Toggling from the local to the virtual: the digital bulletin board as a locative and global platform

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Abstract

Our paper is an empirical study that investigates the use of non-digital community bulletin boards in order to identify some of the foundational principles that could inform the design and development of digital community bulletin boards as hybrid sociotechnical systems. Using design ethnography and constant comparative analysis, this research contributes to the extant literature by adopting an approach that studies traditional community bulletin boards and their content in relation to architectural and physical space. Our study revealed four key social and spatial principles, each intrinsically linked to the users' sense of agency within a delineated physical space. Our results highlight the ways in which bulletin boards tend to be used to exchange content of local relevance, as well as how location, setting, community, culture, identity and personalization can affect how *cultures of participation* engage with non-digital and digital bulletin boards.

Keywords

Cultures of participation; community bulletin boards; technology-mediated social participation (TMSP).

Introduction

We are seeing more and more large digital displays embedded in the urban landscape. Recent advances in hardware and the increasing affordability of display technology has led to the augmentation of public space in an effort to ubiquitously connect the virtual to the physical and the social, creating new hybrid shared spaces for communities (O'Hara et al., 2003).

Although digital public displays were originally non-interactive and mainly used as advertising billboards, the past decade has seen them be increasingly adopted in semi-public settings such as retail stores and buildings that offer public access (Manovich, 2005). While such displays are being networked together in urban settings, engineers have been developing a wide range of systems to make them interactive (Brignull et al., 2004; Greenberg et al, 2011; McCarthy et al., 2009; Schroeter, 2012). Not only can people now use digital public displays to search for information, they can also post content and communicate with other members of a digital public display system's user community (Churchill et al., 2006).

Consequently, we are seeing this locative digital media technology follow a similar evolution as the Internet did when it shifted from Web 1.0 to Web 2.0 (O'Reilly, 2007), that is, from an architecture of *publication* to one of *participation* focused on helping community members share content (Warschauer & Grimes, 2007).

Based on the assumption that the media and tools a society uses can either encourage a passive attitude or proactive behavior to the ownership of problems within a community, Fischer (2011: 42) has argued that "the rise in social computing (based on social production and mass collaboration) has facilitated a shift from *consumer cultures* (specialized in producing finished artifacts to be consumed passively) to *cultures of participation* (in which all people are provided with the means to participate and to contribute actively in personally meaningful problems)". He further remarks that sociotechnical environments are needed in understanding, fostering and supporting such cultures of participation because they allow users to become active contributors that shape their technological systems through real-time use.

If online social computing has helped turn consumers into participants, could new urban computing platforms be designed to help them participate more actively in their local culture and possibly develop a stronger sense of belonging in their community? Like online applications, these digital public platforms would enable asynchronous sharing of content through media that allows the storage and retrieval of information.

However, they also have a tangible presence in real physical space and thus enable *embodied interaction* (Dourish, 2001). What would users gain with such hybrid sociotechnical environments? Could they facilitate new forms of technology-mediated social participation (TMSP) that bring value to local communities (Peltonen et al., 2008)? Would they provide a flexible tool for communities to develop their own local information kiosks? Would such kiosks be useful in urban settings? If so, under what conditions?

This paper is an empirical study that investigates the use of non-digital traditional community bulletin boards in order to identify some of the foundational principles that could inform the design and development of digital

community bulletin boards as hybrid sociotechnical systems. Using design ethnography and constant comparative analysis, this study seeks to understand how digital bulletin boards might foster and support cultures of participation. This research contributes to the extant literature (Alt et al. 2011b; Churchill et al., 2003; Taylor and Cheverst, 2010) by adopting an interdisciplinary approach that studies traditional community bulletin boards and their content in relation to communities and to architectural and physical space.

Our study revealed four key social and spatial principles, each intrinsically linked to the users' sense of agency within a delineated physical space. Our results highlight the ways in which bulletin boards tend to be used to exchange content of local relevance, as well as how location, setting, community, culture, identity and personalization can affect how cultures of participation engage with non-digital and digital bulletin boards.

