Supporting Community in Third Places with Situated Social Software

Joseph F. McCarthy, Shelly D. Farnham, Yogi Patel, Sameer Ahuja,
Daniel Norman, William R. Hazlewood, Josh Lind

Strands Labs
4143 University Way NE
Seattle WA 98105 USA
http://labs.strands.com/seattle

mccarthy@strands.com

ABSTRACT

The Community Collage (CoCollage) is designed to cultivate community in a café, a quintessential "third place", by bringing the richness of online social software into a physical community space. The system shows photos and quotes uploaded to a web site by café patrons and staff on a large computer display in the café, providing a new channel for awareness, interactions and relationships among people there. We describe the CoCollage system and report on insights and experiences resulting from a 2-month deployment of the system, focusing on the impact the system has had on the sense of community within the café.

Categories and Subject Descriptors

H.5.3 [**Information Interfaces and Presentation (e.g., HCI)**]: Group and Organization Interfaces – *Asynchronous interaction, Synchronous interaction*

General Terms

Design, Experimentation, Human Factors, Measurement.

Keywords

Place-based social networking, situated social software, public displays, community, third places, cafés, coffeehouses.

1. INTRODUCTION

Cafés are quintessential *third places*, "'homes away from home', where unrelated people relate" [15]. These local, accessible and inclusive "great, good places" act as staging grounds for cultivating the vital informal public life that is essential to all great cultures. They provide neutral spaces in which diverse people with divergent views can serendipitously encounter and engage with one another. In contrast to many online communities of interest, third places in the real world provide "the full spectrum of local humanity", creating opportunities for connecting with people with different interests, and for appreciating that other people can be interesting, in spite of – or perhaps because of – these differences. In addition to personal benefits, the "inclusive sociability" and "ease of association" offered in such places benefits the community by enabling people to discuss, plan and execute "potentially useful collective undertakings".

C&T'09, June 25–27, 2009, University Park, Pennsylvania, USA.
ACM 978-1-60558-601-4/09/06.

Although many cafés and coffeehouses are designed to encourage conversation and community, the growing proliferation of technology, especially laptops and mobile phones with wireless Internet access, is rendering many such places "physically inhabited but psychologically evacuated" [7]. Café patrons often use technology to tunnel out to their online social networks, while ignoring the physical community in which they are situated. Some cafés have responded by prophylactically disabling wireless Internet use on weekends [4].

The Community Collage ("CoCollage") is a new place-based social networking application designed to bridge the gaps between people in coffeehouses by bridging the gaps between the richness of their online interests and activities and their physical presence in a potentially "great, good place" [15]. CoCollage links online profiles, machine-readable loyalty cards and a large computer display that shows elements from those profiles when people use their loyalty cards in the café.

The CoCollage display, situated near the coffee bar, incrementally adds social media – digital photos and short text messages – to a dynamic collage (see Figure 1). Priority is given to media items associated with people who are physically present in the café, offering new channels of awareness and potential conversation-starting opportunities ("tickets to talk" [21]). CoCollage is an example of *situated social software* [22], designed for use by a specific social group – and, in this case, a specific social setting – rather than for a generic set of users.

Figure 1: CoCollage display in a cafe.

CoCollage is deployed at a café in the University District of Seattle. This paper describes the primary components of the system, compares and contrasts it with related work in the research literature of communities and technologies, and presents the results of a two-month study of the system's usage and its impact on the sense of community and place attachment in the café.

In developing a framework for measuring the impact of our technology on sense of community and place attachment, we draw heavily from research by Rosenbaum, *et al*. [19], on *third place attachment*. In a study of 83 patrons of a coffee shop, they found that people who experience voids in their social support networks – e.g., through moving to a new place – may fill those social voids by visiting third places and connecting with the community they find there. As they develop supportive relationships through the third place, they become attached to the place itself. Drawing from sociological research, we also found a measure of psychological sense of community [23] that we believe is appropriate for assessing the impact of situated social software like CoCollage.

The study we report here demonstrates that users of CoCollage experienced a significant increase in two dimensions:

- the *neighboring* factor of sense of community, which is the extent to which people in a community visit each other's homes and/or do each other favors, and
- the *dependency* factor of place attachment, which is the extent to which people rely on the place itself to have their needs met.

After reporting on the results of this study, we conclude with a discussion of lessons learned from our deployment and future plans for enhancing the system.

2. SYSTEM COMPONENTS

CoCollage consists of a number of system components. Online profiles are created on the CoCollage web site, which enables users to upload, link to and share digital content – currently images and text – as well as vote and comment on others' content. The presence of users is established via an explicit "check-in" through the use of machine-readable loyalty cards or a button on a web page that is enabled only when the user's computer is connected to the wireless Internet router in the café. A visualization component shows a continuously updated collage of content items selected from users' online profiles. An administrative interface enables café owners and employees to control the behavior of the system and manage its users. These will be described in more detail in the following sections.

2.1 Online Profile Management

The profile management system enables people to create or modify a CoCollage account. Each account has the following features:

- username
- email address
- password
- avatar (thumbnail image representing the user)
- loyalty card ID
- greeting message
- birthday
- a collection of social media content items

The first three fields are required, the others are optional. A user's *username* and *avatar* are shown on the "People" page on the CoCollage web site (see Figure 2), and also included along with any of their content items shown on the display or on the web site. Entering a *loyalty card ID* in the profile enables the user to "check-in" via their card. The *greeting message*, which defaults to "It's great to be here!", is shown on the display when the user checks in; if the check-in occurs on the user's *birthday*, a special birthday greeting is shown.

CoCollage users can add to their collections of social media *content items* in two ways: explicitly or implicitly. Explicit specifications of items take the form of either a local image file name (accessed through a file browser pop-up window) or a free text field, e.g., for an inspiring quotation or other short message to be shared with others.

Implicit specifications take the form of RSS feeds that tap into social media streams generated through other web services; in the current version of CoCollage, we offer a connection to the Flickr photo-sharing web service. Each implicit stream is represented by a username (on the hosting web service) and a set of optional tags that restrict the range of media imported from that stream to items that include those terms in their metadata.

2.2 Online Interaction

In addition to supporting the creation and maintenance of a user's online profile, CoCollage supports a few types of online interactions. Users can view others' profiles and the content in those profiles by clicking on the avatar or username of anyone appearing in the "People" tab on the CoCollage web site.

