Abstract
An emerging technology called Near Field Communication (NFC) is used to enable touch between mobile devices. This paper describes how a mobile social media system called ‘Hot in the City’ (HIC) enables people to make friend connections on the spot when they meet each other. We first describe the HIC system, and then explain how the visibility of friends is arranged in the system. The research focuses on the context during the action of friend connection and how context data should be taken into account in design. A use pilot was organized to study the use of HIC. Observations from the pilot lead us to reconsider the HIC mobile application logic, study location and status information, and plan to add event and time as useful contextual data to organize collected and generated mobile information. Finally, design issues for the next steps are delineated.

1. Introduction

Internet-based applications that enable friends to network and share content – such as Facebook, MySpace and Flickr – have introduced us to social media and the social networks that emerge through them. The idea is that friends, past or present, connect and link with each other by sharing images and videos, exchanging messages, or playing games. The user sends a friend invitation to someone he or she knows and the recipient then accepts or rejects the invitation.

These social networking media have been catering to mobile users. It is possible to use Facebook with a mobile device, for example. However, social media systems have not focused on establishing instant friend connections when people meet each other. Friend connections are still made with computers.

In this paper, we present an approach where friend connections can be created on the spot when people meet each other. We present a pilot study where mobile users create friend connections with their mobile phones by simply touching one mobile device to another. This pilot was two weeks long, including a training period, and culminated in a Christmas party. We are interested in the context in which the friend connection is made and how the context data should be taken into account in the design of such a system.

The technology enabler is Near Field Communication – NFC (www.nfc-forum.org), an emerging technology related to RFID, Radio Frequency Identification. NFC allows peer-to-peer connections (P2P) that can be used for various applications. One example is the exchange of business cards between mobile devices. In general, mainstream efforts to harness NFC have targeted payment and ticketing applications. Moreover, it is possible to write information to electronic tags, which can then be attached on a wall or poster to be read with an NFC capable device. Hence, tags in the context of NFC are essentially different from keyword tags describing an online or offline artifact [e.g. 7, 11]

In order to study the creation of mobile friendships, we developed an application called ‘Hot in the City’ (HIC). This system lets users exchange data and connect to a back-end system linking users as friends. The system, its architecture and features are explained in section 2. Tagging experiments were carried out during the pilot. The tagged spaces were local venues selected by mobile users and the restaurant rooms where an experimental evening was held.

The HIC pilot is presented in section 3. We introduce the pilot setting, training and a social party evening organized for HIC experimentation. We sought to study use situations, learn more about P2P friend connections and then consider how to improve the system design. Observations are presented in section 4. They were collected from the experiments in a qualitative manner by making notes and video clips and then using them in reflective design sessions. Finally, a set of concrete design issues was assembled to feed iterative work on the HIC system. These issues are presented in section 5.

Creating an on-the-spot friend connection is a delicate event with social pressure to become friends. The technology used – both the hardware and software – should allow fast connection so as not to disrupt friendship creation. It would be possible to allow categorization of friendships, e.g. colleague, if the fast connection requirement is fulfilled. In addition, event and time information can be used to create context data for viewing and structuring friendship connection data.
later. Furthermore, we noticed that the users created locations and made individual spaces with the tags given to them. Consequently, several tags were scattered in some public spaces. It is not always possible, however, to trust the location information a tag provides. The tag may indicate status rather than location: in meeting, on holiday, etc.

1.1 Method

The development of a social media system is a design effort where both technological advances and social phenomena must be understood and brought together in a way that enables innovative design solutions. How can friendship creation be studied systematically? Such an event is local and individual, and it cannot be predicted when it will happen.

We started out by making scenarios and selecting key technologies. HIC was then developed iteratively with feedback from the target domain and by working on the scenarios in development sessions of the design team, while taking technical advances into consideration. While this work was in progress, specifications for NFC technology have been under development by the NFC Forum. The first technology prototype of the HIC service was available in autumn 2008. Would HIC be a useful approach for social networking and creating mobile friendships? We realized that this was the first time such friendship creation was possible. How can we study friendship creation with a useful amount of data in a way that would be beneficial for further system development?

