily focused on techno-spirituality (“t-s”)
- *Covering*: Addressing t-s as a partial focus (e.g., as one component of several)
- *Finding*: Producing relevant findings although not focused on t-s *per se* (e.g., a finding of spirituality as a concern of elderly people in using technology for physical therapy)
- *Peripheral*: Addressing a different but potentially relevant topic (e.g., papers about HCI and death that do not explicitly mention the spiritual aspect but would be fertile ground for it)
- *Design*: Describing digital/technical designs that foster spiritual or transcendent experiences
- *Meta*: Encouraging the HCI community to address more research to techno-spirituality, or discussing/mentioning the state of such research

#### *Final corpus*

Our selection approach gave us a total of 98 papers, articles, and other contributions. We used two criteria in selecting items: The work had to be published or available in a public resource of ACM or

its affiliated organizations and had to associate itself with HCI or its cognate fields; and it had to deal with spirituality or religion, as we determined it.

We do not limit spirituality to religion or theology, but see it as a sense of deep connection to something larger than oneself, whatever that may be (a deity, nature, a cause, the Universe, an intimate group...). We are interested in all user experiences that can be described as spiritual, religious, transcendent, or numinous. We use “spiritual” to encompass all of these.

#### *Literature review*

Our analysis of the literature in our corpus revealed three main themes of techno-spiritual ICT in HCI research: institutional, practical, and experiential.

- *Institutional*. This line of research focused on the ways in which religious groups adopted and adapted new technologies. Religious groups often use ICT for communicating their messages and fostering their members’ spiritual growth. In a study of Protestant pastors, for example, Wyche, Hayes, Harvel, & Grinter [31] found that the ministers used ICT mainly for three aspects of their religious work: “research and reflection, sermons, and pastoral care” (p. 207). The authors report some observations that the pastors offered about the reactions of their members (e.g., that some preferred electronically mediated means of counseling because they were more comfortable in discussing difficult topics), although this particular study did not interview members about their own spiritual experiences. Similarly, Wyche, Medynskiy, & Grinter [32] studied the use of large displays for Protestant mega-church services in the USA.

- *Practical.* Some ICTs are important in enabling people to carry out their spiritual practices but involve no direct participation in the experiences. Woodruff, Augustin, & Foucault [28], for example, studied Orthodox Jewish families' use of home automation in their Sabbath practices. This technology switches lights and appliances on and off according to a preset schedule, allowing families not only to benefit from electrical devices without controlling them manually but also to practice Sabbath reflection and "submission to external processes and entities" (p 532). The authors found particularly striking "the orientation to external forces... [which] is in stark contrast with traditional visions of the smart home, which focus on control and mastery" (p. 534).
- *Experiential.* Some techno-spiritual works in the HCI research literature describe particular designs that appear to provide some aspect of the immediate spiritual experience. Examples of experiential ICTs include AltarNation [11], an interactive environment that uses telepresence to help physically isolated people meditate with others online, and the *Sonic Cradle* [26], which "foster[s] a meditative experience by facilitating users' sense of immersion while following a specific attentional pattern characteristic of *mindfulness*" (p. 408). The experiential role for techno-spiritual ICT appears rather more sparsely in the literature that we have found than does either the institutional or the practical. In addition, for the most part the research has not analyzed the characteristics of the experiences or of the technologies that facilitate them: we found only one paper ([15]) that addressed the "transcendent" characteristics of different technologies.

The institutional, practical, and experiential roles are not mutually exclusive: some spiritually oriented ICTs exhibit aspects of more than one. For example, the "Sun Dial" [29] appears both practical and somewhat experiential. This smartphone app for Muslims indicates when one of the five daily prayer times is close and then helps locate the direction of Mecca. This aspect is practical, but the app's visual design incorporates Islamic imagery to provide a more spiritual approach to the user experience than do existing systems, which "typically rely on text and numbers to communicate prayer times" (p. 56). Noting that the users responded positively to the sacred imagery, Wyche et al. [29] commented that the imagery "worked in similar ways to the uses of imagery in other artifacts (such as those in prayer rugs) to help connect believers to the experience of their faith" (p. 58).