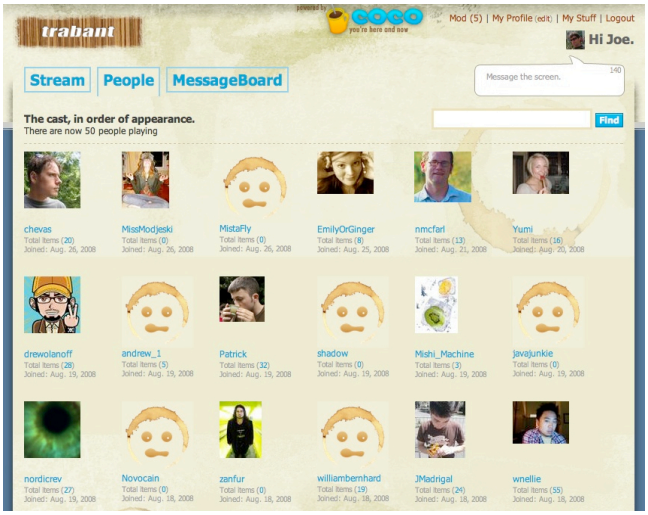

Figure 2: CoCollage "People"

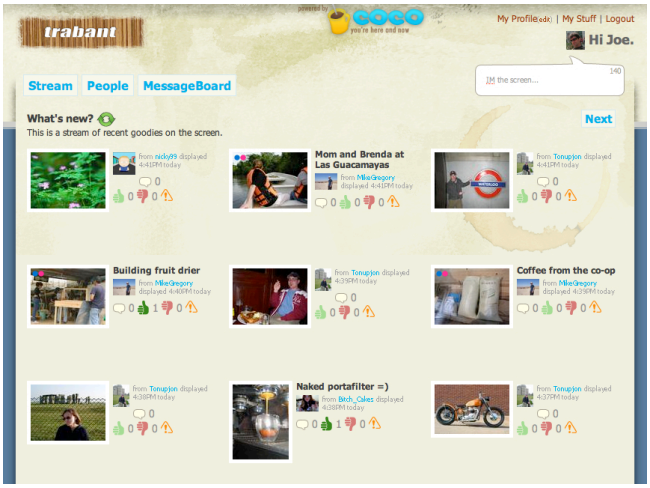

Figure 3. CoCollage history "Stream"

Users can also view a chronologically ordered history of content items that have been shown on the CoCollage display by clicking on the "Stream" tab (see Figure 3).

Any item appearing in either people's profiles or the history stream can be voted on ("thumbs up" or "thumbs down"), commented on, or flagged as inappropriate by any user. Content that is flagged as inappropriate is immediately removed from the CoCollage display and has a "flagged" image and label superimposed upon it on the web site, pending a decision by a system administrator.

CoCollage users who are connected to the web site in the café may also send messages directly to CoCollage via a textbox near the upper right of any page. These messages become part of the history – and may thus be commented or voted on – but do not become part of the collection of content items in their profile.

2.3 Check-ins

Users can notify the system of their presence in the café in two ways, through the use of their loyalty card or through clicking the "I'm here" link that appears at the top of any page when they are connected to the web site while in the café.

The current version of the system has a magnetic stripe card reader attached below the display, through which users can swipe their loyalty cards. Future versions of the system will integrate the loyalty card check-in directly with one or more point-of-sale (POS) terminal software packages, so that simply using the loyalty card for a purchase will mark the person present.

2.4 Display Visualization

The ambient collage on the screen is updated with a new image or short text message every 15 seconds. When a person's presence is first detected, a welcome message and personalized greeting are displayed, along with the user's avatar and username (Figure 4).

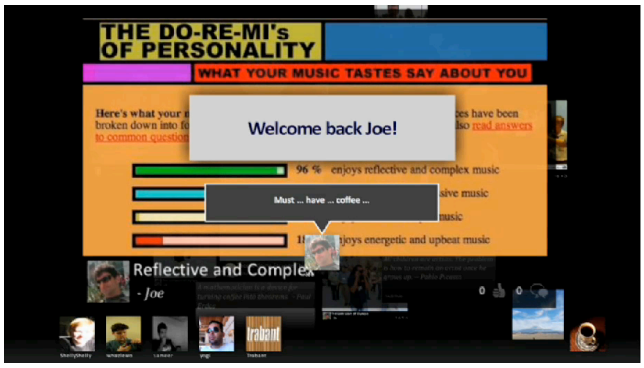

Figure 4. Welcome message on CoCollage screen

The avatar and username are then moved to the leftmost position in the queue of users who have recently checked in – shown along the bottom of the screen – and a new image or text message associated with that person's profile is immediately added to the collage. When users send messages directly to the display, they pop up in a bubble above the user's avatar in the queue (Figure 5).

The initial version of the collage visualization represents a 3D space as viewed from a position perpendicular to the planes of the individual items. The distance of an image from the "camera" is proportional to the amount of time the image has been on the display. Whenever a new item comes in at the center of the screen, a semi-random algorithm determines its final position so as to fill the visual space as completely as possible, emulating the collage metaphor. Every few minutes, the camera performs a randomized pan motion around the items. When viewed from different angles, the 3D nature of the collage is revealed to the viewers.

Figure 5. Direct message sent to CoCollage screen

The selection of the next item to be added to the collage is based on several factors, including when the item was added, the last time it was shown, how many thumbs up votes it has, how many thumbs down votes it has, how recently it was voted upon, how many comments it has, how recently it was commented upon, and when the author of the item last checked in.

The algorithm strives to balance the goal of showing items that are of interest against the goal of minimizing "repetitive display injury" (the boredom that would result if the same small subset of photos is shown over and over). Content items from users who are considered present (via check-ins) are generally preferred to items from users not present. The algorithm also takes into account aspects of the content items themselves, preferring items that

- have been submitted recently
- have not shown recently
- have recent and/or many "thumbs up" votes
- have few "thumbs down" votes
- have recent and/or many comments

Scores for these features are weighted and normalized. A weighted random selection is then made based on the normalized scores.

2.5 Administrative Interface

Like other users, the administrators – owners and employees at the café – can view a history of content items shown on the display, as well as vote or comment on items. Administrators also have a special page on which they can review any items that have been flagged as inappropriate. Content items that are deemed inappropriate by administrators are blacked out in the history list; those that are deemed appropriate are restored to a normal view.

The administrator interface also enables the banning of users, not just items, for cases in which users repeatedly submit inappropriate content or comments.

