

Posting for Community and Culture: Considerations for the Design of Interactive Digital Bulletin Boards

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ABSTRACT

The next decade is likely to see a shift in digital public displays moving from non-interactive to interactive content. This will likely create a need for digital bulletin boards and for a better understanding of how such displays should be designed to encourage community members to interact with them. Our study addresses this by exploring community bulletin boards as a ubiquitous type of participatory non-digital display “in the wild”. Our results highlight how they are used for content of local and contextual relevance, and how cultures of participation, personalization, location, the tangible character of architecture, access, control and flexibility might affect community members’ level of engagement with them. Our analysis suggests entry points as design considerations intrinsically linked to the users’ sense of agency within a delineated space. Overlaps with related work are identified throughout to provide further validation of previous findings in this area of research.

Author Keywords

Large public displays; digital bulletin boards; observation; urban computing; entry points; cultures of participation.

ACM Classification Keywords

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

INTRODUCTION

Public digital displays can broadly be described as wall-sized video projections or digital displays using LED, LCD or plasma screens situated in public space. Such displays can provide people with contextual maps/information, announce status updates in terminals, advertise merchandise in shop windows and publicize site-specific resources. Currently, the majority of public digital displays remain non-interactive. They are mostly used for advertising or

broadcast with a one-way flow of information delivery. Yet the coming decade is likely to see an increasing number of *interactive* digital displays in public settings [21].

Given this, our goal was to understand how interactive public displays, akin to *digital bulletin boards*, should be designed to meet the needs of their users and to encourage community members to interact with them as part of a *culture of participation* engaged through public usage [12]. By participation we are referring to acts such as the posting of new information, commenting on existing information, or the “taking” of content by individual community members. This contrasts with the current use of public displays, which is largely concerned with the *publication* of information, often by companies or institutions, where viewers look at the displays rather than interact with them.

To address this, we conducted an empirical study using design ethnography to investigate how communities exchange information on traditional community bulletin boards. Given that new media often borrows from existing cultural forms, we chose to study traditional community bulletin boards for several reasons. First, it is currently difficult to study interactive digital bulletin boards because there are few instances in which they have been deployed in public settings. Second, bulletin boards constitute one of the most ubiquitous “interactive” types of paper-based public display. Thus, they are arguably a precursor to future interactive public displays. Third, and following from this, traditional bulletin boards serve an important community-building function in public space [7]. This leads us to believe that existing practices around non-digital bulletin boards may provide a valid basis for understanding how communities might use digital bulletin boards, and possibly by extension, certain types of other public digital displays.

Our study focused on understanding what types of content people place on bulletin boards and how this ties to the boards’ communities. We also sought to understand how attributes of postings and bulletin boards make them more inviting in terms of their location, context, and architectural setting. Our observational study reports on findings similar to those published in the past [3, 7, 18, 27]. We bring further validity to these findings by identifying each study in which they have been reported and by framing them in the broader context of bulletin boards and digital displays throughout our paper in order to support and synthesize the

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work previously conducted in this area of research. We also extend previous work by offering a more comprehensive classification of postings, by construing the needs of the user community as the primary stakeholder and by placing a deeper focus on entry points for action in public spaces.

To foreshadow, our results show that bulletin boards are primarily used to post information of local and of contextual relevance. Boards placed in locations with an existing culture of participation received the most postings along with boards facilitating the appropriation and personalization of content. In these spaces, tangibility, flexibility, access and control each played an important role in enabling posting. Together, these results suggest design considerations, each intrinsically linked to the users' sense of agency and discussed in relation to geographic relevance, contextual relevance and entry points that invite action.

RELATED WORK

Most of the early prototypes for interactive digital bulletin boards were designed and deployed in research lab environments over the past decade. More recently, designers have conducted studies to evaluate their prototypes in the world, often in semi-public or public space. Some researchers have even created a permanent infrastructure of networked digital displays in an urban setting as a means to facilitate public display research [23].