Methodology

All the empirical data analyzed in this study was collected over a period of eight weeks in early 2012. Fifty-nine bulletin boards containing a total of 1297 postings were surveyed in the Greater Vancouver area. Because Vancouver contains significant suburban sprawl, we were able to test whether people were posting content of urban relevance in adjacent suburbs. Locations were chosen to offer a cross-section of a broad diversity of communities.

Our goal was to focus our observations on traditional community bulletin boards located in public spaces to learn more about how people socially interact through this cultural artifact (Spradley, 1980). Accordingly, design ethnography was the methodology that

informed this empirical study (Dourish, 2001). We inductively gathered qualitative and quantitative data in non-controlled environments and used constant comparative analysis to analyze this data.

From a scientific perspective, the constant comparative method can help ground the analysis and validate the findings (Van Niekerk & Roode, 2009). In our study, this method was also useful in collecting and analyzing data about locations where we expected to find bulletin boards, but found none. This is consistent with the Glaserian approach wherein "negative findings would provide a basis for refining theory" (Glaser & Strauss, 1967: 11). Field notes and photographs were also taken of these locations as a basis for comparison.

The coding techniques used were respectively open coding, core coding and selective coding. All coding was performed by hand on paper, mostly in the field, by the first author. In keeping with Glaserian Grounded Theory's creative conceptualization principle, a single person conducted the data collection, coding and content analysis to provide an acceptable level of reliability in determining general patterns, and to increase the levels of integrity and consistency (Van Niekerk and Roode, 2009).

Bulletin boards for cultures of participation

There is already a large body of research concerned with how the affordances of social media can increase technology-mediated social participation (Moore & Serva, 2007; Preece & Shneiderman, 2009). However, with the exception of one study that takes an engineering perspective to building and studying a prototype (Alt et al. 2011a), there is still little data on

GEOGRAPHIC RANGE	DISTRIBUTION
immediate local	69%
municipal	18%
regional	6%
national	5%
international	1.5%
non-localized	0.5%

Table 1. Breakdown of the geographic relevance of content. Proportions indicate how far an audience postings were intended to reach.

how locative media such as digital bulletin boards could foster and support cultures of participation.

In our empirical study of traditional bulletin boards, we made four salient observations that could provide some insights on this question. The first is that people mostly use bulletin boards to post content that is geographically relevant. The second is that content tends to be contextually relevant. The third is that cultures of participation are tied to a sense of place. And the fourth is that the affordances of postings, bulletin boards or architectural settings can invite different degrees of participation and a wide range of actions that are found from within the reader-to-leader framework spectrum (Preece & Shneiderman, 2009).

1. Think Locally, Connect Globally

Before the recent introduction of geolocation features in mobile devices, location was a factor of minor importance in the development of networked technology. McLuhan's rhetoric of the global village writ large paved the way to reinforcing the idea of the Internet's cyberspaces as geographically unbounded habitats for the netizens of the world. Indeed, one of the main affordances of social media applications has always been that one can exchange with people regardless of where they are located in the world. In this sense, social media tends to operate as what Augé (1995) called a "non-place", a space through which people and communities move quickly.

In online interaction, virtual presence typically dominates while physical presence and embodied interaction are downplayed. New human-computer interaction (HCI) paradigms such as pervasive

computing and mobile HCI, however, are reversing this relationship (Wiberg, 2012). All computational media connects the physical with the virtual but the emphasis can be placed on one more than the other. The user's situated presence is increasingly becoming the primary reference point for designing new forms of interaction, even when data exchanges are circulating through networks around the world. Until recently, digital bulletin boards existed only online. If they were designed as locative media bound to a specific place, would they be used to access global or local content?

The results of our empirical study showed that content of local relevance strongly dominated and that the number of postings in each category was directly pro-portional to geopolitical proximity. According to our study, traditional community bulletin boards are pri-marily used to communicate information that is either local (69%) or municipal (18%) as shown in Table 1.

This allows us to identify *geographic relevance* as an important factor in the use of bulletin boards. We define geographic relevance as the topographical range within which content is pertinent. For instance, a personal ad offering babysitting services is generally geographically relevant to a neighborhood or city, but not to a whole province or country. Its scope is limited to a more or less well-delineated zone, which can loosely be described in terms of geophysical distance (i.e. a neighborhood vs. a country).