3. RELATED WORK

The decreasing costs and increasing proliferation of large, interactive displays is resulting in an ever-broadening array of physical contexts in which these displays can run applications that offer value to the people in, or passing through, such contexts. The research prototypes developed and reported in the literature thus far differ primarily in the types of contexts, content and interaction models they have offered.

The Notification Collage [5] is an application running both on personal computers and a public display that enables members of a small work group to share a variety of content – e.g., photos, slideshows, video, web pages, notes – with both collocated and

remote members of the group. Although we have adopted the collage metaphor in our CoCollage application, we have restricted the range of content sources to make it more accessible to our broader population of users.

The Plasma Poster Network [1] consists of three large, interactive displays deployed in a kitchen, hallway and foyer of an industry research lab. Content producers can post text, web pages, images and short video clips; content consumers can read content, navigate different content frames and send messages to content producers. We have drawn heavily upon the insights and design principles articulated in this work, and differentiate it in a few important respects. Rather than require people to explicitly post individual content items to the displays, we also offer the option to tap into and repurpose existing social media streams (e.g., photos on Flickr). The content shared on Plasma Posters tends to be mostly professionally oriented, whereas much of the content shared on the CoCollage display is of a more personal nature. Finally, the content shown on the Plasma Posters, like that in the Notification Collage, was not related in any specific way to the people who happened to be near the displays at any given time. Content on a CoCollage display is strongly influenced by the people who are in the café (and, thus, near the display).

The EyeCanvas application is an instantiation of the Plasma Poster designed for a café environment [2]. EyeCanvas incorporates many of the features as the original Plasma Poster, with the additional capability of enabling café owners to show content relating to the café (e.g., menus or upcoming events) and enabling customers to "finger scribble" on the touch screen display. The type of context – and content – is closely related to CoCollage. The ability to interact directly with the screen itself is a beneficial feature that we have chosen not to include, due to the additional cost of a touch-screen over a standard display and our desire to set the stage for as broad – and thus, as cheap – a deployment of our technology as possible. While the EyeCanvas incorporates media contributed by the café owners, there is no way for café customers to submit content via a web page for inclusion on the display (unlike the original Plasma Poster), and it does not allow users to specify a stream of content to have shown on the display.

There are relatively fewer examples of large displays that show content relating to the people who are in their vicinity. IBM's BlueBoard [20] is an example of a large display whose content and applications are affected by people nearby. Users can swipe their employee badges at the badge reader in order to bring up a whiteboard, presentation, calendar or other tools to engage with others on focused collaboration tasks. The CoCollage system, by contrast, is intended for less focused, more ambient types of awareness and interactions in a non work-oriented context.

Some display applications are beginning to augment physical spaces in a more proactive way; by recognizing and responding to individuals who enter or leave the physical space. AutoSpeakerID, Ticket2Talk and Neighborhood Window are examples of such *proactive displays,* deployed in a conference setting [11]. These applications require conference attendees to create an explicit web-based profile and associate that profile with a radio frequency identification (RFID) tag. The applications show elements of those profiles when the associated RFID tags – usually inserted into conference name badge sleeves – are detected nearby. Although our primary goal is similar – increasing the sense of community among collocated people – the CoCollage system differs in at least four key aspects: we use a loyalty card rather than an RFID tag to identify people; our profiles can contain both explicit content to be displayed as well as pointers to implicitly specified and [potentially] continuously updatable streams of content; our deployment is in a café rather than a conference venue; and the displays have been in use longer than 3 days.

The C3 Collage [12] is similar in many respects to CoCollage: it uses large displays to show a collage of Flickr photos associated with people who are considered "present" (near the displays). The system uses Bluetooth phone IDs to detect who is present, and has the additional advantage – and, as noted above, the associated costs – of a touch-screen interface on the displays. While the users of the C3 Collage (members of a Nokia research lab) regularly carry mobile phones with their Bluetooth radios set to "discoverable", we found relatively few people in the café with discoverable Bluetooth phones. CoCollage allows both the kind of implicit specification of content as the C3 Collage and the explicit specification of content. Finally, CoCollage is being deployed in the considerably less constrained context of a café, in which different kinds of relationships typically exist, and our analysis of the deployment is looking at the impact of the system on users' relationship to – and through – the place in addition to their relationships to each other.

CityWall [18] is a large, multi-touch interactive public display deployed in Helsinki city center. The display shows a zoomable timeline of photos of the city (public Flickr images with the tag "helsinki") that can be resized, rotated and moved with one- or two-handed gestures. The use of CityWall has been extensively recorded via a hidden video camera and microphone (recording mechanisms that would not be acceptable in the café environment in which CoCollage has been deployed). The initial analysis provides many details of the interactions people had with the display over the course of a week. CityWall provides a greater range of interactions than the CoCollage display (e.g., a touch-screen to rotate and resize images). The CoCollage system differs from CityWall in a few significant ways. CityWall photos are related to a broader sense of place (the city of Helsinki vs. a single café). The study revealed interesting facts about the interactions people had with the display (e.g., the relative numbers of individual vs. multi-person interactions, and the variations of multi-person interaction they label parallel vs. teamwork), but yields few insights on the interactions people had with each other – except the shared interactions on the displays themselves – or the impact those interactions had on people's relationships with each other or the place.

Given that CoCollage is an example of a technology to support a community, this work is related to other work focused on communities (and not just technologies). CoCollage adopts a "Web 2.0" approach [17], enabling the use and prioritization of user-generated content through tools for community self-regulation [8]. By writing on a wall in a semi-public space, so to speak, people have a unique opportunity for awareness and interactions with each other over time, facilitating the development of not only interpersonal relationships but the community as well.

Community development is extremely important to many café owners. Rosenbaum, *et al*. [19], conducted a study of the role of commercial social support on third-place attachment. In their study of customers who regularly visited a coffee shop, they found that the more social support that customers received from others in the coffee shop, the more place attachment they felt. That is, they had an increased sense of belonging, dependency, and identity with the coffee shop itself. Thus, in deploying the CoCollage community display, we hope to not only help individuals meet each other, but to help build a sense of community over time.

4. DEPLOYMENT STUDY

In a preliminary study of CoCollage, we distributed a questionnaire both within the coffee shop and online to early adopters to better develop our baseline measures of place attachment and sense of community [3]. We found that about half of the people in the coffee shop were interested in meeting others within the shop, and that people who had higher levels of place attachment and sense of community were more likely to adopt the technology. The question remains, did CoCollage have a meaningful impact on people's sense of community and place attachment two months later.