Interactive Digital Bulletin Boards for Research Labs

NOTIFICATION COLLAGE (NC) was one of the first shared display prototypes. Its UI followed the metaphor of bulletin boards with a collage aesthetic [16]. Implemented in an academic research laboratory, the simultaneous use of NC on a large digital display in the lab and on personal computers in the lab or at home was found to enhance its use and increase social interaction and communication among users inside and outside the laboratory space. Similarly, YETI was designed to simultaneously support multimedia content sharing between research labs in California and Japan to connect the two communities across time zones and space [9]. In this case, however, the importance of content was found to prevail over interaction.

CWALL also used a bulletin board format where users could place text or images on the screen; a study found that users' expectations varied in relation to the placement of the display, and that motivation and use of the display depended on how much effort was needed, and on whether users could see their postings and feel part of the display community [25]. Studies of the digital bulletin board, MESSYBOARD, showed that visibility highly impacted usage and that usage was related to the nature of the community, their projects and their collaborations [11]. Churchill et al. designed and deployed the PLASMA POSTER NETWORK in their workplace and similarly found that the culture of the workplace contributed to the boards' success [7]. Moreover, the flexibility of their display for supporting varied content was highly valued. Our study builds on this past research

which highlights the importance of context and of a culture of participation in public display usage.

Interactive Digital Bulletin Boards for Public Spaces

A second set of digital bulletin boards have been designed for public spaces, the focus of this paper. CAMPIELLO was designed for communities where people could share and read tourist guides, flyers, maps and newspapers by linking together paper and digital artifacts [14, 15]. A study of its use in schools revealed that the system helped reinforce a sense of community amongst students [1].

Churchill and her collaborators studied several prototypes that functioned as digital bulletin boards. CHIPLACE and CSCWPLACE were deployed in ACM conferences [8], while EYECANVAS was deployed in a neighborhood café/art gallery [10]. Studies of these displays found that each of the prototypes provided a context-specific means of content sharing that enhanced existing communication tools; that their strategic placement defined how often and in what ways they were used; that the prototypes were quickly adapted to users' needs, cultural norms and their physical setting; and that visual content tended to be most popular.

COCOLLAGE was designed for a large display in a café located in a university district to encourage a stronger sense of community [22]. A study found that COCOLLAGE did not instigate new interaction, but did make patrons more aware that they were sharing space. DYNAMO supported the cooperative sharing and exchange of a wide range of media in a communal setting [5]. Studied in a high school student lounge, Brignull et al.'s study found that DYNAMO lent itself to unexpected appropriation uses and different degrees of personalization; promoted a sense of collective ownership of the platform and its surroundings; and generated a social atmosphere and opportunities for people to engage with one another. CITYWALL was a large 2.5 m display that allowed users to post and interact with Flickr™ media in a downtown area [24]. Users were found to crowd around the display, learn from each other and develop social protocols surrounding interaction (e.g. turn taking).

The most recent prototype, however, is DIGIFIEDS, a digital public notice area (PNA) deployed in an urban environment in Finland for 2 months [2]. After having collected data in log files, and conducted field observations, semi-structured interviews and field trials during summer 2011, the study found that community-related information and content of local relevance rated highest amongst content providers and viewers; that privacy concerns were a major issue in using the display in public view; that there was a correlation between content posted on DIGIFIEDS and on traditional bulletin boards; and that digital natives were more likely to use the platform than people from older generations.

Studies of Non-Interactive Bulletin Boards and Displays

Finally, other studies have examined non-digital bulletin boards and non-interactive displays "in the wild". First,

Huang et al.'s study showed that to encourage interaction, displays should be placed at eye-level and at arm's reach; that although large displays tend to be more eye-catching, their ideal size is of human scale; and that physical content placed next to a digital display may attract attention [18].

Second, in their work on traditional community billboards in public areas, Churchill et al. found that boards are situated in places where people can spend time looking at them (e.g., waiting rooms, bus stops), places of leisure, and places where one looks for information (e.g., libraries) [7]. Boards allowed people to voice their viewpoints and advertise for activities and events, and also provided a sense of community. Monitoring ranged from formal to open with different levels of control being exercised over what and how content gets posted to no moderation at all. Lastly, content often had a temporal component where it may be relevant to a particular date or time period. In a follow-up study in the workplace, when comparing bulletin boards in smaller organizations with those in larger ones, they found that people in smaller groups where everyone knows one another 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" [7, p. 101].

