Presence Management and Bluetooth Naming on Situated Displays

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Abstract

This paper describes a user study that investigated to what extent the display of Bluetooth presence and device names on a public screen changes people usage of Bluetooth and alters social practices in a particular context. In this work, the utilization of Bluetooth device naming extended beyond identity representation and introduced the use of a simple interaction mechanism in which the system can recognize parts of the Bluetooth device name as explicit instructions to trigger the generation of content from the web on a interactive public display. The user study, which involved the deployment of a fully functional prototype in a University bar, generally addressed the suitability of these techniques and the type of social practices that emerged. However, in this paper, we particularly focus on how the naming of the devices was utilized as a communication tool. In fact, the results from the analysis of usage logs and in-situ group interviews suggest that people creatively appropriated the interaction techniques employed and these techniques were effective in their ability to sustain situated interaction and self disclosure around the public display. Implications of our findings to the design of further functionalities are also pointed out.

Keywords

Ubiquitous computing, situated displays, bluetooth, user study.

1.INTRODUCTION

Our on-going long term research goal concerns the investigation of the design space of *interactive and digital public displays* as an enabling artifact to support people's situated interactions in public spaces. We view public digital displays as an important enabling technology for many types of ubiquitous computing scenarios. They can provide a simple and effective way for bringing digital information into our physical world. Furthermore, interactive displays promise much potential for leading people to interaction and that can be crucial for the generation of pervasive user-generated content back to the virtual world. However, research has highlighted that enticing people to participate is a major challenge [Brignull2004; Huang2006], and there are complex issues related with publication management.

The system presented here and under study involves the scanning and depiction of Bluetooth device names in a display situated in an informal public space. In this present work, two main themes will be considered: (a) how the display of Bluetooth device names on a public display fosters/facilitates/enhances situated interactions in a particular context and (b) to what extent this displaying changes Bluetooth usage. In other words, in

this paper we will investigate to what extent our novel approach generates distinct results from other research regarding Bluetooth usage. By doing so we will try to highlight how making the Bluetooth device names publicly available on a digital public display may change the social practices in a particular public space.

Research suggests that people are taking advantage of new web, mobile and ubiquitous technologies to explore novel ways to disclose personal identities and self to others [see, for example, Hardey2002; Kindberg2007; Turkle1995]. Furthermore, research also indicates that, sometimes, people seem to deliberately manage this self disclosure transitions between virtual and physical spaces. For example, Hardey [Hardey2002] explored how on-line and off-line personal identities were managed by people within the realms of online dating systems, showing distinct strategies to deal with the transition from one environment to the other.

People use of Bluetooth devices are a good example of technology appropriation for the facilitation of novel ways of social interaction. Some studies have investigated Bluetooth scanning as a mechanism for sensing presence and uncovering all sorts of social patterns, e.g. the familiarity of the surrounding

environment [Paulos2004], the social situation [Nicolai2006], and more general large-scale reality mining [Eagle2006]. Kindberg and Jones [Kindberg2007] show how some situated practices around the use of Bluetooth in public spaces also hint on how people deliberately self disclose to explore the social surroundings or entice others to engage in interaction. In fact, they go one step further arguing that one can see the emergence of a Bluetooth usage culture and proposing the notion of Bluetooth as *partially embodied* medium.

Given the nature of the present study we opted to consider the following **research questions** instead of fully fledged hypotheses:

- *Were people aware of their displayed Bluetooth presence on the public display?*

- *How did people "manage" their displayed Bluetooth presence? Did people change the name of their device? In what ways?*

- *Were people curious and responsive to the other displayed Bluetooth presences?*

- *How did people react to the relative anonymity provided by the system?*

The nature of the user study presented in this paper is descriptive and the analysis of the results is fairly qualitative. Our aim at this point was to explore how people reacted when confronted with such system and appropriated it, rather than investigating the putative benefits of the system or possible design alternatives.

The remaining of the paper goes as follows. Section two provides an overview of related work, focusing on situated public displays and the emergence of a Bluetooth usage culture. Section three describes the system developed while section four describes the study framing. Section five presents the results and section six the overall discussion. In section seven we present the lessons learned and future developments.

2.BACKGROUND

The display of Bluetooth presence in public or semi-public displays has been explored in a variety of systems.