4.1 Research Goals

Our primary research goal in this paper is to assess whether the CoCollage deployment had a meaningful impact on people's community experiences within the café over a two-month period. We predicted that our users' place attachment and sense of community would increase with continuous use of the system.

4.2 Study Procedures

4.2.1 The Participating Cafe

We selected the coffee shop for our deployment by reviewing local coffee shops on a number of dimensions, including size, space configuration and sense of community. We interviewed several coffee shop baristas and owners to explore their interest in participating in our research project. The site we selected had both the right mix of physical features and owners who expressed the most interest in actively engaging in an iterative design process.

The owners, baristas and customers at the coffeehouse we selected have co-curated a creative community space. The artwork on the walls and the music being performed on Mondays (an "open mic" night hosted by one of the cafe customers) and weekends reflects some of this creativity, but one of the strongest markers of the creativity that flows through the space is the sketchbooks they have put out on tables that various people have contributed to over the five years since they opened. The sketchbooks reveal a wide variety of depth and breadth of individual personal introspection and community-oriented social, political and artistic commentary. They also reveal conversations and connections being formed as people riff on each others' words and pictures across space (pages) and time, a form of reciprocal self-disclosure. One of our goals in deploying CoCollage at this cafe is to open a new channel for expressing this creativity and revelation to all members of the community.

Based on interviews with café owners, on site observations, and the initial questionnaire we estimated that there were about 400 regular customers, out of which 200 might be interested in joining the CoCollage system to meet others (see [3] for more details).

4.2.2 Deployment

We initially made the system available only to the baristas and the owners for a week, to test the site and to ensure a sufficient initial population of content items, and opened the system to all customers in mid August 2008. Accounts were restricted to customers who actually visited the shop by requiring people to use invitation codes printed on cards that we placed in the shop near the display. The system has run continuously since that time, a period of nearly four months at the time of the writing of this paper.

4.2.3 Questionnaires

In order to assess the impact of the display over time, we sent emails to CoCollage users to recruit participants to complete a questionnaire at two stages of their use of the system: within a week of first creating an account and then two months later. 24 people completed the first questionnaire between September 8 and September 29, (Time 1) out of a population of 101 users at that time, and 19 people completed the second questionnaire two months later, between November 3 and December 1 (Time 2), when the system had 143 users. All of the people who completed the questionnaire at Time 2 had been in the system for at least two months. 10 people completed the questionnaire at both times. Participants received a $10 coffee gift card for each questionnaire completed.

For our measures of sense of community and place attachment, we also adapted the psychological sense of community measure [23] to apply directly to sense of community within the café, and then adapted questions from Rosenbaum, *et al.* [19], assessing the three dimensions of place attachment: functional dependency, commitment to continue using the café, and identification with self. An earlier report on a preliminary study [3] examines these measures as tools for assessing community technology deployments at greater depth.

We also had 15 café customers who are *not* CoCollage users complete a brief questionnaire in the café at Time 2 to assess if the display alone had an impact on people's sense of awareness or interactions with others within the cafe.

4.3 Study Results

4.3.1 Interviews with Café Owners

Each week we met the owners of the coffee shop to solicit feedback for aspects of the system and the deployment that were or were not working, and then brainstormed possible solutions for problems as they arose. This process proved extremely valuable in better understanding how the technology was being used in context by all of the stakeholders involved – the owners, the baristas, and the customers – and what were possible barriers to adoption.

The owners informed us early on that while customers were curious about the new display on the wall of their café, the baristas did not feel well prepared to explain it. Thus our initial deployment efforts focused on increasing understanding and awareness of the system and encouraging adoption. One of our early challenges was helping customers understand that the CoCollage display was not a TV. Another early challenge was letting customers know that they could join in the community of participants (i.e., it was not only for the owners and baristas at the café). The owners helped us craft signage and a flyer to help get these messages out. The flyer also helped reduce the burden on the baristas, who could now offer a brief[er] explanation and then hand a flyer to interested customers.

4.3.2 Usage analysis

Within the first fourteen weeks of our deployment – at the end of Time 2 (December 1st) – there were 143 CoCollage accounts created by members of the coffee shop community, including baristas and customers. This means we reached about 35% penetration with the regulars, and 70% of the regulars we estimated would be interested in meeting others through the cafe. We examined some basic usage statistics to answer whether people are using the community features. As can be seen from Figure 6, the majority of users have updated their own profiles, uploaded images to the share on the CoCollage display, browsed other people's profiles, and browsed other people's images (with 47 image views each). Between 20% and 30% further added comments to images and profiles, and sent instant messages to the screen.

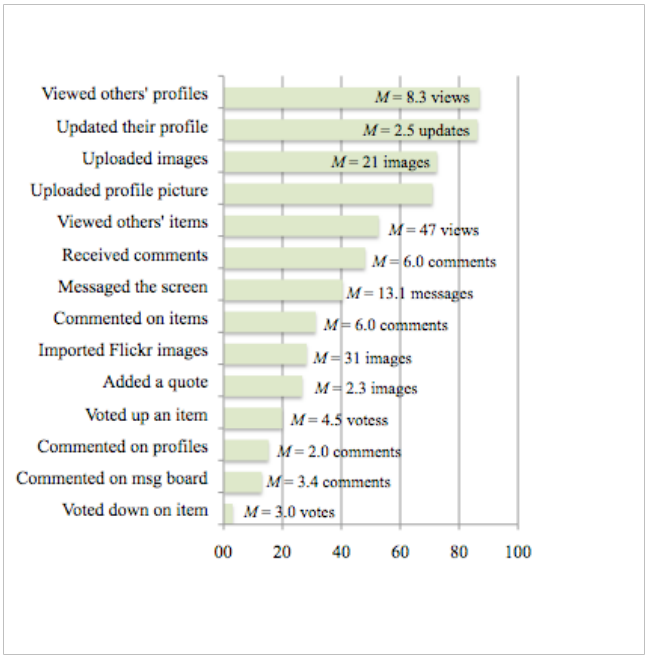

Figure 6. Percent of users who engaged in activities, with their mean usage

These numbers are reflected in self-reports of usage, on a Likert scale where 1 = "not at all" and 7 = "extremely so. Participants indicated CoCollage was used primarily to share (M = 4.5), and less so to communicate (M = 3.0) or get to know new people (M = 2.4). We also found there is a significant correlation between the desire to make friends at Time 1, and the number of comments users posted on others' profiles (r = .43, p < .05) and the number of unique days they have returned to the system (r = .43, p < .05).