Third, Taylor and Cheverst did a survey in North West England on the use of noticeboards in a rural community with the intention of exploring how community display practices might be digitally augmented by technology [27]. The study found that people posted notices on almost any surface which afforded noticeability; tended to put up content that advertised small, local businesses, items for sale or job openings; did not take down notices when these were "stale" (p. 3); exercised various degrees of access control over boards; and sought flexibility and ease of use.

Fourth, in their extensive study of 29 public notice areas in several towns of Switzerland and Germany, Alt et al. found that these advertising displays should provide board owner with control (while our study recommends the opposite); are mostly useful in informing people about locally relevant content; should have a flexible design to meet the needs of those who create, post or control content; and must easily support the taking away of content [3].

Although many of the observations made in these last three studies overlapped with our own, there are substantial differences in our work's methodology and focus. First, the analyses in these studies heavily rely on unstructured or semi-structured interviews with different stakeholders such as content providers, viewers and display owners/managers [3, 7, 27]. Ours is not based on interview data. Conducted without the use of extant theory, we adopted an approach that sought to generate concepts from focused observation and detailed note-taking onsite. Second, we present findings that hone in on the user rather than an analysis based on balancing the needs of different stakeholders. Third, we

used a larger sampling frame collected in a different major metropolitan area, which provides a strong basis for comparison and validation with two prior studies [3, 7]. Fourth, we made a deeper analysis of posted content and organized it in fine-grained categories. Fifth, we more broadly discuss where bulletin boards should and should not be situated as a result of field observations. And sixth, our main contribution consists of proposing some new, more abstract and conceptual entry points for action.

METHODOLOGY

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 and with this cultural artifact [26]. We used mixed methods to gather data and constant comparative analysis to analyze it [13].

Data Collection

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 Metro Vancouver, Canada. Because this area 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.

We conducted observations in many types of environments. Each site visit lasted from 15 to 45 minutes. When possible and relevant, we conducted multiple observation sessions, varying the days, the week and the time of day during which we visited the site, especially when the bulletin boards were in more public, high traffic settings such as publicly accessible buildings or outdoors near the street.

The principal neighborhoods visited in this study included a mix of urban and suburban boroughs in five types of environments. The residential environments included a few suburban housing complexes, a remote on-campus graduate residence, and the main lobby of an urban housing co-op. The designated areas of the educational environments were rooms, hallways, and common lounges on three university campus sites. Urban and suburban municipally-run establishments such as libraries, community centers, skating rinks, public pools, and recreational centers comprised the indoor public environments. The outdoor public environments included sites where bulletin boards were located outside such establishments, on university campus sites, around store exteriors and in various bus shelters. Commercial environments included small and large retail businesses on university campus sites, in urban or suburban boroughs and in a shopping mall.

The first author (A1) was responsible for collecting and recording all of the raw data in the form of detailed field notes and photographs. A1 conducted the field study using a focused ethnographic approach that sought to carefully describe observations with detailed note-taking onsite. The

visual appearance of the bulletin boards, the postings, and the context they were embedded in were recorded in 113 digital images with some boards being photographed more than once from different angles and distances. Photos were used as visual reference and for illustrative purposes only.

Method of Analysis

The principal method of analysis used in this study is constant comparative analysis from Glaserian grounded theory (GGT) [13]. The coding techniques used were respectively open coding, core coding and selective coding applied to the field notes, to generate concepts by gradually moving from description to abstraction. In keeping with GGT'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 [28]. In our study, the constant comparative method was also useful in collecting and analyzing data about locations where we expected to find bulletin boards, but found none. Field notes and photos were also taken at some of these locations as a reference for comparison.

Overall, we made three salient observations about how people posted content to the bulletin boards we studied. These related to the geographic relevance and contextual relevance of content (findings supported by prior research [3, 7, 27]), and to physical and aesthetic attributes of postings and bulletin boards, which could invite different degrees of engagement in terms of location, context, and architectural setting. The next sections present these results.

GEOGRAPHIC RELEVANCE

Our analysis of bulletin board content revealed a strong correlation between content and geographic relevance. We define geographic relevance as the topographical range within which the 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 well-delineated zone, described in terms of geophysical distance.