For example, the visualisation of proximate Bluetooth devices have been explored in art settings [Cardoso2006; Porter2007].

In the Cityware project, Kostakos [Kostakos2001] explored several ways of leveraging the capture of information regarding Bluetooth mobility, including a set of in-situ visualizations about current or recent Bluetooth presences. The system supports links between Bluetooth devices and the Facebook identities of their owners, as a way to create a link between physical presence and virtual presence. The system uses in-situ presence information as a way to generate content for the virtual world. More specifically, it provides data to a Facebook application that lets people associate physical co-presence information with their social network.

Another example of the use of presence as a driver for situated interaction around public displays is the Proactive displays system [McCarthy2003]. The detection of nearby RFID tags was used as a trigger for showing profile information about the owner of the tag, in an attempt to promote occasional encounters between people around the display. However, this approach requires a priori definition of individual profiles with associated data and assumes that everyone will be using a particular type of tag. Furthermore, people have a very limited role in the system, which is basically to move around and be detected.

The Bluescreen project, in its turn, explores the use of Bluetooth presence to optimise the selection of adverts for display [Karam2007]. Content that has already been shown when a particular Bluetooth device was present is avoided if that device is present again, thus reducing the likelihood of the same content being shown again to the same person.

In relation to research that specifically address people's usage of Bluetooth functionality and their appropriation to extend their social everyday practices the following two examples are particularly apposite.

O'Neill et al. [O'Neill2006] investigated the use of Bluetooth and the naming of devices through the scanning of device names in public spaces. In their study they were able to classify distinct types of device names and proposed that people's usage of Bluetooth can be seen as an example of the emergence of a specific culture around artifact utilization.

Kindberg and Jones [Kindberg2007] went beyond the simple scanning of device names and, through 29 semi-structured interviews, tried to uncover the meaning behind the naming practices. They propose the characterization of the use of Bluetooth in mobile phones as a *partially embodied medium*: people can remain anonymous when disclosing their created identities (like in the internet) but, given the nature of the technology, they are also known to be sharing a certain physical space (which is a feature of fully embodied face to face communication). Kindberg and Jones [Kindberg2007] study also revealed that people tend to use Bluetooth mainly to share files. In many cases, the naming of the devices fulfils a practical issue of just relating the device with the owner in order to facilitate the process of media sharing. In these circumstances the names chosen often reflect in group practices, where the elements of the group are able to discern the names ambiguity. Sometimes, however, people also choose names that reflected their presences in other social circles: adopting the same name as the online one or choosing the same name that identifies them in particular practices. Particularly relevant for our study, Kindberg and Jones [Kindberg2007] clearly report that most of their interviewed participants did not tend to change their

device name frequently: of 27 participants that changed their device name only 5 did it more than once.

3. INSTANT PLACES

The system Instant Places was developed to serve as an infrastructure for the generation of content, directly or indirectly derived from Bluetooth presence, on a public interactive screen. The system is composed by one or more Bluetooth enabled computers each connected to a public screen and linked to a central repository. Information about nearby devices is periodically collected by a Bluetooth scanner and fed to a situation data model that manages data about the place and present devices. The central repository maintains persistent information about previous sessions, and combines information from pervasively distributed data sources, allowing for multiple screens in a large space to share the same presence view. The system does not need any a priori information about people, their profiles, permissions or groups, as all the information in the repository is entirely created from the history of presences.

3.1 Overview of the functionality

The basic form of interaction with Instant Places is to have a discoverable Bluetooth device with its name shown on the public display. This can be viewed as an implicit form of interaction where a person unexpectedly finds his or her name on the display. However, it can quickly turn into an explicit form of interaction when that person changes the device name for visualization on the screen. The visualisation of the Bluetooth presences provides an element of situation awareness that we hoped would foster the use of Bluetooth naming as a way for self expression. Furthermore, in order to provide the display of more enticing content, presence information was utilized as a seed for selecting further content from the photo sharing website Flickr.

To enable this latter functionality, support for the use of simple commands in the Bluetooth device names was introduced. This is achieved by parsing device names in search for keywords that are recognised as commands and then using them to trigger specific actions. Two types of commands were supported. The first is a tag command, allowing people to associate multiple tags with their identity. This can be done by including in the name the expression "tag:" followed by a comma separated list of tags, as in the following example "my device tag:punk,pop". The second type is the indication of a Flickr user name, which can be done by including in the Bluetooth name the expression "flk:" followed by the respective Flickr user name, as in the following example "my device flk:JohnSmith".