 Piloting a prototype service is a widely used method in testing technology and involving potential users. However, it is challenging to pilot social media because social networking is not easy to grasp in laboratory conditions or living labs. With this in mind, in September 2008 we decided to link the development effort with one of our company’s social events, i.e., Christmas party. This event provided elements for the first HIC pilot: technologically savvy colleagues and an event where they all gathered. Our research approach has been design led with an expert mindset rather than participatory design, although users do participate by giving feedback on the current designs [15].

Using an online questionnaire, informal discussions and observations, our plan was to focus on collecting data on how ten users experienced the use of the application. We would analyze the data afterwards.

Earlier research has shown that some social networking sites are used primarily for reinforcing and maintaining offline relationships instead of forming new online relationships [6]. We kept that in mind when selecting pilot users. Colleagues at a company party are not necessarily close friends. However, this event gives colleagues an opportunity to bond. Systems such as HIC may open up a new social dimension in helping colleagues connect with each other. The idea was to gain a better understanding of the context of friend connection in order to delineate design requirements for a social media system. To that end, we planned and implemented a pilot experiment in November 2008.

1.2 Related Work

Over the past years, there has been growing interest in providing location-based information and supporting collaboration between people. There are several studies, some dating to the 1990s, that have dealt with tags and collaboration awareness [e.g. 16, 2, 9].

Previous research has also focused on location-aware computing environments, privacy preferences vary with place and social context [1]. Although social network sites have been studied from a rather wide range of viewpoints, not that much is known about the characteristics of mobile social networks. That said, interest in research on social networks in mobile environments has been growing recently [e.g. 4, 13, 10, 17].

In location-aware computing environments, privacy preferences vary with place and social context [1]. Location privacy also plays a significant role in the use of the HIC application. With tags, users can inherently control their location visibility within and from the HIC system. This can be seen as a basic difference to
some more traditional location-aware systems. Privacy issues are out of the scope of this paper.

The mobile social network service presented in this paper utilizes NFC technology and thus differs technologically from earlier social network sites and services. On one hand, the P2P feature in the NFC-enabled mobile phone together with the HIC mobile application allows friends to connect with each other when meeting face to face. On the other hand, the use of an NFC device changes the way social interaction occurs at the moment when people become friends. In comparison, friends are not co-located in social network sites. Furthermore, we assume that users’ contextual information can be used for managing the co-located friendship data.

2. ‘Hot in the City’ Application for Mobile Social Networks

‘Hot in the City’ is a system that in the first design iteration had basic features to enable users to create friend connections using a mobile phone. Additionally, information can be written into NFC tags. Touching the tag reveals the location of the user. This HIC version also included the HIC Facebook application. HIC is not dependent on the Facebook platform in any way, however. Similarly, HIC could be extended to use any other social media service that provides an interface for external applications. Section 2.1 delineates the HIC software architecture, and section 2.2 one of the crucial design issues for system success: how users see their friends through HIC applications, whether in the mobile or on Facebook.

2.1 Software Architecture

The current HIC software architecture consists of three parts. The first is an NFC-enabled mobile phone. Currently, a mobile Java application resides inside a mobile phone and interprets any HIC data, connecting to a back-end master server as necessary. The HIC mobile application can be used to write NFC tags. The information is text stating e.g. the location of the tag. The mobile HIC application is delivered over the air.

The second part is the HIC Facebook application. Facebook offers interfaces for third parties to create applications. The HIC Facebook application is a sub-website inside Facebook. Files are hosted by the web server and Facebook links to the external website.

The third part is the HIC back-end system. This is where the business logic and the data are located. The back-end system hosts automatic update files for the mobile applications that check the latest version every time the application is launched. The actual update time is controlled by the user, however.

Users have two HIC user interfaces: one in a mobile phone application and another in the Internet browser. These interfaces are independent and one can be used without the other. HIC registration is required from the mobile when starting the service. A user who has a Facebook account can add the HIC Facebook application into the use environment. In the HIC Facebook application, the user can see a list of friends and their location as well.