Six geopolitical categories for classifying the geographic relevance of our postings emerged from our analysis: immediate local (within a neighborhood, which represented 69.5% of content), municipal (17.5%), regional (referring to the administrative state, 6%), national (5%), international (1.5%) and non-localized (i.e. web-based relevance, 0.5%). When there was overlap between categories, we made judgment calls on who was posting the content (a resident vs. the government) and the likely impact (city vs. region).

As had been previously observed in a number of studies [3, 7, 27], we found that content of local relevance strongly dominated. Our results showed that 87% of content was relevant either to the neighborhood or to the city it was posted in. The other 13% of postings were on matters of

regional (6%), national (5%) or international (1.5%) concern, with a mere 0.5% of content being related to the Internet and thus lacking ties with a specific place.

We often think of virtual communities as global and placeless [6]. However, our results strongly suggest that the virtual communities of digital bulletin boards would be defined by a sense of place and thus most likely use these platforms to communicate information that is either within local, municipal or regional geopolitical proximity. Given how scarce postings of relevance beyond this range were, it seems legitimate to wonder whether a digital bulletin board would be used at all for such content, as our observations showed that most postings were intended for people living in, or frequently passing by, a board's neighborhood or city.

CONTEXTUAL RELEVANCE

Our analysis revealed that there is also a strong tie between the type of content posted and the type of environment that it was posted in. In other words, content was contextually relevant. The next two subsections outline the categories of postings according to the environments they were posted in.

Categories of Postings

The manifest content of the 1297 postings was coded into twelve major themes forming the following categories of postings: administrative, business, recreational, educational, social/political/environmental, government-related, cultural, maintenance, health/well-being, personal ads, maintenance, and work/employment. These categories may at times overlap or present some ambiguity and although most of them are self-explanatory, a few need to be clearly defined.

Here, we briefly describe these. We defined a subject category as administrative when the subject pertained to the administrative information about the environment itself. For instance, a posting about a library's opening hours or about a housing complex's rules of conduct fell in this category. The maintenance category applied to the maintenance of the environment itself. For example, household tips in a housing complex or 'a dog scooping' ad. All content which was posted by an individual advertising a service or good was tagged as personal ads. This could include an apartment for rent, furniture for sale, tutoring services or housecleaning ads. Social/political/environmental is a catch-all category used to classify all postings with a social, political or environmental relevance. This would include postings about food banks, recycling, neighborhood events, community-supported agriculture or protests.

At a surface level, this illustrates the types of content that people already place on public bulletin boards, which suggests the types of content they may wish to place on interactive digital boards in the future. Yet more deeply, it begins to reveal interesting patterns related to the type of environment in which the content is placed, outlined next.

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

Postings by Type of Environment

Table 1 shows the distribution of postings in each subject category by type of environment. Below the total number of bulletin boards and number of postings in each type of environment is the proportion of postings in each category expressed as a percentage. Categories are organized in order of decreasing frequency. For example, column three summarizes the data collected in indoor public environments: 656 postings were surveyed on a total of 29 bulletin boards. While the majority of these postings related to cultural events (30.2%), a significant number related to recreational matters (18.3%). The proportion of social/political/environmental (11.7%) and educational (12.0%) were in a close tie, but there were few business postings (1.1%) and no maintenance related ones.

Although the exploratory nature of this study makes it difficult to generalize, some emerging patterns are sufficiently disparate to suggest distinct trends of posting in different types of environments.

The last column in Table 1 shows the data aggregated across all five types of environments. Although we can see that people posted content about a large number of things, 25.4% of content on all the 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 averaged 13.5% of content across the five types of environments. Social/political/environmental issues also constituted a large proportion of the overall content, namely 12.4%. At last, educational content about courses, professional training, skill acquisitions, and educational workshops such as computer courses for seniors or kindergarten programs made up 11.2% of the overall content. Conversely, the

overall proportion of postings related to work/employment was low at 1.6% and weak in each category.

If we consider these results in conjunction with the fact that 87% of postings were of proximate geographic relevance, this suggests that the bulletin boards are mainly used by people to communicate with members of their local community about issues that have cultural, social, political, environmental, recreational, educational and personal value. To put it otherwise, our results show that community bulletin boards do not tend to be used to publicize information related to work, business or government, which comprised only 8.4% of content overall.