3.2 Visualizations

Two different visualisations for Instant Places were displayed. Figure 1 depicts the first design and displays real-time information about currently present identities.
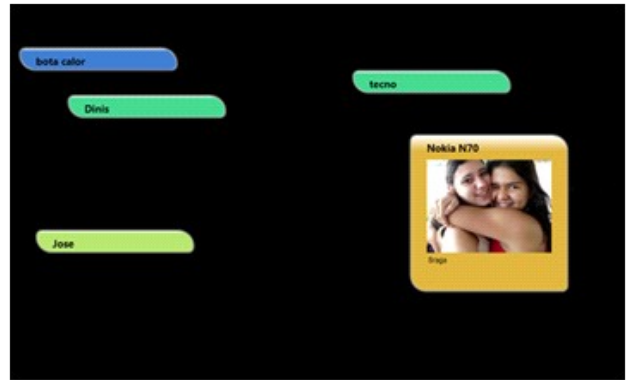

Figure 1 – Visualization A

Each identity is represented as a multivariate icon. The icon colour is generated when the identity is first created, and is always repeated with all subsequent visits to provide some recognition. As an identity remains present, a glow starts to build around the respective icon providing a sense of which identities have recently arrived and which ones have been here for while. For those devices with commands in the name, the respective icon expands to create space for the display of the photos obtained using that command as a seed.

The second visualization of Instant Places was designed with the goal that part of the content should be associated with place rather than individual identities. The overall idea was to explore the small contributions aggregated from the passage of identities that had been there before and left a bit of themselves to characterize that place.

Our approach has been to explore the concept of a tag cloud associated with the place. A tag cloud is a visualization of a weighted list of words in which some attributes, typically size and colour, represent particular features of the associated items. They have become very popular as a visualization mechanism for the topics on a web site, and also as an alternative navigation pattern. In Instant Places, we explored this concept, both as a way of creating an aggregate view that characterizes a situation and as a driver for aggregate content generation.

The result was the visualisation represented in Figure 2. Presences are still represented as icons, and exactly with the same behaviour as in the previous version. However, their size was reduced, and they were all arranged on a sidebar at the left of the screen. The remainder of the screen is used for representing the tag cloud and for showing with greater emphasis content derived from the tag cloud.
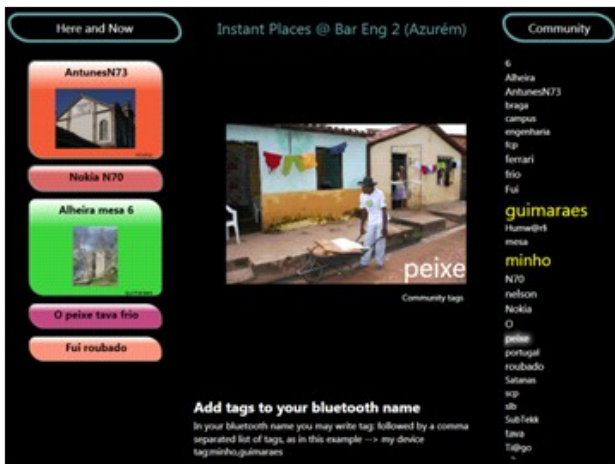
Figure 2 – Visualization B

The tag cloud is generated not only from the tags explicitly defined in tag: expressions, but also from all the strings used in Bluetooth names, thus providing a combination of implicit and explicit tagging. Each tag has a popularity attribute that is increased when the tag is found in the names of currently present identities However, the algorithm clearly favours explicit tags, as popularity increments are much stronger (10x) if the tag is explicit.

To achieve a balance between an historical aggregate view of the tags that have "passed here before" and the ability of the tag cloud to dynamically adapt to the ever changing flow of new tags, the popularity of tags is decremented with every new scanning, albeit at a much lower rate than presence-related increments.

With every cycle, the system represents the 25 most popular tags listed alphabetically, with their relative popularity being represented by their weight and their current presence being indicated through the use of a different colour.

4. THE USER STUDY CONDUCTED

The user study took place at a bar of the University of Minho campus and involved three sequential phases:

- First, running for 4 weeks, we conducted a silent Bluetooth scanning to obtain a neutral perspective of the local Bluetooth environment.