In practice, Facebook contacts the HIC web server by reporting that a user with a Facebook ID has entered the HIC Facebook application. The HIC web server constructs the page in Facebook format and displays it to the user. To construct the page, the web server needs to fetch user data from the HIC master server.

To log in to locations, the user needs to use the HIC mobile application. When touching an NFC tag, the phone reads data from the tag and sends it to the back-end system, which in turn interprets it as a login. Login information answers the questions who, where and when. As feedback, the HIC mobile application receives a list of friends and their login information. That information is parsed and shown to the user. Currently, when the HIC mobile application is running, the information is updated every minute.

A user can create a friend connection by touching another user’s NFC-enabled mobile phone with his or her own phone. Due to the technical limitations of NFC technology, one of the users must act as the inviter and the other as the invitee. The latter accepts the invitation. The roles must be chosen before a connection is made. In this peer-to-peer connection, the HIC mobile applications exchange data and the inviter informs the back-end system that the users have created a friend connection.

Several design meetings were conducted in order to collect requirements for the HIC pilot application. In these design meetings, the participants freely presented their ideas, which could be included in the HIC service concept. Also, a domain expert was in the loop. To ensure that we could create a running pilot application with feasible features, many of the ideas were not implemented. In the future scalable and extendable mass volume service would require reconsideration of the software architecture.

2.2 Visibility of Friends

An essential concept of the HIC software is the concept of friend. Our motivation for studying the visibility of friends is that we wanted to try HIC as a part of a commonly known social media platform. This takes us closer to solving the ‘yet another social media
system’ problem. The use terms of Facebook require the HIC software to have two separate friend groups. One is the friend group that the user has in Facebook and the other is the one that the user has collected with the HIC mobile application and mobile device. Facebook friend data is owned, controlled and used exclusively by Facebook, and consequently may not be displayed in the HIC mobile application. The requirement of having two friend groups meant we had to consider how visible friends are to each other.

User visibility covers three possible use cases. There are three different types of users: 1) users who only use the HIC Facebook application, 2) users who use the HIC mobile application on a mobile device and 3) users who have access to both of these applications.

A user who only uses the HIC Facebook application is able to see only those Facebook friends who have the HIC application installed on Facebook. From the point of view of the HIC system, the user is only a viewer. A user who only uses the HIC mobile application will see his or her HIC mobile friends, as they comprise the only group of friends available through the HIC system on a mobile device.

Finally, someone who uses both the HIC mobile application and the HIC Facebook application has two perspectives on the HIC system. In the phone, the user sees only the mobile friends and their activity. In the HIC Facebook application, the situation is slightly different, since both Facebook friends and HIC mobile application friends are shown in the list of friends.

All in all, while this implementation seems complicated, it was the only way to proceed since software interfaces set restrictions on implementation. In general, social network communities have been independent, isolated and incompatible, because no standards have been established for sharing information between them [14]. Efforts have been made to create open interfaces – such as Google’s OpenSocial – to ease the management of personal information distributed across many sites. In the future, more social networks may be able to share information with HIC, or HIC could be designed and implemented differently.

3. Pilot Settings

The HIC system pilot, including all parts and features of the implemented system, consisted of three phases: 1) user training, 2) introduction period and 3) a pilot evening event. These phases are presented next.

3.1 User Training

Before the introduction period and pilot evening event, a training and demonstration session was held for all potential pilot users. All the persons who came to and participated in the user training session were technologically savvy mobile phone users. Consequently, the user group was tolerant of possible errors or anomalies in the HIC system. Another positive aspect of this selection of users was that they were immediately able to formulate what is wrong with the design and identify the actual reason for a specific problem. They even suggested improvements. Although they are real users, they cannot be counted as representatives of consumers. Due to the stage of system development, average consumer or end-user groups would be brought into the pilot later.