At a more granular level, posting trends suggested a correlation between categories of postings and types of environment. That is, people tend to post content that they feel is relevant to the location and environment a bulletin board is situated in. Like geographic relevance, contextual relevance was an important observation made in similar studies of non-digital bulletin boards [3, 7, 27]. In addition, our results show that people tended to post personal ads more frequently in commercial and outdoor public environments than in residential, educational and indoor public ones. This seemed to be counter-intuitive; one would think that the smaller, more tightly knit community of a residential environment would foster more personal exchanges. In fact, people typically posted more personal ads in environments that could reach a wider audience.

ENTRY POINTS FOR ACTION AND PARTICIPATION

Another significant observation made in the field was that certain postings, bulletin boards and places had features that invited people to use these bulletin boards more than others or to contribute content. By this, we mean “inviting action or user participation”, which speaks to Kirsh’s notion of affordance as an entry point that can provide a structure to cue or stimulate action [20]. Hornecker et al. have suggested that the concept of entry points can be useful in

thinking through the design of shareable interfaces, especially in terms of motivating, facilitating and supporting action [17]. A set of *post hoc* research questions introduce the following subsections to discuss these features in relation to the postings, the bulletin boards as artifacts, the architectural setting in which they were placed, and their contextual environment and location.

Postings

What makes a posting more inviting?

Like previous studies [3, 7, 18], we observed how postings could catch the eye by virtue of the diversity of their colors, sizes, and the visual patterns they produce. In particular, we noticed that different posting scenarios seemed to function as entry points which could motivate action. First, like prior research [3, 7], we saw many postings designed with tear-off strips to be ripped off or postings which users could take away such as multiple business-card-sized postings.

Second, we noticed that postings were often repeated by tiling, by fanning or by spreading in different areas across one or more boards. Another study mentions that this practice increases the probability of being exposed to a posting [3]. We found that this strategy was actually visually enticing and could attract attention, especially if postings were big, colorful and had strong graphic features.

Third, we frequently saw *blank notepaper*, *writing tools* and *empty spaces* specifically reserved for contributions and new postings. Alt et al.'s study also noted that some boards "provide support for posting" [3, p. 270]. However, our observations went beyond "tables...cards and pens", and included more playful tools that placed the emphasis on arts & crafts: cutout color construction paper, a chalkboard with color chalks, big color markers and neon-colored POST-IT™ notes randomly stuck to surfaces such as windows.

Fourth, like the lure of an empty space, postings seemed to effectively respond to a short, simple and specific question placed as a headline on a board such as "What's your favorite food?", "What makes you really happy?", "What is your Vancouver?" and "comments and suggestions?".

Fifth, flyers or flyer stands were often found near bulletin boards, an observation made in several other studies [3, 7, 18, 27]. We wondered if the tangible aspect of paper-based flyers might enhance the space around a digital bulletin board, an idea strongly suggested in one study which describes how people browse through them when they are placed in the vicinity of a digital display [18]. These five examples serve to illustrate how a bulletin board can be set up to draw people in and support the taking of content.

Bulletin Boards

What makes a bulletin board more inviting?

Some of the bulletin boards we observed had distinct properties that inherently limited their function to publication and not participation. For instance, some

bulletin boards were protected by glass casings which could not be removed without the gate-keepers' permission, an affordance other studies have remarked on [3, 7, 27]. Such design unequivocally evokes a one-way flow of information delivery that intentionally discourages access.

Alt et al.'s study classifies notice boards based on the degree to which they are scaffolded and curated to underscore the idea that different stakeholders may want more or less control over them [3]. Given that our study seeks to identify entry points for community, our analysis narrows down on this perspective. Thus, we were most surprised to find that this was the case with certain bulletin boards near community centers as well as with the only board of our sample located in an indoor shopping mall.

This bulletin board was located inside the entranceway of a major supermarket chain outlet. The heading of this bulletin board reads, "Community Information Centre". The word "community" seems a bit of a misnomer since the glass prevents people from posting, but the board is indeed an "information center". Although more than half of these postings had local geographic relevance, all had been professionally designed and printed by businesses or associations. A prior study remarks that non-digital bulletin boards already use digital technology since postings usually contain URLs or email addresses and are often created with desktop publishing applications [27].