Because sharing images was a primary usage of CoCollage (96% of content items are images; the remaining 4% are quotes), we decided to examine more closely the types of images people were sharing with each other on the display. To do so, we selected 150 images from the stream at a time when no one had yet checked in for the day (this biases the sample towards images from more active users that have received comments, and reduces the likelihood of multiple images from each user). Based on both the image and the caption, each item was then categorized by whether it was *personal*, of or relating to the personal life of the person posting the image (e.g., picture of their pet, or picture of a friend), or *impersonal*, having no direct relation to the person's personal live (e.g., picture of the Seattle Space Needle). A picture was considered impersonal if it did not reveal any information about the person who posted it that could not already be assumed (e.g., that they live in Seattle).

We found that 43% of the images were personal, and that 57% were impersonal. The personal images were largely comprised of pictures of friends, pets, and expressions of interests and hobbies. The impersonal images were largely comprised of images of urban environments, nature, and travel pictures. Figure 7 provides a more complete breakdown of the proportion of images in each category.

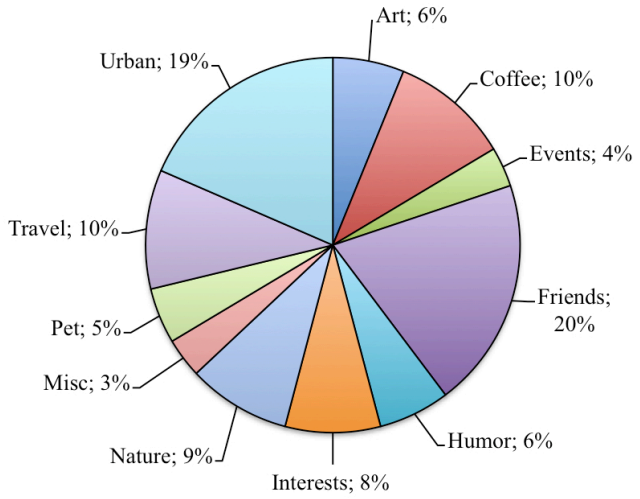

Figure 7. Categories of CoCollage images

It should be noted however, that even though many of the impersonal images did not relate directly to the person posting them, they did speak to the community. Many of the images of urban environments, nature, and events were taken in Seattle and the surrounding areas.

4.3.3 Impact on Community Development for CoCollage Participants

Our first question was whether use of CoCollage increased the numbers of friends our users knew through the coffee shop. Aside from two outliers, we did not observe changes in average number of friends from Time 1 to Time 2. However these two outlying (z > 3.5) users did report many friends made through the coffee shop at Time 2 (M = 40). It should be noted, however, from our preliminary study at Time 1 [3] we did not observe that *raw* numbers of friends in the coffee shop correlated with sense of community or place attachment.

Our next question was whether users at Time 2 had higher levels of sense of community and place attachment than did users at Time 1. In our previous study we found that people who already had a higher sense of community were more likely to adopt the technology; in our new study, we are assessing if that level changed over time.

An examination of our measures of sense of community and place attachment shows that people at Time 2 had higher levels of community on the *neighboring* factor (t(42) = 1.76, p < .09[1]), and

[1] This test is for independent samples with *two*-tailed significant levels, thus are both p < .05 for one-tailed tests. For the subset of users (N = 10) who completed the questionnaire twice, at Time 1 and Time 2, we completed the same analyses using paired sample t-tests and found very similar effects, except there was a stronger difference on the commitment dimension of attachment (t(9) = 2.80, p < .03). While the between subjects' analysis violates assumptions of independence for that subset of users, it is also usually statistically a more conservative test due to higher variance, and so is reported here.

higher levels of attachment on the *dependency* factor ($t(42) = 2.00$, $p < .06$), than at Time 1. See Figures 8 and 9.[2]

As noted earlier, the *neighboring* component of sense of community indicates the extent to which people visit each other's homes and do each other favors. The *dependency* component of place attachment indicates the extent to which people rely on the café to have their needs met (e.g., "I get more satisfaction out of this coffee shop than other coffee shops"). Thus, as people's sense of neighboring increased through their use of CoCollage, so too did their sense of dependency on the coffee shop.

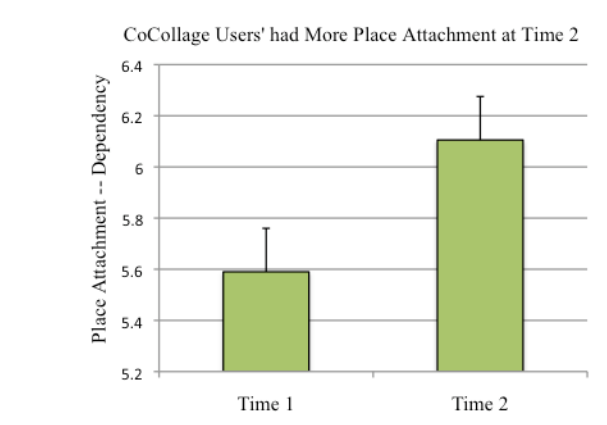

Figure 8. Change in place attachment across time.

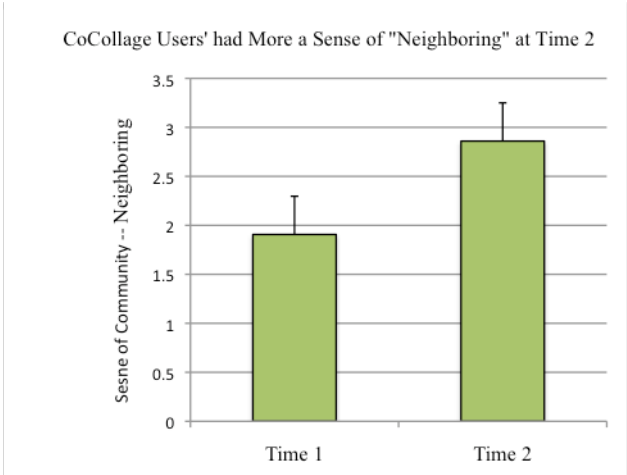

Figure 9. Change in sense of community (neighboring) across time.

A more general sense of community, and the commitment and identification factors of the attachment scale, did not change over time. It should be noted, however, that our previous study showed that the users who are already high on these measures are also more likely to adopt the technology, so there may be a ceiling effect.