Eventually, 10 users were selected for the introduction period and pilot. They were employees of a research-oriented organization who were experienced with mobile applications and services through their research work. Additionally, four pilot users were closely involved in the design and development of the pilot application. They supported the introduction of the system to the pilot users and used the HIC system actively during the work. From the demographic point of view, four out of fourteen users were women and ten were men. Six users were in the 25-34 year age group, four in the 35-44 year age group, two in the 18-24 year age group, and two in the 45-55 year age group.

In the actual training session, the HIC application was briefly introduced to the users and the exact use of the application was demonstrated. After this, the users received NFC-enabled mobile phones for use during the pilot period. First, the users had to download the HIC mobile application to their phones by touching an NFC tag that provided a download address. The HIC Facebook application was not demonstrated in the session. Users were encouraged to examine the HIC Facebook application at their own pace. After the training session, they received an email inviting them to use Facebook application. In fact, this occasion was the first time many of the participants used Facebook. The training and demonstration session took approximately one hour.

Observers collected notes on the pilot users’ comments about the HIC application. These notes were later used for analysis and design.

3.2 Introduction Period

The user training and demonstration session was followed by a one-week self-trial and introduction. The aim was to make sure that the pilot users would be
familiar with the HIC mobile and HIC Facebook applications by the pilot evening. The introduction period gave them the time to create friend connections and have real ‘user experience’ of a mobile social media system. Furthermore, the aim of this period was to test that the HIC system works correctly and would be robust during the pilot evening. From the research point of view, the introduction period provided an opportunity to collect information on how people experience the HIC system in a familiar environment.

Friend connection was not the only target of study since the idea was to study the context, starting with the use of location information. Every pilot user was given two to three NFC tags. Furthermore, they were allowed to freely place their own tags in any location. NFC tags have a permanent adhesive on their back, making it easy to attach them on different surfaces. The only requirement is that the surface may not be metallic, as this would disturb the reading of the tag. Users were able to write location information as a string of data into a tag by using their NFC phone. As we wanted to observe user behavior, we did not specifically instruct them where or how to place tags.

Help and support were available in problem situations during the whole week. Pilot users asked questions by email and face to face. During the week, we made observations on how the users decided to use the NFC phone and tags. Some of the use situations, such as the creation of friend connections or writing tags, were recorded on video for later analysis.

3.3 Pilot Evening Event

The pilot environment and the venue for the Christmas party was a two-floor restaurant in the city center. It had several rooms of different sizes. Tagged spaces on the first floor were 1) a cloakroom, 2) music room, 3) small bar and 4) large bar. The second floor of the restaurant was rather small and the following spaces were tagged there: 1) one big room with two tags, 2) one small room (smoking room), 3) dance floor and 4) dining room. In addition, one tag was located in the pub on the next block. A total of ten such tags were put in place for the pilot evening.

The tags were arranged in this way because location and tag placement is one of the main concepts in the HIC application. In the future, we imagined, not only individual user tags will be available, but service providers such as bars and restaurants will have an incentive to place tags of their own on their premises for marketing purposes. People would use them because this would provide extra benefits for them. In this case, we made the first guesses about how people would behave and use such tag infrastructure.

People heading to a certain location or participating in an elaborate event may want to know how others are finding their way to the venue. Maybe they are in the nearby bar, and want to let others know where they are quickly and on their own initiative.

If the restaurant is large, friends may want to tell each other where they are. Therefore, many tags were distributed in different rooms. A tag in the cloakroom could be used to register to an event. This information would then be available for restaurant owners or event organizers. At the pilot venue, the visual design of the tags featured the text HIC in white and a red circle.

Also during the pilot evening, users could collect friends with other pilot users and keep track of their location in the pilot environment.

All tags were available in the restaurant when the users arrived. This time, the use of own tags was not allowed in order to prevent tag littering. Figure 1 depicts a situation where two users are becoming HIC application friends by touching each other’s mobile phone. After this action, they are able to see each other’s location from the HIC application.

Figure 1. Connecting to a friend by touch.