However, these postings lacked signs of personalization altogether. Many were from 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. Unsurprisingly, no personal ads were posted on this board.

Conversely, we found other bulletin boards offered free access and thus could be said to be more inviting to post on. For example, we saw several concrete structures in the middle of university campus hallways that had been transformed into makeshift boards by students. What was particularly striking about them was that they had thick, messy layers of postings. They were seldom maintained, yet were actively used. In contrast with the "gate-keeper" model in which control is exercised over content, the postings on those unmanaged boards were often handwritten or personalized. This begs the question that one study raised in reference to similar posting practices: "how could this level of flexibility and ease of use be replicated in a digital system with today's technology?" [27, p. 3].

In the previous section, we have already mentioned that a platform can be designed with entry points that invite people to contribute a posting. Here, we suggest that open access and minimal management constitute "open" entry points that allow action to proceed, while the possibility of personalizing postings and boards could be construed as

“offering a diversity of entry points...allowing for gradual adoption and appropriation of the system” [17, p. 332].

In addition to this, we observed two other factors that seemed to affect how dynamic and diverse the content of bulletin boards could be. The first was how messy (or makeshift) they were. The second was how busy they looked (i.e. the density of postings they contained). Messy boards and boards with many postings tended to attract more. We were able to assess this by observing a cross-section of bulletin boards over the full eight-week period of study. We noted that some bulletin boards had no postings at all during that period. For example, 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 tidy did not seem to attract a large group of users. Their consistent appearance over the course of the study suggested that they were used by the same, small group of people, probably the gatekeepers who maintained and managed them. Our observations revealed that if a board was too neat or too clean, it did not function as a platform inviting action and instead seemed to signify a look-but-don't-touch aesthetic.

Architectural Settings

What makes an architectural setting more inviting?

Our observations strongly suggest that bulletin boards should be understood as architectural elements embedded in the built environment. We noted, for example, that certain lighting conditions made bulletin boards more noticeable. This seemed to be the case especially when the lighting on the bulletin board stood out and made it more spectacular in relation to its surrounding space, the way a large outdoor digital screen appears at night compared to broad daylight.

Like Churchill et al. [7], we found that size, orientation and positioning were important considerations in the context of architectural space. We extend their findings with some statistics. Bulletin boards came in landscape (68%), portrait (25%) and square (7%) formats. While most bulletin boards were two-dimensional (93%), some were three-dimensional (7%) with several rectangular planes or a single cylindrical one in the case of a column used for posting. Content was either found within a single board frame (86%) or else it would be distributed across two (7%), three (5%) or more (2%). This suggests that bulletin boards could be designed on several screen interfaces on the same or different planes.

In fact, like [27], we found that almost any surface could be used as a bulletin board and that, in practice, it was often difficult to distinguish the boundary between the bulletin board and its architectural setting as people often posted over and beyond the bulletin board space. For instance, one

bulletin board at a university campus had as many postings taped on the wall as on the board next to it. We also saw content placed on surfaces adjacent to the boards (windows, doors). Alt et al. similarly found that posting space was at times extended by attaching content next to the board [3].

Finally, we found that the larger a board was, the more dense it was with postings. Small boards were almost empty or tended to have few postings. However, this should be weighed against prior findings recommending that display interfaces be of human scale, and placed at arm's reach and eye-level [18]. This corroborates what we saw with boards.

Contextual Environment and Locations

What makes an environment or a location more inviting?

We think it noteworthy that we did not find a single bulletin board or posting in areas containing mass transportation terminals, e.g. the airport, bus terminal or train station. Similarly, most museums we visited did not have a board for people to post or write, except for one large museum in the city's center which had an oversized chalkboard for visitors to write on. As we previously mentioned, only one shopping mall store contained a bulletin board. If we consider that shopping malls are the cultural hubs of certain communities of suburban dwellers (i.e. elderly and teens), this is peculiar. We believe this may relate to postmodern theory which describes such locations as “non-places” because they are branded by globalization, lack a sense of local identity and do not confer a sense of place [4].