- In the second phase, running for 3 weeks, Instant Places was operational with visualisation A being displayed.

- In the third phase, the last 3 weeks of the trial, the system was running with visualisation B.

Leaflets with information about the project and instructions about the use of tags in Bluetooth names were distributed when the system first went public. Those same instructions were presented on screen during phase 3 as part of visualisation B. We also created a blog with more complete information about the project, and the blog itself was periodically shown on the screen to raise awareness about the project and its motivations and to attract peoples' comments about the system.

Since one of the objectives of this trial was to uncover how these techniques could be appropriated, no information or hints to specific uses of the system were referred to. This approach of clearly specifying usability while leaving interpretation of use open [Sengers2006] was purposely made to explore ambiguity as a design goal.

4.1 Setting

The bar of the University of Minho campus, where the study was conducted, is visited every day by several hundred people that come for coffee or a quick snack, normally in small groups. There are several peak periods, with the busiest moment being at lunch time, when small meals are served. The campus wi-fi service is available, and occasionally some students turn on their portable computers and stay longer. Instant Places visualisations were displayed using a large LCD screen that was already in the bar and is normally used for watching TV (see Figure 3).

Figure 3 – Picture of the bar showing the display with visualization A

4.2 The participants

Given the open nature of our study the collection of information of the system's logs made all people visiting the University bar with Bluetooth enabled participants in our study.

Groups	N of People	Age range
1	3	22-23
2	2	23, 25
3	3	All 20
4	2	23, 24
5	2	24, 25

Table 1 – General characterization of the in situ group interviews sub-sample

However, in relation to conducting in situ interviews to small groups (see Table 1 and the next sub-section for details regarding this method), a sub-sample of 12 bar

customers, all students of the University, distributed over five small groups was randomly selected.

4.3 The methodologies for data collection on system usage

Two distinct sources of information were used for our data collection:

- Logs of the system concerning the unique device addresses and unique device names used.

- In situ semi-structured group interviews to customers of the bar and one interview to the bar manager.

The main goal of the in situ interviews was to gain some insight on people's views and attitudes concerning the way the system was being used and generally perceived. The interviews were semi-structured covering the following set of themes [see, for example, Robson2002]:

- Using the Bluetooth technology – considering the central role that the Bluetooth technology has on the utilization of the present system, this theme enabled us to grasp a few fundamentals of the general familiarization of our sample with the technology.

- Familiarity with the system Instant Places – with this theme we aimed at tapping into people's reactions at first encounter with Instant Places as well as the degree of acquaintance with the system.

- Using the Instant Places properties – this theme generally explored how the interviewees did/were utilizing the properties of Instant Places at their disposal.

- Types of device names and tags used – the goal here was to further understand the specifics of the system's properties usage, in particular, to what extent were people able to talk about the "messages" sent to the public display.

- Issues concerning anonymity and privacy related to the use of Instant Places – this theme intended to inquire to what extent people were aware and had formed opinions regarding their anonymity and privacy when using the system.

- People's suggestions for further system development.

The procedure for the interviewing involved combining some initial specific questions with the utilization of probes in order to facilitate the interviewees' familiarization with a general view of the different themes and kick-start their collaboration. The interviews would, normally, proceed with more open questions, following the flow of the interviewees' contributions, in order to foster the possible uncovering of relevant episodes of use and attitudes towards the system.

5. RESULTS

The presentation of the results is mainly framed by the research questions initially set in the Introduction section, blending the analysis done on the usage logs and the data from the interviews.

5.1 Were people aware of their displayed Bluetooth presence in the public display?

Table 2 compares key Bluetooth utilization parameters for the first two phases of the study: the initial silent scanning, and the phase in which visualization A was made public. The estimated total number of visits to the bar is based on sales numbers provided. Information collected from the system's logs showed how many unique device addresses and user changed devices names were registered during these two periods.