It was challenging to observe users and collect data on their experiences at the Christmas party. Non-formal discussions were held with users in order to get their feedback. Furthermore, observations were made and collected when users tried out the application. There were four observers. They could provide assistance if any trouble with the technology was encountered. This data was entered in a wiki page for further study.

After the pilot evening, an online questionnaire was sent to ten users. The questionnaire was not sent to those four users who were closely involved in the design and development of the HIC system. Everyone responded to the questionnaire. In addition, it was possible to analyze the use of the application from the data created by the back-end system.
4. Findings

In this section, we outline the findings based on the observations during the pilot, including all the phases, online questionnaire, and system monitoring. These findings were collected during analysis sessions of the gathered material.

4.1 Feedback on Application Logic

The HIC mobile application logic did not immediately become clear to all users. Many users faced problems when trying to create friend connections by touching each other’s mobile phones. The main reason for this was that, in order to make a friend connection by touching phones, users had to choose who would send the invitation and who would accept it from the HIC mobile application menu. This was found to be a cumbersome feature. The promise of an immediate friend connection collapsed into figuring out who actually is inviting and who is accepting. At that time, the HIC mobile application did not give any feedback on friend connection errors. Inadequate feedback led to uncertainty among users.

The NFC reader in the mobile phone did not always react when another phone was brought into its reading range. Some users said that they had to be very attentive and careful when trying to create a friend connection by bringing the two mobile phones close to each other. We imagined that by default this specific action would be a simple touch, a benefit of the system. However, in fact the users had to try to figure out the position of the NFC antenna inside the mobile phone and be very patient when the phones were physically touching. Sometimes becoming friends required several touches, but most of the time, when the antenna location was found, the connection succeeded on the first try. Obviously, ensuring fast and easy connections is the most important requirement for the success of HIC. The phone antenna design should consider how to support social media through the P2P feature.

One of the early design decisions made on the HIC mobile application was that the user would use the same tag for logging in and out from a location. Some users said that they had to be very attentive and careful when trying to create a friend connection by touching phones, users had to choose who would send the invitation and who would accept it from the HIC mobile application menu. This was found to be a cumbersome feature. The promise of an immediate friend connection collapsed into figuring out who actually is inviting and who is accepting. At that time, the HIC mobile application did not give any feedback on friend connection errors. Inadequate feedback led to uncertainty among users.

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One of the early design decisions made on the HIC mobile application was that the user would use the same tag for logging in and out from a location. It appeared that this logic was not very clear. In the beginning, many users did not realize that when they were leaving a tagged location that they had already logged in to, they should touch a tag to log out. Since users did not remember to log out, the information in the system did not always correspond with the real-life situation. Furthermore, we later noticed that it was far easier to log in than to log out. This observation made us consider removing the out tab from the user interface as redundant (cf. Figure 2 menu). On the other hand, time would be useful as context information in tags to define when location information should expire. For instance, a tag could be set for office hours from 8:00 AM-6:00 PM. Location status would then expire no later than at 6:00 PM. Friends could then see that the status has simply expired.

![Figure 2. ‘Hot in the City’ information.](image)

The HIC mobile application friend listing (cf. Figure 2 friend list) did not seem to follow a clear logic. Some users stated that it should be easy to figure out how friends were listed on it. However, many factors affected how the friend list was composed. The order of friends was determined by when they had become friends and been registered in the back-end system. Fortunately, the number of friends was low and this ‘feature’ did not cause many problems in the pilot. In future designs, friend list composition and list organization options will be crucial. When a large number of users have many friends, they will have to be able to organize their information-intensive lists. Design possibilities can already be identified: friends could be ordered, e.g. based on their location.

All in all, it was clear that the application logic suffers from bad design decisions due to technology limitations (touch, invitation) or inadequate reasoning through scenarios (location in/out, friend listing).