In stark contrast, the data we collected in our commercial environments category provides evidence that people do post content on bulletin boards in certain commercial areas. Commercial Drive, one of the most diverse, grass-root neighborhoods we studied in Vancouver, 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 has its own identity, defined by the specific needs and lifestyle of the community it serves. This corroborates prior research which found that locations with a strong sense of identity will garner more bulletin boards and postings [3, 7, 27].

That said, we did notice counter examples. One of the most illuminating observations we made was during our visit to a downtown YMCA located at the outskirts of 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. Community bulletin boards would have clashed in these surroundings. This illustrates that even when a sense of community and identity exists in a location, the way in which the environment is constructed (e.g., overly sterile) can limit the desire of individuals to post content on bulletin boards.

What this tells us is that using principles that follow the architecture of participation of Web 2.0 would not be enough to build interactive digital bulletin boards. More important is the effervescence of a culture of participation rooted in a sense of place and identity [12]. We observed this again and again in each type of environment surveyed. Interestingly, researchers who deployed digital bulletin boards in research labs or in controlled semi-public settings made similar observations [2, 5, 9, 11, 22, 25].

DISCUSSION AND DESIGN CONSIDERATIONS

We now summarize our results and outline our design considerations with the objective of creating conditions that will encourage participation rather than passive viewing in the design of digital bulletin boards. We present what we feel are the most pertinent lessons based on our results.

Design for Local Content

Before the introduction of geolocation features in mobile devices, geographic relevance was less of a priority in the development of technology designed for community. In fact, one of the main affordances of social media has always been that one can exchange with members of a community regardless of where they are located in the world. In this sense, social media tends to operate with a sense of “non-place”: their communities are bound by a strong sense of identity, but are placeless and in flux [4].

However, as we have seen, traditional bulletin boards are mostly used by members of place-based communities to exchange on issues and events within local range, a key finding made in every such prior study [3, 7, 27]. This implies that designers may want to consider the importance of supporting and prioritizing content of local relevance. Our observations suggest that people value the locality of the boards because residents and community members can see their postings, but as we know the amount of postings on boards can easily become overwhelming. For this reason, it may be advantageous to make locally-relevant content more accessible or to place it in full view for users.

Design for Display Placement in Areas of Identity

Our next design consideration is that the choice of location is a determinant parameter, arguably the most crucial. Based on our observations, we would suggest that institutional space, corporate space, public space and private space can invite different degrees of participation and public interaction depending on how they signify identity, access and ownership. Our results suggest that *locations in which communities already have a culture of participation, an ethic of cooperation and a sense of identity as a community* may better support digital bulletin boards. Past research also strongly supports this [3, 7, 27].

Digital bulletin boards placed in public locations that fall in the category of non-place would likely receive little participation from community members [4]. This includes shopping malls, museums, touristic sites and mass

transportation terminals. A caveat is bus shelters situated in neighborhoods serving a community; our observations showed that many people put postings up in some of these locations as well. Beyond this, public, semi-public or commercial sites that are regularly visited by members of one or many communities seem more likely to foster cultures of participation for digital bulletin boards.

Design for Community and Culture

In reference to factors of contextual relevance, we broadly observed posting patterns that were, on the one hand, manifest across all types of environment and on the other hand, peculiar to each type 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 profit, employment, or government services. This supports Churchill et al.’s remark that identity-building may be one of the drivers of location-based bulletin boards [7]. People use them to share their political activities, their culture, their hobbies, their knowledge and their values. While Alt et al. call for the flexible design of digital bulletin boards to “allow a broad set of people using it” [3, p. 274], we also suggest that their design might be considered in terms of *how people use boards to build and share common ground*.

Our observations on the appropriation and personalization of space further suggests that digital bulletin boards *could be customized over time by the users themselves* who can adapt them to better suit the needs of their community. However, digital bulletin boards must still provide a means to reach the widest possible audience because, as the data showed in relation to personal ads posted in each type of environment, within tightly-knit communities, people prefer exchanging information face-to-face, by phone or by email. Keeping the platform both closed and open, both personal and accessible, presents a design trade-off. People should be able to choose when and where their content is placed, yet they also need to be restricted, for example, to avoid spamming locations with content that is not locally-relevant. Given that other researchers have also commented on the importance of encouraging content creation while ensuring varying degrees of access control over content [3, 7, 27], this seems like it might be a key design challenge.