[2] Note that measures of sense of community and place attachment are averaged items on a Likert scale, where 1 = "not at all" and 7 = "extremely so".

4.3.4 Impact on "lurkers"

The survey results reported thus far have focused on café customers who created CoCollage accounts. We also wanted to understand the impact the system had on "lurkers" – people who see the CoCollage display in the café, but do not contribute to the content items shown on the display.

At the end of Time 2 (December 1), 15 people who did not have CoCollage accounts completed a brief questionnaire in the café asking to what extent – on a scale of 1 to 7 (where 1 = not at all and 7 = extremely so) – they watched the CoCollage display or interacted with others because of the CoCollage display. They reported on average watching the display while waiting in line ($M = 4.8$), giving a more moderate rating when asked if it increased their interactions with others ($M = 3.9$). Strikingly, these averages are not statistically different from those people who had actually created an account and completed the online questionnaire at Time 2. Across these two groups, about a third of our users (with ratings from 5 to 7) reported it had a meaningful impact on their interactions with others in the coffee shop. See Figure 10.

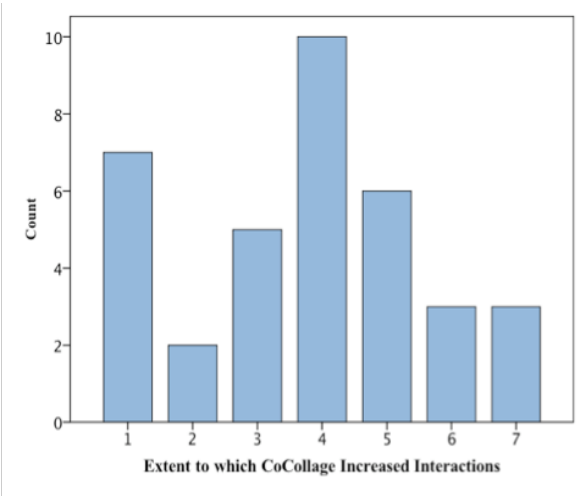

Figure 10. Frequency distribution of ratings for increased interactions

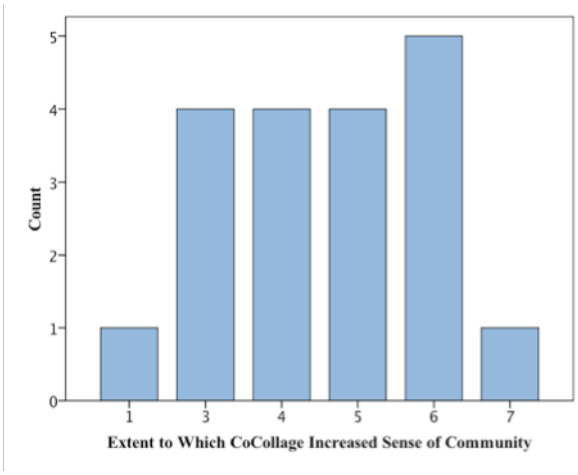

Figure 11. Frequency distribution of ratings for increased sense of community

While only about a third reported that it increased their actual interactions, more than a half indicated it meaningfully impacted their sense of community ($M = 4.5$). See Figure 11.

4.3.5 Open-ended feedback

In order to gain a better understanding of relative benefits of specific features in the CoCollage system, we asked for open-ended feedback from both people who had CoCollage accounts (online questionnaire) and those who did not (questionnaire in the café). In particular, we asked what they liked and disliked about the system, and how they would suggest improving it.

When asked what they liked about the system (which was initially named "CoCo"), responses were generally congruent with our goal of increasing a sense of community:

> *I like seeing everyone's pictures and how it makes [the café] feel like a little community.*
>
> *Get to see what other [café] customers are up to. Really get to see the diversity of U. District.*
>
> *Some of the pictures are really lovely - and the kinds of photos overall tell a lot about [the café]'s style and that of their customers.*
>
> *The friendly atmosphere it creates*
>
> *its fun to add pictures to the collage while you're enjoying a cup of joe.*
>
> *I love visiting with my friends there and looking up and seeing one of our pictures on the screen, then we get to talk about it. Its a great conversation piece.*

A few mention how it has increased their interactions:

> *coco has made me stare at the screen longer at peoples pictures. i usually get my drink in a mug so i can stay in [the café] and since im already there, i usually sit and study as well, whereas before, i would get a to-go drink and run off to the library.*
>
> *It has greatly improved my people watching at [the café]. I think in some ways made me even bit more extroverted then I was before. I have enjoyed the feedback and comments both on the site and in person regarding my stuff*

When asked what they disliked about the system, responses were more inconsistent. For example, some users thought it should make a bigger impact in the café shop, while others thought it should be more ambient.

> *get a bigger screen*
>
> *i dislike that it becomes a centerpiece rather than part of the ambiance.*

One customer, who rated their watching of the CoCollage display as "7" and the impact of the display on their awareness of and/or interactions with others in the café as a "6", nonetheless noted that there was a negative effect, as well:

> *Oddly, I feel more isolated at times by watching photos of people I don't know.*

When asked how would they suggest improving the system, responses largely focused on a greater desire for control over how items appear on the screen.

> *I wish I could switch past ugly, weird or bad photos and spend more time on the nice ones.*
>
> *I would like rating scale to be able rank which pictures and stuff come up more often. Maybe an rfid card instead of swipe card to be able to tap and go to login. I would love to see it in more locations. Be able to rank my items for display*

We also asked people how they would briefly describe the system to a friend. While many of the responses were consistent with the way we would describe the system, there were a few outliers … including one person who showed that our signage and flyer did not completely succeed in counteracting the impression that the CoCollage display was [just] a big TV:

> *a social networking system bringing web 2.0 interaction to real life by allowing users to upload photos to a public display*
>
> *Picture sharing. Picasa for your local coffee / espresso store*
>
> *[The café]'s Facebook page is playing on a big screen.*
>
> *innovative*
>
> *funky*
>
> *intrusion*
>
> *a tv*

5. DISCUSSION

CoCollage can be viewed as an example of a *situated social software* application. Shirky [22] defines *situated software* as programs – especially web applications – designed for a specific social *group*; CoCollage is designed for a specific social *context* in the physical world, which is related, but not necessarily the same. For example, *mobile social software* (MoSoSo) applications, such as Loopt (loopt.com), BrightKite (brightkite.com) or Dodgeball (www.dodgeball.com) run on mobile phones and/or use standard mobile phone capabilities (such as SMS) to enable users to share aspects of their physical context – location specification, text messages and/or photos – with their remote friends.