On-the-spot mobile friend connections are challenging from a design perspective. The technology and application should be designed to be almost as fast as the event of connecting friends.
4.2 Location Under Scrutiny

A starting point for the HIC service was that it can be used to share information about the location, which would then add value to friend list viewing. Pilot users started eagerly testing the new technology with their two to three tags during the introduction period. When these tags were positioned, we found out that the data written into the tags was not exactly what we had expected. Instead of just information on the location – such as room number or company restaurant name – other kind of information appeared. It was popular to write, for example, “on the bus” and “off duty” texts in the tags. These texts in fact express user status at a certain moment.

After writing the tag information, users also had to select a suitable location for it. Positioning a tag, including information about the exact location, was rather consistent. Almost all such tags were attached right next to a door or below the room sign.

One possible source of confusion is that enabling individual users to place their tags into public spaces means that the spaces will be littered with tags indicating the same location but with a different description. This small pilot made us realize that many users with a set of tags introduces multiple tags in public locations. For example, two tags were placed on both sides of the door to the company restaurant dining room. Both tags did in fact include the very same information: “Dining room”. When someone logged into the dining room by touching a tag on the left side, the user should have touched the same tag when exiting (in/out logic). If the user touched the tag on the right side instead, the user was logged in to the dining room again. Since the tags were visually very similar (white with penciled text), it was very easy to forget during lunch which tag should be touched. As we discussed in the earlier section, the in/out logic was a design flaw. If it is fixed, we still have the double tag problem where the tags do not provide exactly the same information for the location.

In the preparatory phase, users were not given any guidelines for either the visualization or placement of tags. In all the cases, they wrote exactly the same information into the tag with the mobile phone and on the tag with a pen. The tag is 3 cm in diameter. Since the tags are rather small and their color is subdued, they were sometimes difficult to locate in an office environment. It is apparent that issuing tag placement guidelines would make positioning of tags more consistent and ensure that they are easier to notice.

As pointed out earlier, the tags “off duty” or “on the bus” were created to express individual activity. In contrast, tags describing a location, such as a working room or a dining room, were meant for broader use. A clear difference between those tags is that the latter tag type is linked to a static location. On one hand, tags with no location information can be attached to a movable object, such as a wallet, suitcase, or laptop. On the other hand, tags with static location information cannot be relocated without changing the information embedded into the tag.

Text information on a tag is essential for other users. If a tag does not provide any clues about its content, it is impossible for a user to know what kind of information it has without reading it with a phone.

4.3 Friends by Touching

48 HIC friendships were created between all of the pilot users. 29 of them were established during the pilot evening event. The remaining 19 HIC friendships were made during the week-long introduction period. Thus, most of the HIC friend connections were established in the restaurant. Friends per user averaged 7; deviation was between 2 and 11 friends per user.

These user numbers are enough for studying single use situations, but do not suffice for studying the dynamics of friendship creation. We also wanted to focus on use situations to feed our efforts to include users’ context in future designs. Piloting is a technological intervention to try out software in a substantially controllable user group.

Although making friends by touching mobile phones often took many tries and required attention, many of the users considered it fun. One user comment was that the HIC mobile application made it easier to get to know colleagues better. The HIC mobile application gave users a good reason to approach colleagues who they did not work closely with at the office. Importantly, one user reckoned that touching is a rather intimate way to interact with other mobile phone users and thought that this ritual requires open-mindedness from users.

Interaction between users is radically different when using web-based social networking sites such as Facebook and when making friend connections in a mobile friend network. A Facebook friend is invited by sending a friend request to another Facebook user. The recipient can either accept or ignore the friend request. Touching a friend’s mobile with one’s mobile phone requires face-to-face interaction. This difference affects how easy or difficult it is to ask someone to be your friend or ignore a friend request. For example, it can be very difficult to refuse to be a friend with someone who is standing in front of you. When location and time provide distance between people, as is the case with Facebook, it may be much easier to refuse or just ignore the request. Furthermore, ways of communication highlight the differences between these
approaches. Web-based social networks rely on written messages. Touching a mobile phone means that different cues, such as body language and tone of voice, might be part of the ritual of becoming friends. Maybe this is also contextual information that should be analyzed more in order to inform design.