Our results also suggest that displays *that look busy and used while still having empty areas for new content* might draw people in. Interestingly, this design feature could help make the digital board appear both closed and open. Also, as noted in our field study, *posing a short, engaging question as a headline presented in big colorful or visible font* is inviting and thus could constitute a good entry point.

Design as a Shared Resource for Collective Ownership

Our findings showed that 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. Brignull et al. also 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” [5, p. 52]. In our study, boards with glass casings were implicitly understood as private property, while those with a banner headline were explicitly branded with seals of proprietorship. Our findings suggest that bulletin boards can be used as bottom-up 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.

In keeping with this, our study suggests that digital bulletin boards *that allow for community self-regulation might be better suited when cultures of participation are taken to be the primary stakeholder*. Content moderation is a necessary feature in any community that encourages contribution, participation and collaboration. The simplest form of moderation may allow users to flag ‘inappropriate’ content and submit it for review to other members of the display community. More formal strategies where content needs to be pre-approved by administrative or technical staff might limit the perceived nature of the display as being “owned” by the community, and thus make it seem less accessible.

Design for Embodied Interaction around the Display

As tempting as it is to think of displays as flat boards with two-dimensional interfaces, in reality they are tangible three-dimensional objects embedded in the built environment, itself made up of palpable objects. Based on our observations of non-digital boards, we think it may prove useful to design digital prototypes with this in mind.

For instance, in order to optimize the appropriation of space and spread the community effect to other spaces of participation, we wonder if designs *could enable the modularization of the screen interface onto different planes and surfaces*. Could there also be a way to extend the posting space, like we saw when content was taped beyond the space of the bulletin boards (this observation was made in other studies [3, 27])? In a digital world where displays have fixed dimensions, this can be more challenging to support for one cannot extend the size of a display as easily as one can appropriate a wall surrounding a bulletin board. However, researchers may think about novel ways of providing additional digital space outside of the confines of a display through handheld projection technologies used by users themselves, or projectors permanently situated with the display (e.g., technologies such as ILLUMIROOM [19] could be used in a public setting rather than the home).

Furthermore, thinking in terms of tangibility and designing with materiality in mind would help. Indeed, we remarked that having fun tools to write and paper-based media to manipulate can attract and motivate users. This idea is also taken up by Grasso et al. [14, 15] and Huang [18] who each note that paper-based media can enhance digital ones when they are placed next to one another. What our observations

suggest is that objects that have a ludic character can attract people to a board: bright colors that contrast with one another, big writing tools that feel good to grasp, lighting that has a theatrical quality, and spaces that don’t feel too sterile and that might even have a playful quality to them. For instance, a space could be lit a certain way which would change as people approach the board or have features that support embodied interaction such as a broad hand gesture that triggers the screen.

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 key considerations for the design and development of digital bulletin boards in public spaces. Our objects of study and units of analysis consisted mainly of postings and bulletin boards. To contextualize the data and to cast a wider net in reflecting on entry points for action, we also considered the architectural setting, the contextual environment and the contextual location in which these community bulletin boards were embedded. Our focus on content and community arguably serves to both validate and extend findings in related work in this area of research. Thus, our contribution to this area of research is twofold.

First, we validate results from prior studies that have found that bulletin boards tend to be used to: (1) post content of local and of contextual relevance; (2) negotiate the needs of its different stakeholders through design affordances related to curation, moderation, control, access, personalization and ergonomics; (3) help build a community’s sense of identity or to lay claim to ownership of a space through appropriation of the board or the space around it; and (4) offer means to take away content in digital or paper form.

Second, our analysis extends these findings by proposing new entry points for digital bulletin boards in public spaces, namely a stronger focus on supporting: (1) content that can help a community exchange more cultural and social capital; (2) only locations that can confer a sense of place; (3) minimal barriers for access and moderation; (4) design strategies that place a greater emphasis on embodied interaction and visual enticement including, for instance, the use of empty space; non-digital media and tangible interfaces; colorful and fun props; playful *mise-en-scène* which stages sensor-based interaction or a busier interface. Although our observations are about non-digital boards, we hope that some of our findings will also be applicable to other types of large interactive digital public displays and help practitioners think through the design process when the dominant stakeholders’ interests are those of communities.

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