The fact that traditional bulletin boards are mostly used by members of place-based communities to exchange on issues and events within local range has two important implications. The first is that geolocation technology could prove useful in connecting people with

RESIDENTIAL		EDUCATIONAL		INDOOR PUBLIC		OUTDOOR PUBLIC		COMMERCIAL		TOTAL	
# of bulletin boards	7	# of bulletin boards	9	# of bulletin boards	29	# of bulletin boards	8	# of bulletin boards	6	# of bulletin boards	59
# of postings	34	# of postings	183	# of postings	656	# of postings	272	# of postings	152	# of postings	1297
CATEGORIES	%	CATEGORIES	%	CATEGORIES	%	CATEGORIES	%	CATEGORIES	%	CATEGORIES	%
administrative	47.0	cultural	29.0	cultural	30.2	personal ads	30.0	cultural	22.4	cultural	25.4
maintenance	14.7	educational	25.7	recreational	18.3	recreational	23.1	health/well-being	15.1	recreational	16.0
personal ads	11.8	social/political/env.	16.9	educational	12.0	cultural	15.8	personal ads	15.1	personal ads	13.5
social/political/env.	11.8	personal ads	10.4	social/political/env.	11.7	social/political/env.	11.0	social/political/env.	12.5	social/political/env.	12.4
recreational	5.9	administrative	6.5	personal ads	7.2	business	8.0	recreational	10.5	educational	11.2
educational	5.9	recreational	3.3	government-related	5.9	educational	4.4	fundraiser drive	9.2	health/well-being	5.5
cultural	2.9	business	2.7	health/well-being	5.5	health/well-being	3.3	business	8.6	administrative	4.4
business	0.0	health/well-being	2.2	administrative	3.8	fundraiser drive	1.5	educational	3.9	business	3.6
fundraiser drive	0.0	work/employment	2.2	work/employment	2.3	government-related	1.1	administrative	2.0	government-related	3.2
government-related	0.0	fundraiser drive	1.1	fundraiser drive	2.0	maintenance	0.7	maintenance	0.7	fundraiser drive	2.6
health/well-being	0.0	government-related	0.0	business	1.1	work/employment	0.7	government-related	0.0	work/employment	1.6
work/employment	0.0	maintenance	0.0	maintenance	0.0	administrative	0.4	work/employment	0.0	maintenance	0.6

Table 2. Distribution of the proportion of postings in each category by type of environment

relevant postings from their local bulletin board. The second is that digital bulletin boards should be designed to prioritize content of local relevance, while offering the option to browse online for global content when, for instance, people wish to look for remote housing or engage in glocal community building or activism.

Of course, one possible caveat of our study is that people simply may not currently be able to easily place content on non-digital bulletin boards that are geographically distant. Thus, the nature of a paper-based bulletin board may have been forcing content to be local. As bulletin boards become digital, placing content on distant bulletin boards could turn out to be an added value for communities. This question remains open to further investigation.

2. Design for Community and Culture

In addition to being geographically relevant, we also found that the content of postings were manifestly *contextually relevant* to the type of environment in which the bulletin boards were situated. We define contextual relevance as the level of affinity between the type of content in a posting and the type of environment it is posted in. Describing this relationship can help researchers better understand what such community platforms tend to be used for in practice.

With regards to contextual relevance, we made two major observations about posting patterns. First, at a granular level, posting trends suggested a correlation between categories of postings and types of environment. For instance, as can be seen in Table 2,

postings related to culture and recreation comprised a total of 48.5% of postings on "indoor public" bulletin boards located in cultural and recreational institutions such as libraries, community centers, skating rinks, public pools, and recreational centers, while postings related to culture and learning constituted 54.7% of postings on bulletin boards in "educational" settings.

Because this pattern recurred across all types of environment, it suggests that bulletin boards tend to attract contextually relevant content. Moreover, our observations showed that similar categories of content tended to be clustered together on bulletin boards. This phenomenon further suggests that people tend to want to post on certain subjects where others have posted similar content. This was particularly obvious, for instance, with cultural or community events, family activities, protest marches, courses and personal ads.