	Silent scanning	Visualization A
Estimated visits	7625	6526
Unique devices	356	460
% visits w/ bt visible	4,7%	7,0%
Unique names	317	685
Names per device	0,9	1,5

Table 2 – Descriptive statistics concerning Bluetooth use in the silent scanning and visualization A phases

Table 2 shows an increase of the percentage of visible Bluetooth devices from the initial silent scanning phase to the deployment of Instant Places (from 4.7% to 7%). Furthermore, we can also observe that the number of names per device also increase from phase 1 to phase 2. These two facts strongly suggest some effect of the Instant Places deployment which in turn indicates that people were in fact aware of the system, their presence in it and acted by changing and/or adding names to their devices. The value of less than 1 concerning the number of names per device in the phase of silent scanning is due to the fact that some devices were left with their default name.

Information collected from the interviews is in line with the previous comments. All the participants interviewed reported having noticed the system before being interviewed. Of the twelve interviewees, five said to have changed their device name in response to their awareness of the system, although none of them on the first encounter. Nevertheless, these same interviewees witnessed colleagues changing their device names on first encounter. Furthermore, in one of the groups, the participants explicitly acknowledged the need to personalize their device name when confronted with the viewing of their default device name on the system's screen.

Some of the interviewees said to be unsure about the system's specific purpose, but others appear to have easily grasped the basic properties and how to adopt them

to enhance their own social relations within the bar: "*I could see the possible use as soon as I saw my colleague´s name on the screen*", "*The system might increase the interaction between people at the bar*". They clearly reported understanding of what was being displayed and saw the use of the system as a way for people to present themselves, to publicize things, to send playful messages and experiment with a new artifact (one of the users even displayed a commonly used phrase for programming learners: Hello World).

5.2 How did people "manage" their displayed Bluetooth presence? Did people change the name of their device? In what ways did they do so?

As mentioned in the previous sub-section, people seem to have changed their device names in response to the deployment of Instant Places.

Table 3 shows that from a total of 650 "seen" devices, 126 devices did change their device name. Furthermore, not a single name change was detected during the phase of silent scanning. Table 3 also indicates that although many people only changed their device name once (62), sixty four did so more often (45 people between 2 and 4 times and 19 more than 5 times).

Total unique devices	650
No name changes	524
1 change	62
2-4 changes	45
5 or more changes	19

Table 3 – Total number of devices registered in phases 1 and 2 and number of name changes per device

To further understand the uses people gave to the functionality of device name change, device names were classified according to emergent categories. The categories were: messages directed to or referring specific persons, messages related to the service of the bar, default names of the devices, personal names and nicknames, satirical and obscene messages.

Clearly, the most common type of name was some form of personal name or nickname (55%), followed by device default names (15%). However, people also appropriated this feature in order to send messages to others or even to the service being provided (see Figure 4).

Most of the messages directed to or referring specific persons were examples of playful and teasing behavior (comments about others sexual orientation, personal characteristics, etc...). Some messages referred to specific interactions happening at the time: "*Shut up X!*", "*Let's go to the Architecture School!*", "*Can you give me a cigarette?*" Other messages played with the sender's knowledge of other people device names trying to pinpoint them within the bar. For example, "*The guy with*

the black coat!" Some messages could also take the form of a reply of an on-going dialogue within the bar that could suddenly become displayed in the screen. Finally, in relation to this category, we were also able to identify true dialogues through the display (see next sub-section for a more detailed description).

Messages directed to the service of the bar were also sent: "*The fish was cold*", "*The coffee was burnt*", "*The cake was not fresh*" or suggestions "*We want ham sandwiches*". The interview with the bar manager supported the idea that these messages were mostly playful behaviour taking advantage of the particular friendly relationship between the manager and his customers.
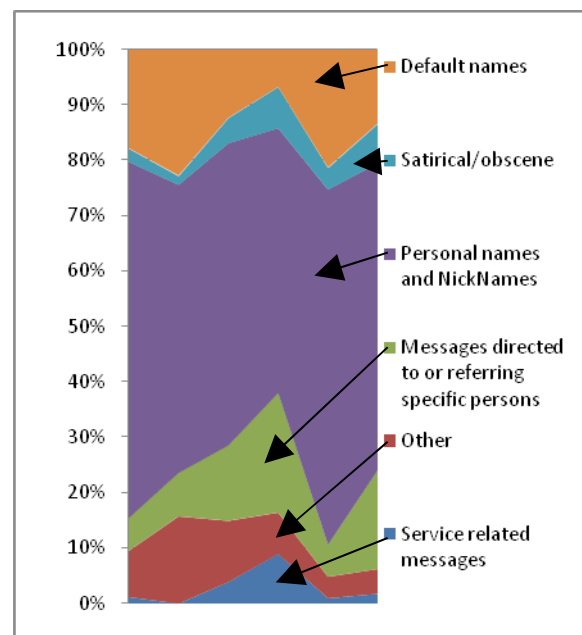

