

# Title of Observational Paper

Anonymous Authors

## 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 ...

## 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.

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, 26], but we have extended 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. We note this difference in our related work section, while throughout the paper, we identify similar findings that have already been presented in prior work to bring further validity to them.

To foreshadow, our results show ....

## 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 [22].

### 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]. The public nature of the system amongst colleagues was found to increase social interaction and communication. 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 [24]. 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. [7] designed and deployed the PLASMA POSTER NETWORK in their workplace and similarly found that the culture of the workplace contributed to the boards' success. 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]; EYECANVAS was deployed in a neighborhood café/art gallery [10]; and, YETI was simultaneously deployed at research labs in California and Japan to connect the two communities across time zones and space [9]. Studies of these displays found that each of the prototypes provided a context-specific means of content sharing that enhanced existing communication tools; that the strategic placement of the display defined how often and in what way it was used; that the prototypes were quickly adapted to users' needs, cultural norms, and physical setting; and finally, 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 [21]. 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 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<sup>TM</sup> media in a downtown area [23]. 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 Displays and Bulletin Boards**

Several studies have important overlaps with ours. First, Huang et al.'s study has similar findings in terms of entry points [18]. However, they observed the use of public digital displays (mostly non-interactive) rather than our focus on non-digital bulletin boards, and they did not make any observations on the nature of content. Findings showed that to encourage interaction, displays should be placed at eye-level and arm's reach, and the size should be of human scale, neither too big, nor too small. They also found that large displays are eye-catching and physical content placed next to a digital display may attract attention.

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 informal. 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]. Our study validates many of these findings and extends them by exploring a broader range of environments through the lens of entry points for action [17]. While Churchill et al.'s focus was largely on technical, ergonomic and social factors, we investigate more deeply the types of content posted on boards and how this relates to community.

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 [26]. 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”; exercised various degrees of access control over the boards; and sought flexibility and ease of use.

Fourth, in their more thorough survey 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, 26]. 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.

In summary, our study makes a contribution, on the one hand, by adding new analyses that focus on entry points for postings and engaging with a board, and on the other hand, by validating results of prior studies and framing them in the broader context of bulletin boards and digital displays. In doing so, we both support and synthesize the research previously conducted on non-digital and digital bulletin boards for research labs and in public spaces.

## **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 [25]. 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 without prior knowledge of extant theory, 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 photographs 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 [27]. 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, 26]), 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.

The manifest content of the 1297 postings was coded into twelve major themes forming the following categories of postings: administrative, business, cultural, educational, fundraiser, social/political/environmental, personal ads, government-related, maintenance, recreational, and work/employment. These categories are organic to this study and can at times overlap or present some ambiguity.

Although most of the above categories are self-explanatory, a few could seem unclear. 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.

## FINDINGS

## DISCUSSION

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