Second, and in our view, more importantly, certain trends tended to be manifest across all types of environment. In general, we found that people posted content that contributed to increasing the human, cultural or social capital of a community, rather than content providing opportunities for business, profit, employment, or government services.

As the last two columns in Table 2 show, although people posted content about a large number of things, 25.4% of content on all the community bulletin boards was "cultural" content which means that it advertised plays, concerts, music jams, lectures, poetry readings or cultural events such as dance or music festivals. "Recreational" content publicizing sports and family activities, book clubs and community events of a recreational nature comprised 16.0% of overall

content. "Personal ads" steadily held a high count across all types of environment with an average of 13.5%. "Social, political and environmental" issues also constituted a large proportion of the overall content, namely 12.4%. At last, "educational content" related to courses, professional training and educational workshops made up 11.2% of the overall content.

These results support the idea that community bulletin boards are mainly used by people to communicate with members of their local community about issues that have cultural, social, political, recreational, educational, environmental and personal value. To put it otherwise, our results show that paper-based community bulletin boards do not tend to be used to publicize or exchange information related to work, business or government, which altogether comprised only 8.4% of all content.

This in turn suggests that community bulletin boards are grassroots platforms that enable people to find ways of acquiring knowledge about the community they belong to; in this sense, identity-building may be one of the drivers of paper-based bulletin boards. People tend to want to use them to share their culture, their hobbies, their knowledge, their values and their political activities. To a certain extent, they are also used by members of the community to advertise a service or good they wish to make available to other members.

Finally, our results showed that people tended to post personal ads more frequently in "commercial" and "outdoor public" environments than in "residential", "educational" and "indoor public" environments. This seemed to be counter-intuitive; For instance, one would think that the smaller, more tightly-knit community of a "residential" environment would foster more person-to-

person exchanges. In fact, people posted more personal ads in environments that were more impersonal and more likely to be seen by strangers.

This result corroborates what Churchill et al. (2003) had found when comparing bulletin boards in smaller organizations with those in larger organizations. According to their study, in smaller groups where everyone knows one another, people are more likely to send emails or exchange information face-to-face. By contrast, in larger organizations, they found that "people felt that posting content to poster boards was more socially appropriate and did not risk being an unwanted intrusion" (101). Thus, we speculate that people tend to post personal ads on bulletin boards that serve large communities rather than intimate ones because this allows them to reach a wider audience. This in turn suggests that digital bulletin boards may be more useful when a community reaches a critical mass.

3. Tap Into Existing Cultures of Participation

Paper-based bulletin boards may offer an efficient means to locally broadcast a message to a large number of people, but they can also provide a community with a free and accessible forum in which members can engage in what Goffman (1963: 14) called *disembodied forms of social interaction* most useful within publicly accessible settings. Despite the fact that this type of platform mostly facilitates *disembodied messaging*[1], we found that *where* bulletin boards were located had a very big impact on how they were used. Public, semi-public or commercial sites

which were regularly visited by members of the communities seemed to be the best locations.

The data we collected in the "commercial" environment category suggested that small, local businesses provided some of the most dynamic environments for bulletin boards. For instance, the Commercial Drive area, a vibrant and politically-active Vancouver neighborhood, contained the highest concentration of community bulletin boards inside retail stores such as bookstores, health food stores, food co-ops, cafés and restaurants. These formed a large proportion of the bulletin boards included in our "commercial" environment category. In this area, every retail store had its own identity shaped by the specific needs and lifestyle of the community it serves. This strongly suggests that digital bulletin boards should first be placed in locations in which communities already have an existing culture of participation, ethic of cooperation, political identity and sense of community.

Of particular interest was how the boundary between bulletin boards and architectural setting became blurred when members of a community appropriated public or semi-public space for posting. For instance, we found several makeshift posting boards placed on the exterior walls on, or adjacent to, storefront windows (see Figure 1) or on the clear plexiglass panels of university campus bus shelters (see Figure 2). These were always very dense with postings. We noticed that when the university maintenance staff would clear all the postings, many new ones would appear the next day. From our observations, these improvised outdoor bulletin boards provided some of the richest and most diverse source of postings.

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[1] Goffman (1963: 14) defines *disembodied messages* as "the ones we receive from letters and mailed gifts" or when information can be trapped and held until it is later received.