The primary difference is that while *mobile* social software – and more general social networking systems such as Facebook (www.facebook.com) – generally helps people maintain existing friendships, *situated* social software like CoCollage helps people who are in the same physical context become friends, or at least become more familiar strangers [13]. Rather than using technology to tunnel out to a virtual community from any physical space (e.g., using mobile social software), this kind of application helps to bring some of the richness from our online lives into the physical spaces we share with others.

We believe that third places provide the perfect kinds of physical contexts in which to insert situated social software applications. As noted above, research has shown that people may develop third place attachment when they experience voids in their social support networks, e.g., through moving to a new place, and fill the social void through visiting third places and connecting with the community they find there [19]. As society becomes increasingly mobile, such voids are occurring for more people in more places. We believe that the use of situated social software like CoCollage can help facilitate connections in third places, and thus increase the strength of third place attachment, to the benefit of the customers and the owners of such third places. The results of our deployment study of CoCollage shows that people are developing a stronger sense of community and place attachment through the use of this situated social software application.

Another way to think about CoCollage is as an example of an *ambient information system* [6]. Unlike most other public and situated display applications [16], which seek to occupy the foreground of attention, e.g., through supporting task-focused collaboration, CoCollage is designed to occupy the background or periphery of people's attention. We do hope that the content that shows up on the screen occasionally becomes the focus of attention for some of the people some of the time. Our goal is to create a kind of augmented mirror that reflects the richness of people's online lives and community back into the physical space they inhabit, creating opportunities for conversation in the space among the people who are there. If CoCollage becomes simply another portal to draw people's attention into the digital realm – and away from the physical third place and the other people in it – we will have failed. Designing a system that is generally ambient or peripheral, and yet occasionally becomes the focus of attention, is a challenging tension, but we believe our dynamic 3D visualization offers a reasonable balance between the poles of foreground and background attention.

6. FUTURE WORK

Our user community has helped us identify – through words and/or actions, online and offline – some new features that would enhance the CoCollage system. Relatively few users (18%) have swiped their loyalty cards to indicate their presence in the café. Although more users (28%) have used the web-based check-in, the majority of our users are members of the café loyalty program. Part of the problem is that the café does not require the use of cards to participate in the loyalty program – members can simply give their name when they purchase something to drink or eat – and thus few people bother carrying or using the cards. One improvement would be to establish some kind of link between CoCollage and the point-of-sale terminal software used at the café, so that regardless of whether customers use loyalty cards or simply give their name, checking in would become more seamless.

Another new feature that we hope will lower the barriers to participation is the use of some kind of webcam in the café, at or near the coffee bar. Baristas often like to share photos of "latte art" – the designs they draw in the foam as they prepare a latte for the customers (some baristas at the café participate in nationwide competitions in this area). When we mentioned this idea to some baristas, they found it very appealing. Customers could also use the camera to snap impromptu photos of books they are reading, or perhaps new contributions they've made to one of the sketchbooks in the café. Broader-based, impromptu participation would help us better achieve the *leveling* function that Oldenburg [15] identifies as one of the key features of third places.

We have begun experimenting with a new community visualization, that would periodically show a collage of [only] users' avatars and usernames to enable community members to more easily recognize that the images and quotes being shown on the CoCollage display are from other members of the community. One of our users suggested that periodically highlighting the "most popular" images and quotes on the display would provide more incentive for her to both share more content items as well as vote or comment on others content items.

One of the research questions we would like to explore is whether and how CoCollage, as a semi-public physical window into collections of online photos, affects the use of online photo sharing services by CoCollage users. Miller & Edwards [14] reported on new photography practices, socialization styles and perspectives on privacy they observed in users of the Flickr photo sharing web service. CoCollage *recontextualizes* photos from Flickr (along with the explicitly uploaded photos), and it would be interesting to better understand how that recontextualization in physical space impacts perceptions and use in the online space.

Another question we hope to address is the impact of different features on interactions via CoCollage – online and offline. Lampe, *et al*. [9] reported on how different Facebook profile elements affected interactions in the purely online social networking site; we hope to better understand how different elements affect interactions in a place-based social networking system that shows elements of profiles both on a web site and on a large screen in a physical place.

The initial version of CoCollage focuses exclusively on the visual domain – showing words and images that people have shared on a large display in the café. However, we have received suggestions from the owners of the café, as well as some of the baristas and customers, that incorporating music into the mix of media that people can share with each other would be a great addition. In the same way that MusicFX [10] offered a capability for the community assembled in a fitness center to influence the selection of music being played, we could likewise enable café customers to influence the music being played in the café, perhaps simply by sharing their playlists from services such as Last.fm (www.last.fm) or Rhapsody (www.rhapsody.com).

Future versions may also take advantage of recommender system technology: looking at the media and its associated metadata that people are sharing in the café, and using collaborative filtering to recommend other media to them, either on the CoCollage display or on the associated web site. For example, if a user present in the café has shared photos with "dog" in their title or tags, we might boost the priority of other "dog" photos, or photos of other things that are related to dogs, in selecting items to show on the display. In the time since the study reported in this paper was conducted, our user population at the initial café has grown to over 200 users, who have collectively shared over 5000 photos and quotes, so we may soon have the critical mass of content needed to bootstrap a recommender system, and thus become more effective in, say, helping dog lovers (or dog owners) establish new channels of connection in the café.

In addition to growing our user base at the first café, we have deployed CoCollage in 20 additional venues. Most of these are other cafés or coffee shops, but we are also working with bars, restaurants, and "other hangouts in the heart of a community" [15]. One of the most exciting questions we hope to explore in our future work is what kinds of communities – or, more properly, in what kinds of community *places* – can a place-based social networking application like CoCollage be most effective in fostering greater awareness, interactions and relationships. In addition to the psycho-social factors of the café customers we examine in this paper, we will also investigate factors involving the owners and staff at CoCollage venues. We also expect that physical factors, such as the sizes, locations and layouts of the spaces, influence the communities … and their adoption of place-based, community-oriented, situated software.

7. CONCLUSION

CoCollage was designed to promote conversation and community within a café. In a preliminary study [3] we found our measures of sense of community in the place and place attachment were meaningfully correlated and predicted likelihood of technology adoption. In the current study, we have shown that a community technology such as CoCollage can meaningfully improve sense of community and place attachment over time.