Intimacy of interaction can also have a negative impact on willingness to create a friend connection. In the pilot, many users knew each other and there was a reason to try out making HIC friend connections. They may even have felt that it was their duty to use the pilot application. Real-life situations would probably be different, because becoming friends requires relatively close interaction with other HIC mobile application users and entering others’ personal space. In social interactions, personal space makes one feel comfortable; if someone trespasses into our personal space, we can feel stressed.

In the study of interpersonal distance proxemics [8], four important interpersonal distances have been identified: intimate distance, personal distance, social distance and public distance. Based on Hall’s observations, intimate distance ranges from 0 to 0.5 meters. We have a tendency to avoid getting this close to people we are not intimate with, and we usually try to escape if we do. Thus, in some cases the threshold for approaching other users and becoming friends with them can be higher when touching than when using more indirect traditional web-based social media.

4.4 Visibility and Communication Possibilities

The pilot period showed that user visibility must be considered very carefully in location-based mobile social networks. All of the users were able to see their HIC friends’ location or status without limitations during the pilot. Several pilot users stated, however, that they would have wanted to limit their visibility to other users in some way. It is difficult to use the application when there in fact are different kinds of friends, and certain information may be private in nature. Consequently, it is not desirable to show all the information to all other users. The closer a friend is, the more willing one usually is to give that friend access to one’s personal life.

One possibility to limit visibility is that a user does not use tags at all, or only for a specific purpose, e.g. status information. In this way, the user maintains control over location privacy. However, that essentially limits the use of the application, because then no one gets real information about the user’s location. Users wanted a more versatile way to adjust their HIC visibility, so that information embedded into tags could be shared with specific users or a user group. When taking into consideration the need to limit visibility, it would also be possible to improve the privacy of users and at the same time provide a basis for more active use of the application.

Finding a friend was not a problem in the pilot, as the user group consisted of 14 people working for the same organization. The HIC concept probably works best when users already know each other or have a motivation to be connected, e.g. as colleagues. If the HIC system user group were larger and geographically widely dispersed, the HIC application could also be used to find potential new friends. For example, friends of a friend could be visible to HIC users. More study is needed to understand how the dynamics of the friends of friends concept would work in a mobile context.

Some users also wanted to have more diverse ways to communicate with friends through the HIC application. The HIC application now provided the possibility to monitor friend location or status with a mobile device. Although this was considered to be an interesting feature, the users soon identified missing features. Users were not able to directly communicate with a friend. Inherently, a mobile phone provides a possibility to call or send a text message. It would be easier to the user, for example, to add a message to be shown along with the location field. Furthermore, communication could be enhanced with a direct chat feature integrated in the application.

All in all, when friends were connected, some information was considered private. This brought new visibility considerations. The pilot application brought up new ideas on how to support friend communication with extra features.

4.5 Connecting Friends

It was evident from the pilot that creating friend connections with NFC mobile phones should be made as easy and fast as possible. When a user decides to create a connection with a friend or a colleague, the connection should occur quickly when phone-to-phone touch is made. The use of menus should be minimized. When users are required to know whether they are the inviter or invitee, the whole process is complicated. The next design could simplify the process to a single menu item. The reason why invitation and acceptance menu structures were used in the first place was that the P2P protocol of the mobile phone required one of the two devices to master the session.

After a successful friend connection, there is a need to assess and categorize the friendship. A successful event means that there will be a crowd of friends in the HIC list. Who is your close friend? How many friends and whom do you want to follow with the mobile application or the Facebook application? The mobile application should provide the functionality to make
friend categories. Even though the classification would not occur immediately during connection creation, it should be possible later.

There are also several smaller usability ideas for improving friend connection in a mobile environment. When the mobile application lists friends, it could provide functionalities to contact them directly. Browsing through the list and selecting a friend could open a menu with chat, SMS, or phone call commands.