Figure 1. Makeshift bulletin boards facing each other outside retail store.

Figure 2. Bus shelter plexiglass on university campus used to put postings up randomly.

While deploying their prototype of a large multi-user interactive board designed to enable the sharing and exchange of a wide variety of digital media in a high school, Brignull et al. (2004) had remarked that "a clear sense of collective ownership of, and responsibility for, the common room" set the conditions for "the appropriation and consequent personal or shared use of resources in a very lightweight way" (52).

Our findings corroborated this; the degree to which bulletin boards and content were used, adapted and personalized by the public at large seemed closely related to signs of implicit or explicit ownership.

Figure 3. Board with glass casing preventing easy access in shopping mall grocery store.

Figure 4. Board with banner headline in university gallery warning people not to post.

Bulletin boards with glass casings protected by gate-keepers were implicitly understood as private property (see Figure 3), while those with a banner headline were explicitly branded with seals of proprietorship that forbade posting (see Figure 4). As we have seen, community bulletin boards are grassroots communication tools that enable people to find ways of acquiring knowledge about the community they belong to by exchanging human, cultural and social capital. The way they are visually branded is therefore important in signifying whether they belong or not to a community.

For instance, we did not find a single bulletin board or posting in areas containing mass transportation terminals, e.g. the Vancouver airport, bus terminal or train station. We attribute this to the transient nature of these spaces through which people come and go anonymously. We believe that the university campus bus shelters (see Figure 2) did not fall into this category because it constitutes a space in which *regular commuters come to form and identify as a community*.

Similarly, most museums we visited did not have community bulletin boards, except for the Museum of Vancouver (MOV), which had a large chalkboard visitors could write on (see Figure 5). Again, this was an interesting observation. Most museums do not serve a specific local community (Mathur, 2005). Embedded in the trendy residential neighborhood of Kitsilano however, the MOV has a more local clientele. Did the fact that the MOV serve a local community motivate the administration in putting up a large chalkboard?

We also found that only one of the shopping malls and box stores we observed contained a bulletin board (see Figure 3). If we consider that shopping malls are the

Figure 5. Large chalkboard in the main hall of the MOV.

Figure 6. The "Center for Reflection" in downtown YMCA.

cultural hubs of certain communities of suburban dwellers (i.e. teens and the elderly), this seems peculiar. Yet it speaks to the existing literature which describes shopping malls as "phantasmagoric" and "impersonalized" because they have been branded by globalization and lack a sense of local identity (Giddens, 1990, 140-141).

Along this line of thinking, perhaps, one of the most illuminating observations we made was during our visit to a downtown YMCA located at the outskirts of the West End, a vibrant and politically active neighborhood. YMCAs are generally regarded as the flagships of community centers in North America yet we did not find a single community bulletin board in that YMCA. Instead, the space was pristine, clean and branded with signs of corporate culture such as its "Center for Reflection" boardroom sponsored by one of the big banks (see Figure 6). The messiness of community bulletin boards would have clashed in this setting.

What all this tells us is that a culture of participation emerges from a setting in which a sense of community and of identity as a community already exist because they facilitate individual agency within this setting.

Media technology can either foster this or inhibit it, but our study strongly suggests that where there is no sense of community, it is unlikely that non-digital or digital bulletin boards could create it. The effervescence of a culture of participation seems to be rooted in a sense of place and identity.

4. Create Entry Points for Action and Participation

Another key observation we made in the field was that certain postings or bulletin boards had features which incited people to put up postings. By this, we mean that they invited action or participation. This speaks to Kirsh's (2001) notion of an affordance as an entry point that can provide a structure to stimulate action.

For instance, some postings attracted more attention by virtue of their diversity of colors, sizes, and visual patterns repeated across one or more bulletin boards (i.e. tiling, fanning or spreading). Similarly, postings that were designed with tear-off strips to be ripped off; multiple business-card-sized postings (see Figure 7); or postings that were also offered as flyers (see Figure 8), suggested that there are strategies to draw readers in and facilitate the taking away of content.

Figure 7. Some postings had tear-off strips or business cards that people could take.