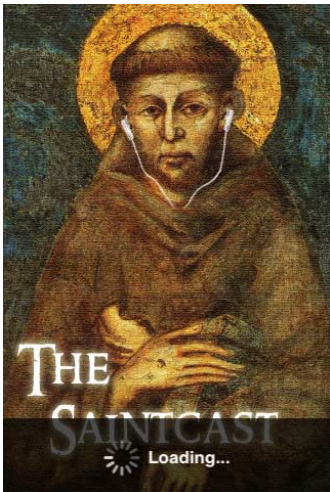
Other examples of ICTs in the HCI literature that may take on multiple roles include the Prayer Companion [9], designed to give a community of cloistered nuns information on outside events about which they might pray (practical and experiential); and Sterling & Zimmerman's [24] mobile applications for a Buddhist community (institutional and experiential).

### In the Wild

Having overviewed the research in the HCI literature, we decided it might be useful to contrast this work with current technological developments. We chose the iTunes App Store as a place to reflect on recent technological developments. The pace and scale of app development and distribution are astonishing and well documented: in 2009 there were approximately 25,000 apps, and in 2012 there were more than 775,000. Apple recently announced it had reached 40 billion



**Figure 1.** Image from “MyPrayer” (Islamic)



**Figure 2.** Image from “The SaintCast” (Christian, Catholic)

unique downloads, with half of these occurring in 2012 alone (Reisinger, 2009). Searching the App Store thus provides some indication of current technological developments “in the wild”.

### iTunes App Store

We conducted a partial inventory of the Apple Inc. iTunes United States App Store, to get an idea of the number and types of mobile applications that are available to support spirituality.

The limitations of the App Store search facility make it impossible to determine how many techno-spiritual apps existed at any specific time in the past. It seems safe to say, however, that given the extraordinary growth in total offerings since the iTunes App Store opened in July of 2008 [1] — an 18-fold increase in 4.3 years, roughly doubling every year — the number of apps related to spirituality is likely to have experienced strong growth as well. Our study analyzed the offerings available in early December of 2012.

### Method

The app analysis began with a search of the US App Store for iPhone® and iPad® apps that met our criteria. (We chose the US App Store because we felt it would give us the broadest picture of the relevant apps available, and in further research we will explore App Stores for other regions of the world.) We began by searching on *spiritual* and *religion* and reviewing the results; then we expanded our search to seek additional apps for generic keywords. In all, we searched on 13 terms: (in alphabetical order) *divine*, *holy*, *inner peace*, *inspiration*, *meditation*, *mindfulness*, *prayer*, *religion*, *sacred*, *spirit*, *spiritual*, *spirituality*, and *uplift*. (We also searched on *numinous*

and *transcendent* but did not find anything relevant, so we do not mention them further in this paper.)

We sorted the search results in descending order of average customer rating and recorded the name and search term of each app that scored 4 or higher (on a 5-point scale). We then went through the list and eliminated duplicates that were due to platform (iPhone and iPad), version (e.g., “lite” vs. regular or “Pro”), and search term (some apps appeared in more than one set of search results). We also removed apps that were not relevant to spirituality — e.g., the search for “spirit” returned several apps on spirit levels (a building construction tool) and several on alcoholic beverages. Table 3 shows the numbers of apps found for each search term<sup>1</sup>. (It does not show the results for apps found via keywords for specific faith traditions, such as *christianity* or *islam*; those will be used in follow-on work.)

### Overview of apps found

The final list contains approximately 1500 unique iOS apps that have a “4” or higher average customer rating. This figure, plus the average proportion of 4+ apps to all apps in our total search results (approximately 1 in 4), leads us to estimate that the total number of unique iOS apps for these keywords is likely to be somewhere around 6,000.

### Preliminary app analysis

In preparing the inventory, we examined the apps’ titles and, in some cases, descriptions, to ensure that we listed only apps related to spirituality. In this process we noticed

<sup>1</sup> Table 3 does not show totals because many apps appeared in the search results for multiple keywords and most are available for both iPhone and iPad.



**Figure 3.** Image from “Shabbat Shalom” (Jewish)



**Figure 4.** Image from “MyAarti” (Hindu)

apps with features and uses that we have found to be largely missing from the current HCI literature:

- education (especially of children)
- prayer exchanges
- trivia quizzes
- stories
- comparisons of different faiths
- guidance for daily living
- teachings and sermons from specific leaders

Although the preliminary state of our app analysis does not allow us to go into further detail about these features and uses, we plan to conduct more in-depth analysis in the very near future and expect to be able to say more about them as soon as we have done that. We anticipate that further analysis will reveal even more uses that the literature has missed, beyond the above list. Further research will also explore apps tagged for specific faith traditions.