4.6 Location and Status

In the introduction period, HIC users started to enthusiastically make their own virtual spaces using NFC tags. Originally, we thought that the rooms and spaces would be named along the lines of ‘Meeting room K220’ or ‘Restaurant’. These labels describe the exact location of the space. Consequently, it would be easy to map the tag location exactly to the person’s location. The mobile application would simply list that your friend ‘Vili’ (see Figure 2) is in ‘Beerhouse Leskinen’. How exact is ‘Beerhouse Leskinen’ or ‘Cloakroom’? Where is tag ‘Cloakroom’ or ‘Dance floor’? Who made the tag and can it be trusted?

In addition, the meeting room tags had information that was more or less mental statements. For example, one tag was placed in ‘the land of uhuru’. ‘Uhuru’ is not a real place, but the mental state of a person, his imaginary holiday destination.

As a design consequence, we need to ask the question if there should be an official set of tags placed by an organization, which can provide meaningful information for HIC users. Or would there be a need for certified and digitally signed tags to counter vandalism. Then perhaps there could be a way to provide information on the user’s context with the tag: in meeting, telco, holiday, etc. in addition to the room name or other description of the person’s location. In comparison, Facebook provides a field called ‘status’ where users can insert practically any information.

A consequence of individual tagging was that our company restaurant suddenly had two different tags with similar but different descriptions of that space. From a casual user point of view, the question is then which of the restaurant tags is the most suitable? There is no sense in using one of the user’s own tags. This brings us to a design scenario where attending the HICSS event would start by touching a tag. Friends and colleagues would then see that you are at this event. HICSS colleagues you have previously met would be able to see that you are in and meanwhile you would see the same view of the event. In fact, if the rooms were tagged, you would be able to see exactly where they are. The power of the structuring is in the possibility to manage any event data. When the event organizer has a toolset for structuring all the material, the event inside HIC in Facebook or other such application would provide the material. Thus, materials and friends could be structured according to the event.

4.7 Events

There is a need for higher abstraction of the events in order to organize where friends were met. In addition, such abstraction could organize data, where friendship creation occurred, or any multimedia material for that specific event.

The HIC Facebook application could provide information browsing capabilities using different views of friend connections and materials, e.g. an event view showing Christmas parties, conferences, etc., a date view, an event/friend view listing the events where you met these friends, and so on. An abstraction of an event would enable the user to virtually manage friend connections created at that event. A friend could then be a person met for example at HICSS, who we may want to consider as a colleague.

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5. Further Work

A three-step pilot exercise was carried out to evaluate the approach and generate a clear picture of what features had potential and what should be redesigned. Other research approaches are still needed for the further evaluation of HIC design. Especially,
making friends is a deeply social agreement between two persons. People behave differently when making a friend connection in the same space and time. We can identify several design items for the next iteration. The first concerns the creation of friendships, the second the context of the user, starting from his or her location and status, and then proceeding to the event and time as contextual parameters.

One intriguing question that emerges from this research is: what exactly is the concept of a friend? For instance, is a colleague a friend? Contemporary social media systems have tackled this same question in various ways. Yet, it seems that the way in which friend connections are handled and the visibility of these connections are crucial for the success of such systems [3].

We will take a new perspective on the friend concept into account while reconsidering what exactly constitutes an event. For instance, do we count a location, such as restaurant, and some specific time as an event, or should the event be more structured, organized by someone? An event is a dimension for further design, and more work on defining what an event is will also greatly affect how we want to think about the HIC system design.

During this effort, we had our first indication of how location can be seen from the tagging point of view. The difference of GPS is that users can leave tags in a location that can be used by everyone. Otherwise, location can be provided to the system in a similar manner. The users, however, can choose whether they want to inform others where they are by means of the act of touching a tag.

We consider that future research can have both a wider generic focus and a domain-specific focus. On one hand, it is possible that an NFC-based mobile social network can provide an open and generic service similar to Facebook or that this open system can be embedded into an existing generic social media system. On the other hand, specific domains (e.g. work domains, shops or restaurants) have different social dynamics. The HIC system can be designed to support selected social dynamics. Finally, we intend to do more research on user experience with the HIC system. In autumn 2009 we will hold a HIC field trial that aims to examine the use of HIC at a conference with several hundred participants.

References