Figure 8. Some people posted on boards placed near stacks of flyers related to content.

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Figure 9. Color paper strips to write comments & suggestions.

Figure 10. Bulletin board in university graduate residence.

Figure 13. Storefront of art gallery at Seymour & Dunsmuir
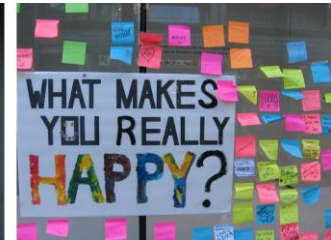
Figure 14. Close-up of colorful post-it notes inviting comments.

But some community bulletin boards actually had "empty postings" in the form of materials and spaces that were specifically reserved for user contributions. One bulletin board in the lobby of a grad residence had a clear plastic pouch with color paper on which residents could write their "comments & suggestions" which they then post (see Figure 9 and 10).

We also saw a board divided into two sections on the back wall of a luncheonette: on its left side, people could post content on a corkboard, while on its right side, was a blackboard inviting patrons to answer the question, "What's your favorite food?".

Finally, there was the large storefront window of a downtown alternative art gallery outside of which the curators had posted the very big sign "WHAT MAKES YOU REALLY HAPPY? [*sic*]" (see Figures 13 and 14). All around this sign, scores of brightly colored sticky note papers were laid out to encourage people to contribute a response.

These three examples illustrate how a platform can be set up to support the taking of content in order to foster a culture of participation. This leads us to remark that an empty slot and a tool to fill it out can make a posting or bulletin board more inviting.

Conversely, some of the bulletin boards we observed had distinct properties that made them inherently uninviting. An example of this is how some bulletin boards were protected by glass casings which could not be removed without permission and access granted by gate-keepers. We were most surprised to find that this was the case with certain bulletin boards near community centers as well as with the only bulletin board of our sample located in a large indoor shopping mall (see Figure 3).

Figure 11. Double board in small luncheonette.

Figure 12. Close-up of chalk Board on right side of board.

This bulletin board was located inside the entranceway of an outlet of a supermarket chain. The heading of this bulletin board read, "Community Information Centre". The word "community" seemed a bit of a misnomer since the glass prevents people from posting, but the board was indeed an "information center" rather than a bulletin board. Our analysis revealed that there were no personal ads posted on this board. Although more than half of these postings had local geographic relevance, all used the design codes of advertising and were not personalized; All the postings had been professionally designed and printed by businesses or associations. For instance, many postings had been prepared by the local senior community center; a few originated from philanthropic associations or a regional fundraising initiative; and others were businesses advertising their services: a real estate agency, a pediatric dental group, a spa, and a restaurant. Almost all the content was addressed to a target audience of seniors and retirees.

Would members of this mall's community have put up or taken some postings with them if they had been given the means to? Was the fact that the board was kept under lock and key too intimidating for regular folks to use? How does ownership and moderation of a board affect cultures of participation?

We can only answer this by remarking that the bulletin boards we saw that seemed to invite the most participation were often makeshift ones. What was particularly striking about them was also that they had thick layers of postings and were seldom maintained.

In addition to access and moderation, we observed two other factors that seemed to affect how dynamic and diverse the content of bulletin boards could be, and

Figure 15. Thick layers of postings on makeshift board placed at Yew & Vine.

Figure 16. Appropriate lighting can make a board attractive for both reading and posting.

whether this made them more inviting. The first was how messy they were. The second was how busy they looked (i.e. the density of postings they contained). What we observed is that the more postings a bulletin board had, the more it seemed likely to attract. We were able to assess this by observing a cross-section of bulletin boards over the full eight week period of study.

For instance, we noted that some bulletin boards had no postings at all during that period. This was the case in a suburban recreation center which served as a family hub with a pool, a skating rink and a sophisticated fitness center. It had a single bulletin board located in the main hallway that led from the main lobby to the fitness center. This board remained empty for eight weeks even though it was located in an area that had a fair amount of daily traffic.

Similarly, bulletin boards that were too neat did not seem to attract many users. Furthermore, their homogeneous and consistent appearance over the course of the study suggested that it was the same people who posted content onto them. These users

may have been the gate-keepers who maintained and administered them. Our general impression was that if a board was too empty or clean, it did not function as a platform for cultures of participation because it was perceived as a look-but-don't-touch artifact.