Our analysis of system logs and questionnaire responses highlight other dimensions of the use and appeal of different features we've incorporated into the system, which may be of value to others seeking to design, develop and deploy situated social software applications for third places.

The CoCollage display offers a semi-public window into a community, revealing some of the interests – and interestingness – of members of the community in a place that serves as its hub. This revelation may not always lead to new interactions, but it does at least increase the interpersonal awareness, and perhaps even appreciation, among people who share space, but who may not share interests. Healthy communities are often rooted in the diversity of their members, and we hope that our ongoing development of deployment of CoCollage will offer an increasingly effective tool for supporting community and celebrating the diversity of more people in more places.

8. ACKNOWLEDGMENTS

We are grateful to the owners, baristas and customers at the café, for allowing us to deploy and study the CoCollage system in their community. We are also grateful to the anonymous reviewers of this paper for their insightful and helpful feedback.

9. REFERENCES

1. Churchill, Elizabeth F., Les Nelson and Laurent Denoue. Multimed*ia Fliers: Information Sharing* with Digital Community Bulletin Boards. *Proc. of the Int'l Conf. on Communities and Technologies (C&T 2003)*. 97-117.
2. Churchill, Elizabeth F., Les Nelson, Gary Hsieh. Café Life in the Digital Age: Augmenting Information Flow in a Café-Work-Entertainment Space. *Proc. of the SIGCHI Conf. on Human Factors in Computing Systems (CHI 2006) Extended Abstracts*, 123-128.
3. Farnham, Shelly D., Joseph F. McCarthy, Yagnesh Patel, Sameer Ahuja, Daniel Norman, William R. Hazlewood and Josh Lind. Measuring the Impact of Third Place Attachment on the Adoption of Place-Based Community Technology. In *Proc. of the SIGCHI Conf. on Human Factors in Computer Systems (CHI 2009),* 2153-2156.
4. Fleishman, Glenn. Some Café Owners Pull the Plug on Lingering Wi-Fi Users. *The New York Times*, 13 June 2005.
5. Greenberg, Saul, and Mike Rounding. The Notification Collage: Posting Information to Public and Personal Displays. *Proc. of the SIGCHI Conf. on Human Factors in Computing Systems (CHI 2001)*. 515-521.
6. Hazlewood, William R., Lorcan Coyle, Zachary Pousman and Youn-kyung Lim. *Proc. of the 2nd Int'l. Workshop on Ambient Information Systems* (collocated with UbiComp 2008), Seoul, South Korea, September 21, 2008, CEUR Workshop Proceedings, ISSN 1613-0073; http://CEUR-WS.org/Vol-402.
7. Katz, James. As quoted in The New Oases, *The Economist*, 10 April 2008.
8. Kelly, Sean U., Christopher Sung and Shelly Farnham. Designing for Improved Social Responsibility, User Participation, and Content in On-line Communities. *Proc. of the SIGCHI Conf. on Human Factors in Computing Systems (CHI 2002)*. 391-398.
9. Lampe, Cliff, Nicole Ellison and Charles Steinfeld. A Familiar Face(book): Profile Elements as Signals in an Online Social Network. *Proc. of the SIGCHI Conf. on Human Factors in Computer Systems (CHI 2007)*. 435-444.
10. McCarthy, Joseph F., and Theodore D. Anagnost. MusicFX: An Arbiter of Group Preferences for Computer-Supported Collaborative Workouts. *Proc. of the ACM Conf. on Computer-Supported Cooperative Work (CSCW 1998)*. 363-372.
11. McCarthy, Joseph F., David W. McDonald, Suzanne Soroczak, David H. Nguyen and Al M. Rashid. Augmenting the Social Space of an Academic Conference. *Proc. of the ACM Conf. on Computer Supported Cooperative Work (CSCW 2004)*, 39-48.
12. McCarthy, Joseph F., Ben Congleton and F. Maxwell Harper. The Context, Content & Community Collage: Sharing Personal Digital Media in the Physical Workplace. To appear in *Proc. of the ACM Conf. on Computer Supported Cooperative Work (CSCW 2008)*. 97-106.
13. Milgram, Stanley. The Familiar Stranger: An Aspect of Urban Anonymity. In S. Milgram, *The Individual in a Social World*, pp. 51-53. Addison-Wesley, 1977
14. Miller, Andrew D., and W. Keith Edwards. Give and Take: A Study of Consumer Photo-Sharing Culture and Practice. *Proc. of the SIGCHI Conf. on Human Factors in Computer Systems (CHI 2007)*. 347-356.
15. Oldenburg, Ray. *The Great Good Place: Cafes, Coffee Shops, Bookstores, Bars, Hair Salons, and Other Hangouts at the Heart of a Community*. New York: Paragon Books (1989).
16. O'Hara, Kenton, Mark Perry, Elizabeth Churchill and Daniel Russell. *Public and Situated Displays: Social and Interactional Aspects of Shared Display Technologies*. Springer. 2003.
17. O'Reilly, Tim. What is Web 2.0? Design Patterns and Business Models for the Next Generation of Software. http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html.
18. Peltonen, Peter, Esko Kurvinen, Antti Salovaara, Giulio Jacucci, Tommi Ilmonen, John Evans, Antti Oulasvirta, Petri Saarikko. "It's Mine, Don't Touch!": Interactions at a Large Multi-Touch Display in a City Centre. *Proc. of ACM Conf Human Factors in Computer Systems (CHI 2008)*. 1285-1294.
19. Rosenbaum, Mark S., James Ward, Beth A. Walker and Amy L. Ostrom. A Cup of Coffee With a Dash of Love: An Investigation of Commercial Social Support and Third-Place Attachment. *Journal of Service Research*, Vol. 10, No. 1, 43-59 (2007).
20. Russell, Daniel M., Clemens Drews and Alison Sue. Social Aspects of Using Large Public Interactive Displays for Collaboration. *Proc. of the 2nd Int'l Conf. on Ubiquitous Computing (UbiComp 2002)*. 229-236.
21. Sacks, Harvey. *Lectures on Conversation*. Basil Blackwell, Oxford. 1992.
22. Shirky, Clay. Situated Software. First published 30 March 2004 on the "Networks, Economics and Culture" mailing list. http://www.shirky.com/writings/situated_software.html
23. Wilkinson, Derek. The Multidimensional Nature of Social Cohesion: Psychological Sense of Community, Attraction, and Neighboring. *American Journal of Community Psychology,* Vol. 40, (2007), 214-229.