## Discussion

### *Gaps in HCI research to date*

To date, HCI research on techno-spirituality misses a considerable amount of what’s out there in the wild. Moreover, very few people are studying this area: almost half of the research papers in our corpus (eight out of 19) are the work of one person and her collaborators, and that person has moved on to other topics (Wyche, personal communication, 2012).

### *Challenges for App Store analysis*

Analyzing the App Store presents many challenges. The contents are volatile, as apps appear and disappear continually, and a search must therefore be conducted within a very short time. Apple has removed from its App Store search facility the capability to sort search

results, and much of the information we sought is not available via current software. (For this paper, we used an older version of iOS to conduct the search.) In addition, recording detailed information about an app requires retrieving its page on [itunes.apple.com](http://itunes.apple.com), as the iOS app screens do not support text selection and copy.

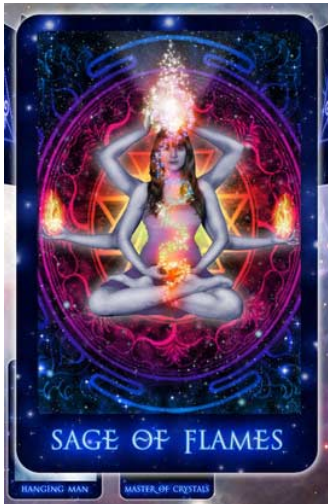
### *Challenges for addressing spirituality*

As we have noted above, ten years or more have passed since the CHI community first received calls to study spirituality and religion. Why, then, does this research continue to be so sparse in the literature? Calls for investigating subjective user experience, aesthetics, emotion, affect, and similar topics — all important components of techno-spiritual experiences — began at about the same time yet those areas are beginning to flourish; they do not languish to the extent that spirituality does. What’s the key?

The following sections are speculative but are based on our own experience and on conversations with other researchers interested in this field.

### BECAUSE IT’S IRRELEVANT TO THE HCI COMMUNITY?

It may be that despite Bell’s fairly high-profile calls, HCI researchers consider spirituality irrelevant to their work. The academic community tends to be less religious than other segments of the population: a recent survey of academics found that 52% reported no religious affiliation, as compared with 14% of the general population [9]. (Similarly, Bell [4] comments that it is likely there is little research on sports in HCI because, as a community, we ourselves are not interested in sports.) It does not follow, however, that because a topic is irrelevant in a researcher’s personal life it is irrelevant to their work. CHI is more interested



**Figure 5.** Image from “Sirian Starseed Tarot” (New Age)

than ever in aesthetics, experience, and affect, each of which is an important part of spirituality. We contend that studying spirituality and religion would broaden and deepen our understanding of these aspects of life.

#### BECAUSE IT’S DIFFICULT?

Methodologically, studying subjective experience *per se* is hard. Although the past few years have seen the development of methodologies for doing that (e.g., [5] [14] [17] [20]), it remains a thorny problem. Part of the difficulty is that an interest in subjective experience entails, to some degree, moving away from purely objective observation. To take someone else’s experience seriously, one must have empathy and a relationship with that person [29], neither of which is a traditional feature of objective scientific investigation. To take one’s own subjective experience seriously, one must turn to reflectivity and introspection [20] — again, techniques not usually associated with scientific inquiry. In addition, spiritual or religious experiences can be deeply personal and difficult for people to articulate, let alone share with a researcher.

#### BECAUSE IT’S SENSITIVE?

A cliché holds that polite company avoids discussing three topics — politics, sex, and religion. Although politics *per se* is rarely found in HCI-related discussions, SIGCHI is very much interested in public policy (see, e.g., [16]), having an International Public Policy Committee. HCI researchers spend a sizeable amount of work on topics such as sustainability, public health, voting systems, and the usability of government systems [7], all of which could carry a political charge if their proponents were not careful. A small but growing body of work has begun to address sexuality in HCI [12], but addressing the topic is not easy: the Bardzells

have, for instance, been asked to refer instead and euphemistically to “intimacy” (*ibid*). The topic of religion is deeply sensitive in many parts of the world, and it can be personally risky to present a religion in ways different from what its leaders would like.

#### BECAUSE IT’S PROFESSIONALLY RISKY?

We suspect that some researchers hesitate to study spirituality for fear of being dismissed as bringing a religious agenda to their work. We confess to having more than a small amount of sympathy with this concern ourselves, although we are confident that the objections can be countered.