Finally, we noted that certain lighting conditions made the architectural quality of a bulletin board and its surrounding space more inviting. This seemed to be the case especially when the lighting on the bulletin board stood out in relation to the rest of the space. It made the bulletin board stand out and seem attractive, the same way a large outdoor public digital screen appears at night compared to broad daylight. Carefully crafted lighting design can therefore also attract users.

Conclusion

This paper has described how we have empirically studied traditional community bulletin boards by using an ethnographic design methodology with the objective of finding some key principles for the design and development of digital bulletin boards in public spaces. Our objects of study and units of analysis consisted of both the postings and the bulletin boards. To contextualize the data and to cast a wider net in reflecting on spatial and social factors, we also considered the architectural space, the contextual environment and the contextual location in which the community bulletin boards were embedded.

Extant work related to digital bulletin board prototyping has proved to be invaluable in guiding our research process, but also useful in validating and refining some of our findings (Alt et al. 2011a; Alt et al. 2011b; Churchill et al., 2003; Ojala et al., 2010; Taylor and Cheverst, 2010). However, we believe our study makes

a significant contribution in that it has placed more emphasis on the ontology of space and artifacts by taking into account how people use bulletin boards to post content in a wider variety of settings with a much larger sampling frame than other studies. In addition, we have drawn inference by focusing on people's posting patterns rather than on technical features.

Perhaps more significantly however, we have suggested a set of four guidelines and design principles which can help researchers better understand how to make the cultural transition to locative digital media systems, through which communities could learn to toggle between the local and the virtual using digital bulletin boards. For after all, the notion of cultures of participation in relation to computational technology takes on an even greater significance in physical spaces where multiple users can meet. Indeed, the layering of physical, social and digital spaces opens up promising new paradigms that could redefine public space.

Acknowledgements

References

[1]   Alt, Florian, Thomas Kubitza, Dominik Bial, Firas Zaidan, Markus Ortel, Björn Zurmaar, Tim Lewen, Alizera S. Shirazi and Albrecht Schmidt. Digifieds: Insights into deploying digital public notice areas in the wild. In *Proc. of MUM'11*, ACM Press, New York, NY, (2011a), 165-174.

[2]   Alt, Florian, Nemanja Memarovic, Ivan Elhart, Dominik Bial, Albrecht Schmidt, Marc Langheinrich, Gunnar Harboe, Elaine Huang and Marcello P. Scipioni.

Designing shared public display networks: Implications from today's paper-based notice areas. In *Proc. of the 9th International Conference on Pervasive Computing*, Berlin, Heidelberg (2011b), 258-275.

[3]   Augé, Marc. *Non-places: Introduction to an Anthropology of Supermodernity*. Verso, London; New York (1995).

[4]   Brignull, Harry, Shahram Izadi, Geraldine Fitzpatrick, Yvonne Rogers and Tom Rodden. The introduction of a shared interactive surface into a communal space. In *Proc. CSCW'04*, ACM Press, New York, NY (2004), 49-58.

[5]   Churchill, Elizabeth F., Les D. Nelson and Laurent Denoue. Multimedia fliers: Informal information sharing with digital community bulletin boards. In *Proc. C&T'03*, Kluwer Academic Publishers (2003), 97-117.

[6]   Churchill, E.F. and Les Nelson. From media spaces to emplaced media: Digital poster boards and community connectedness. *Media Spaces Workshop CSCW'06*, Banff, Canada (November 2006).

[7]   Dourish, Paul. *Where the Action Is: The Foundations of Embodied Interaction*. MIT Press, Cambridge, MA (2001).

[8]   Fischer, Gerhard. Understanding, fostering, and supporting cultures of participation. *ACM Interactions 18,* 3 (May & June 2011): 42-53.

[9]   Giddens, Anthony. *The Consequences of Modernity*. Stanford, Calif. : Stanford University Press (1990).

[10] Glaser, Barney G. and Anselm L. Strauss. *The Discovery of Grounded Theory : Strategies for Qualitative Research*. Aldine Publishing Company, Chicago, IL (1967).