Figure 4 – Graphic displaying the evolution of found device names by type along the phase 2 (with visualization A)

Approximately 37 people took advantage of the possibility of using tags. The tags uncovered through the analysis of the system logs reveal that almost half of the tags referred to places (names of cities, particular locations, etc). Another important category includes to personal interests, like football clubs, sports, music or hobbies. The third largest category included tags that could be considered obscene or satirical. In most cases these were explicit attempts of "wining" over the limitations imposed by the system and being able to cause the display of obscene photos. It is also curious to observe that most of the 37 participants that utilized tags also changed their device names more than once.

We were also able to observe what seemed to be a few cases of further identity disclosure by re-directing the observer to other places in the virtual world. People did so not only by providing Flickr addresses (three cases)

but, in other three cases, displaying in the device name the address of what seems to be personal blogs.

The interviews, however, did not reveal much about the use of tags. Apparently, the few interviewees who did use tags (only three from one specific group) considered doing so without any specific relation with their use of the device name - they quite clearly referred to their utilization as "random in relation to the names".

5.3 Were people curious and responsive to the other displayed Bluetooth presences?

As already referred to above, people used the device names in order to identify themselves within their in-group, but, in other cases, people appropriated the display as a message board, broadcasting highly situated messages.

Although our interviewees mentioned that they did not react to content being displayed on the screen by changing their device names or tags, they were quite positive about having witnessed such occurrence with colleagues.

In fact, the analysis of the device names and its temporal occurrence, using the system's logs, enabled us to uncover short dialogues through the public display. These exchanges, at least five, seem to be cases where messages directed to a specific person were replied by the target person, sometimes provoking a tit for tat. As examples, we could identify: (a) "*Will you marry me?*" "*Yes, I will!*"; (b) "*I got an average mark of 15!*", "*But he gets 10 in accounting*", "*Just to give you a chance*", "*If you can, all can*".

5.4 How did people react to the relative anonymity provided by the system?

The types of personal or nicknames people used to personalize their device mostly show in group practices, where the names leave space for ambiguity if the perceiver is not a group member. This way people are identifiable by their group peers and maintain a certain degree of anonymity towards strangers.

As expected, some people took advantage of the relative anonymity provided by the system to send satirical or obscene messages to the display. It seems they were testing the limits of the possibilities and probably integrating this functionality into situated in-group practices. When asked in the interviews about the display of less proper content, most of the interviewees considered blocking the content an option. Nevertheless, a few pointed out the technical difficulties of such blocking actions and the need for people to be more responsible for their own activities, foreseeing the emergence of some kind of code of conduct, and, we can add, some sense of community.

The interviewees also show some general consensus that although the relative anonymity provided by the system encourages its use it also allows the emergence of content that is considered less proper for a public space. In relation to privacy issues, all the interviewees considered that given the characteristics of the technology it is just a question of personal choice, they were not concerned of any procedure to trace back the origin of the content being displayed on the screen.

5.5 Participants suggestions for further system development

We also asked our interviewees in what ways could Instant Places be further developed. The collection of accounts seems to point out the following main issues:

- More user centered interactivity - the interviewees suggested the possibility to send and download content (pictures, music etc.) and play games using the screen. In this sense, it seems the participants are viewing Instant Places through the Bluetooth usage metaphor (see Kindberg and Jones, 2007).

- More content - the interviewees seem keen on the displaying of more information on the screen (general news, news about the University, local events, etc.).

- The deployment of similar screens at different locations within the University, all connected, so that people could use them to communicate and interact. This suggests the notion of an extended place - not this specific bar but all the bars within the University.

6. DISCUSSION

Generally speaking, our results strongly suggest that some people frequenting the bar (approximately 19% of all potential users, if considering the data collected in the silent scanning phase) appropriated the technology and used it in creative ways. The simple interaction mechanisms were indeed adopted and included in everyday social practices at the bar. The interactivities provided were able to overcome possible "entry barriers" and were successful in persuading people to utilize the system, which was previously identified as a problem with other proposed systems [Brignull2004; Huang2006].