#### BECAUSE IT’S NOT SCIENTIFIC?

Although the CHI community is very open to qualitative research in general, some researchers may hold that CHI should not address religion and spirituality, maintaining that the subject itself is not scientific and that scientists would give it undue credence by the very act of studying it. We reject this argument: A subject can be studied scientifically without any position being implied regarding its content, and any area that is a part of so many people’s lives and uses technology is a vital topic for HCI research.

#### BECAUSE IT’S NOT FUNDED?

Finally, it is perhaps an obvious point, but one worth making, that what gets studied in research depends in large part on what gets funded, and by whom. In the UK the research agenda is set by government research councils; and despite academic protest, calls for research are increasingly shaped by the political agenda of the party currently in power [12]. It is possible, however, to address issues of spirituality within topics that are currently funded, such as aging



(e.g. [10]). There are also other sources of funding (businesses, charities, individuals), so funding alone does not account for the gap.

#### *Addressing the concerns*

In these concerns we detect echoes of a controversy that occurred some 30 years ago regarding research into near-death experiences (NDEs). We draw inspiration from five points that Widdison [27] offered at that time (and we quote):

- Scientists are not immune to the influence of their culture.
- Personal values affect what scientists define as appropriate fields of research.
- Scientists tend to condemn research that does not fit their concept of what is "scientific."
- If technology hasn't progressed far enough scientific research may be inhibited.
- The postulates of science are applied differentially depending upon the acceptability of the research area. (p. 9)

Widdison illustrated his points by describing several NDE research projects that he considered scientific.

#### **Conclusions**

This paper has described a review of the relevant literature and of well-regarded apps for techno-spirituality. We have demonstrated that the rate of growth in the HCI literature pales in comparison to the growth in relevant technologies. We have identified scores of spiritually oriented apps that provide features and uses that we have not found to be covered by the current HCI literature, including education (especially of

children), prayer exchanges, trivia quizzes, stories, comparisons of faiths, and guidance for daily living.

Despite a decade of urging, the CHI community, with a few outstanding exceptions, has not taken up the challenge of studying techno-spirituality.

Any aspect of life that uses technology is fair game for HCI research and can be approached scientifically. Any area of life that touches so very many of the world's people and uses technology so heavily can — indeed, *must* — be a subject for HCI research.

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#### **References**

- [1] App Store Metrics: Count of Active Applications in the App Store. <http://148apps.biz/app-store-metrics/?mpage=appcount>
- [2] Bell, G. The age of auspicious computing?. *interactions* 11, 5 (2004), 76-77.
- [3] Bell, G. No more SMS from Jesus: Ubicomp, religion and techno-spiritual practices. In *Proc UbiComp 2006*. Springer (2006), 141-158.
- [4] Bell, G. Messy Futures: culture, technology and research. Keynote address, CHI 2010 (Atlanta, GA, 2010).
- [5] Blythe M & Wright P. Technology scruples: Why intimidation will not save the recording industry and how enchantment might. *Personal and Ubiquitous Comput.* 12, 5 (2008), 411-420
- [6] Bødker, S. When second wave HCI meets third wave challenges. In *Proc. NordiCHI '06*, ACM Press (2006), 1-8.