[11] Goffman, Ervin. *Behavior in Public Places: Notes on the Social Organization of Gatherings*. Free Press of Glencoe, New York, NY (1963).

[12] Greenberg, Saul, Nicolai Marquardt, Till Ballendat, Rob Diaz-Marino and Miaosen Wang. 2011. Proxemic

interactions: the new ubicomp? *Interactions 18*, 1 (January 2011), 42-50.

[13] Kirsh, David. *The context of work. Human-computer interaction 6,* 2 (2001), 306-322.

[14] Manovich, Lev. *The Poetics of Augmented Space: Learning from Prada*, (2005), 1-28: http://www.manovich.net

[15] Mathur, Saloni. Museums and Globalization. *Anthropological Quarterly 78*, 3 (Summer 2005), 697-708.

[16] McCarthy, Joseph, F., Shelly D. Farnham, Yogi Patel, Sameer Ahuja, Daniel Norman, William R. Hazlewood and Josh Lind. Supporting community in third places with situated social software. In *Proc. C&T'09*, ACM Press, New York, NY (2009), 225-234.

[17] Moore, Trevor D. and Mark A. Serva. Understanding member motivation for contributing to different types of virtual communities: A proposed framework. In *Proc. of ACM SIGMIS-Conference on Personnel Research'07* (2007), 153-158.

[18] O'Hara, Kenton, Mark Perry, Elizabeth F. Churchill and Daniel Russell. Introduction to Public and Situated Displays. In *Public and Situated Displays*, H. O'Hara, M., Perry, E.F. Churchill and D. Russell (Eds), Kluwer Academic Publishers, Norwell (2003), MA, xvii-xxxiv.

[19] Ojala, Timo, Ville Valkama, Hannu Kukka, Tommi Heikkinen, Tomas Linden, Marko Jurmu, Fabio Kruger and Simo Hoslo. UBI-hotspots: Sustainable ecosystem infrastructure for real world urban computing research and business. In *Proc. MEDES'10*, ACM Press, New York, NY (2010), 196-202.

[20] O'Reilly, Tim. What is Web 2.0: Design patterns and business models for the next generation of software. *Communication & Strategies 65* (2007), 17-37.

[21] Peltonen, Peter, Esko Kurvinen, Antii Salovaara, Giulio Jacucci, Tommi Ilmonen, John Evans, Antii Oulasvirta and Petri Saarikko. "It's Mine, Don't Touch!":

Interactions at a large multi-touch display in a city centre, In *Proc. CHI'08*, ACM Press, New York, NY (2008), 1285-1294.

[22] Preece, Jennifer and Ben Shneiderman. The reader-to-leader framework: Motivating technology-mediated social participation. *AIS Transactions on Human Computer Interaction 1*, 1 (2009): 13-32.

[23] Schroeter, Ronald. Engaging new digital locals with interactive urban screens to collaboratively improve the city. In *Proc. CSCW'12*, ACM Press, New York, NY (2012), 227-236.

[24] Spradley, James P. *Participant Observation*. Holt, Rinehart and Winston, New York, NY (1980).

[25] Taylor, Nick and Keith Cheverst. Exploring the use of non-digital situated displays in a rural community. In *Public and Situated Displays to Support Communities Work-shop OZCHI'08*, Lancaster University, (2008): cs-wray. lancs.ac.uk/ozchi08/papers/taylor_non_digital_displays.pdf

[26] Van Niekerk, Johanna C. and J.D. Roode. Glaserian and Straussian grounded theory: Similar or completely different? In *Proc. SAICSIT'09*, ACM Press, New York, NY (2009), 96-103.

[27] Warschauer, Mark and Douglas Grimes. Audience, authorship, and artifact: The emergent semiotics of Web 2.0. *Annual Review of Applied Linguistics 27* (2007), 1-23.

[28] Wiberg, Mikael, Hiroshi Ishii, Paul Dourish, Daniela Rosner, Anna Vallgårda, Petra Sundström, Tobie Kerridge and Mark Rolston. "Material interactions": from atoms & bits to entangled practices. In *Proc. of CHI EA '12*, ACM, New York, NY (2012), 1147-1150.