Looking more specifically at the research questions formulated initially, the results presented strongly hint that people were aware of their Bluetooth presence in the public display. Furthermore, by changing their device names they were able to figure out a diverse range of possible uses: display personal names and nicknames (and consequent self disclosure), writing situated messages towards other people, writing messages directed to the service of the bar and cases of defiant/deviant behavior by posting satirical or obscene messages.

When comparing our findings with the findings reported by Kindberg and Jones [Kindberg2007] the following issues seem particular relevant:

- In the Kindberg and Jones [Kindberg2007] study people reported not changing their device name frequently, the personalization of the device seems to have some resilience. Considering the main use the participants give to Bluetooth, a file sharing device among friends, it makes sense not to change the device name to facilitate recognition and sharing. In our study, however, people did change their device name. Since the purpose of our system was not file sharing some people were quick and keen in adapting their usage of Bluetooth to explore the inherent possibilities of this new artifact.

- The nature of personal names and nicknames seems analogous in both studies. People chose to partially disclose their identities keeping in-group codes. Similarly to what Kindberg and Jones [Kindberg2007] found, we also had a few cases of deliberate attempts to re-address the attention towards the other facets of the device owner – a few people did publish their Flckr id and a few others gave clues to their online presence (pointing to blogs).

- Reinforcing the notion of the role of the public display in the use of Bluetooth, the emergence of situated messages and dialogues are particularly interesting cases. In relation to situated messages towards other people, it is quite peculiar to see that we were able to identify some cases where the message tried to pinpoint a particular person at the location. This seems to suggest that people extended the notion of quasi-anonymity and played with it, something that had some correspondence with what was also reported in Kindberg and Jones [Kindberg2007] study, when people send messages to other Bluetooth devices and expect to identify the owner by his/her behavior. However, in our case, the person sending the message makes the identification of the other public and that transforms the nature of the interaction. The case of dialogues seems to be an example of the importance of being able to publish and make a statement – some people are keen on doing so (even with the most frivolous purposes) and we wonder if this can play in our advantage concerning our intention to foster the generation of situated content.

- Another important issue is people's suggestions for further development. In one hand, the request for more content and the possibilities to upload and download files appears to be close to the notion of "common" Bluetooth usage. On the other hand, the suggestion concerning the possible connection of different displays at distinct locations points towards the notion of an extended place, and somehow, tweaking the spatial constraints of Bluetooth as a communication medium.

7.CONCLUSIONS AND FUTURE WORK

The evidence collected point to the notion that novel social practices emerged when the Bluetooth usage was made public in an interactive display. The simple interactivities provided were appropriated and people were able to find ways to explore the artifact. Furthermore, instead of a single usage pattern we were able to identify distinct uses: opportunities for personalization, the public display as a message board, and cases of trying to tweak and win over the system. Such results strengthen our belief that this is a worthwhile line of research.

In relation to future work, the following three main topics will be pursued:

- Exploring the space dimension - by this we mean to extend the notion of place supported by the system beyond the local space, allowing multiple spaces, contiguous or not. For example, connecting a set of public displays and supporting interactivities between them.

- Exploring the identity dimension – this dimension highlights issues of personalization and self disclosure and the intention is to study how to promote the evolution, differentiation and social relations of the identities created by the system. This may involve exploring the history of presence and interaction, building reputations, supporting explicit control of some identity elements, supporting social networks between identities, and making all these things perceptible.

- Exploring the web dimension - we intend to investigate new models for linking Bluetooth identities with several types of web presence, such as Facebook, Twitter, MySpace or others.

Finally, in terms of methodology, we are considering utilizing some different methods to be able to triangulate the findings and enrich our understanding. Although the descriptions provided in this present paper are, in our opinion, enriching we still need to account with more depth the motivations behind the behavior. More research is needed to understand the meanings of the messages displayed and its relation to the on-going situated social interactions. For example, to what extent are the targets of a certain message able to reply (or feel comfortable doing so)? Is it possible that the interactive display becomes a medium for harassment or bullying? Can we observe a code of practice emerging? To what extent is this code of practice a true reflection of the sense of community and place? In order to investigate the referred to themes individual interviews will be conducted and the

construction of more structured questionnaires will be explored.

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