- [7] Buie, E.A. and Murray, D.M. (eds.) *Usability in government systems: User experience design for citizens and public servants*. Morgan Kaufmann Press, Boston, MA, USA, 2012.
- [8] Cockton, G. Designing worth is worth designing. In *Proc. NordiCHI 2006*. ACM Press (2006), 165–174.
- [9] Donovan, P. (2007, June 29). Scientists may not be very religious, but science may not be to blame. University of Buffalo. Retrieved from: <http://www.buffalo.edu/news/releases/2007/06/8732.html>
- [10] Gaver, W., Blythe, M., Boucher, A., Jarvis, N., Bowers, J., & Wright, P. The prayer companion: openness and specificity, materiality and spirituality. In *Proc. CHI 2010*, ACM Press (2010), 2055–2064.
- [11] Hlubinka, M., Beaudin, J., Tapia, E.M., and An, J.S. AltarNation: interface design for meditative communities. *Ext. Abstracts CHI 2002*. ACM Press (2002), 612–613.
- [12] Jump P. (2007, April 7). Delete “Big Society”: email protest presses AHRC to drop Tory mantra. The Times Higher Education Supplement. Retrieved from <http://www.timeshighereducation.co.uk/story.asp?storycode=415741>
- [13] Kannabiran, G., Bardzell, J., and Bardzell, S. How HCI talks about sexuality: Discursive strategies, blind spots, and opportunities for future research. In *Proc. CHI 2011*. ACM Press (2011), 695–704.
- [14] Kaye, J. I Just clicked to say I love you: Rich evaluations of minimal communication. *Ext. Abstracts CHI 2006*, ACM Press (2006), 363–368.
- [15] Laarni, J., Ravaja, N., and Kallinen, K. Transcendent experience in the use of computer-based media. In *Proc. NordiCHI 2004*. ACM Press (2004), 409–412.
- [16] Lazar, J., Abascal, J., Davis, J., Evers, V., Gulliksen, J., Jorge, J., McEwan, T., Paternò, F., Persson, H., Prates, R., von Axelson, H., Winckler, M., and Wulf, V. 2012. HCI public policy activities in 2012: a 10-country discussion. *interactions* 19, 3 (May 2012), 78–81.
- [17] Light, A. Adding Method to Meaning: a technique for exploring peoples' experience with digital products. In special issue on 'User Experience' in *Behaviour & Information Technology* 25, 2, 2006
- [18] McCarthy, J., & Wright, P. (2004). Technology as Experience. Cambridge, MA: MIT Press. Retrieved from [http://bookshelf.theopensourcelibrary.org/MIT/2004\\_MIT\\_TechnologyAsExperience.pdf](http://bookshelf.theopensourcelibrary.org/MIT/2004_MIT_TechnologyAsExperience.pdf)
- [19] McGandy, M.J., & Seligmann, D.D. (2006). Multimedia enlightenment: Transcendent experiences with the help of technology. *IEEE Multimedia* 13, 1, 4–8.
- [20] Neustaedter C., Sengers P.: Autobiographical design in HCI research: designing and learning through use-it-yourself. In *Proc. DIS 2012*: ACM Press (2012), 514–523.
- [21] Pew Research Center's Forum on Religion and Public Life (2012, December 18). The global religious landscape: A report on the size and distribution of the world's major religious groups as of 2010. Retrieved from <http://www.pewforum.org/global-religious-landscape-exec.aspx>
- [22] Reisinger D (2012) Apple Store Hits 40 billion downloads, 20 billion in 2012 alone. CNET. Retrieved from: [http://news.cnet.com/8301-13579\\_3-57562400-37/apple-app-store-hits-40-billion-downloads-20-billion-in-2012-alone/](http://news.cnet.com/8301-13579_3-57562400-37/apple-app-store-hits-40-billion-downloads-20-billion-in-2012-alone/)
- [23] Sengers, P., Liesendahi, R., Magar, W., Seibert, C., Müller, B., Joachims, T., Geng, W. Mårtensson, P., and Höök, K. (2002). The enigmatics of affect. In *Proc. DIS 2002*. ACM Press (2002), 87–98
- [24] Sterling, R., and Zimmerman, J. Shared moments: opportunities for mobile phones in religious participation. In *Proc. DUX 2007*. ACM Press (2007), 15.
- [25] Thumma, S. (2011, March). Virtually religious: Technology and internet use in American congregations. Retrieved from <http://www.hartfordinstitute.org/research/technology-Internet-use.html>

- [26] Vidyarthi, J., Riecke, B.E., and Gromala, D. *Sonic Cradle*: designing for an immersive experience of meditation by connecting respiration to music. In *Proc. DIS 2012*. ACM Press (2012), 408-417.
- [27] Widdison, H.A. Near-death experiences and the unscientific scientist. In C. R. Lundahl (Ed.), *A collection of near-death research readings*. Nelson-Hall (1982), 3-17.
- [28] Woodruff, A., Augustin, S., and Foucault, B. Sabbath day home automation: it's like mixing technology and religion. In *Proc. CHI 2007*. ACM Press (2007), 527-536.
- [29] Wright P & McCarthy M. Empathy and experience in HCI. In *Proc. CHI 2008*. ACM Press (2008), 637-646
- [30] Wyche, S., Caine, K., Davison, B., Patel, S.N., Arteaga, M., and Grinter, R.E. Sacred imagery in techno-spiritual design. In *Proc. CHI 2009*. ACM Press (2009), 55-58
- [31] Wyche, S., Hayes, G., Harvel, L., and Grinter, R. Technology in spiritual formation: An exploratory study of computer mediated religious communications. In *Proc. CSCW 2006*. ACM Press (2006), 199-208.
- [32] Wyche, S.P., Medynskiy, Y., and Grinter, R.E. Exploring the use of large displays in American megachurches. *Ext. Abstracts CHI 2007*. ACM Press (2007), 2771-2776.