Mobile Phones for the Next Generation:
Device Designs for Teenagers

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ABSTRACT

In this paper, we demonstrate how ethnographic fieldwork studies can be used to inform the design of third generation mobile phones. We draw on a field study of teenage mobile phone users and, specifically, their participation in gift-giving practices to design the user interface and form of a concept mobile phone. The concept device is designed to support teenagers' social practices through a novel multimedia messaging system and the augmentation of the phone's address book. We report on the process adopted to design the concept and briefly describe preliminary reactions from potential users. To conclude the paper, we comment on the lessons we have learnt in applying ethnographic findings to design.

Keywords

3G, interaction design, ethnography, mobile phones, cell phones, multimedia messaging, teenagers, gift-giving.

INTRODUCTION

With the imminent arrival of 3G (3rd generation) wireless communication systems in Europe and the US (and their recent deployment in regions of South East Asia), mobile phone manufacturers and network operators are in search of features and services that will make use of the promised technological advances (e.g., increases in bandwidth, 'always-on' connectivity, etc.). They are also seeking to identify those solutions that will revive consumer interest and boost waning sales of both mobile phone handsets and service contracts.

Various possibilities have been suggested to meet these demands. Multimedia messaging (MMS), for example, has been designed to extend the hugely popular short text messaging (SMS) facility, available on existing digital networks, by enabling users to exchange still images, sound and video content.

Also, through the much used 'anytime, anyplace, anywhere' slogan, location-based services are said to offer a means to provide context-sensitive, commercial services to consumers when they need it (i.e., 'push advertising').

Despite these offerings, however, serious concerns have been raised about the financial commitment made towards the 3G venture. There is no certainty that the pay-outs made by the manufacturers and operators will result in the much needed increases in revenue [1]. It seems confidence has dwindled because of the lower than expected demand for advanced services, based on WAP (wireless application protocol) for example, and the overall slump in the mobile telephony market. Nobody seems to be sure about how to make the most of 3G and, perhaps more importantly, what services will be popular amongst mobile phone users.

In an interesting strategic twist, manufactures and operators seem to be turning to so-called 2.5G as a means to test out features such as camera enabled phones and MMS services. 2.5G has offered an interim test bed through which the manufactures and operators can explore markets and consumer needs before making yet further commitment to the costly 3G infrastructure [5,8]. Unexpectedly, technological progress appears to be outpacing economic and marketing developments, providing space to assess the feasibility of particular services and features.

In this paper, we demonstrate that as well as investing in this 'build-and-see' approach, there is still much to be learnt from detailed investigations into current phone use. Specifically, we aim to reveal that ethnographically oriented field studies of phone users can be used to inform the design of particular interactive features and the form phones might take with the advent of 3G systems. The research presented here draws on an ethnographic study of teenage mobile phone users and presents an early design concept of a mobile device based on the field investigations. Using this research as an example, our aim is to illustrate how ethnographically informed studies offer a viable approach to determine how the 3G infrastructure might be used more fruitfully and what services might be well-received by consumers.

In the next section we outline the fieldwork study of teenage mobile phone users and briefly describe the findings. Following this, we report on the design of a concept for a mobile device. We reveal how the design was influenced by the fieldwork findings, briefly describe the design process itself and present an overview of the device's interactive features and its form. We also offer some insights gained from preliminary reactions by potential users of the device. We conclude the paper with some general comments on the use of an ethnographic approach to inform design.

FIELD STUDY

The fieldwork study of teenage mobile phone users took place at a sixth-form college located in an English suburban town. A familiar part of the English education system, sixth-form colleges are institutions in which students between the ages of 16 to 19 are taught for two years in preparation for their advanced level examinations. These examinations qualify them for entry into university – determining whether they can attend university, what university they attend and what subject they might study.

Run over a five-month period, the study employed various qualitative procedures, including observational and interview techniques. The observations took place in and around the college premises, including in the college cafeteria, in the classrooms and hallways, and in playgrounds and parks near to the college. The interviews were held over ten weeks with six of the college's students – five girls and one boy. Held weekly, the interviews were used to clarify points of interest raised in the observations and to learn more about those activities that could not be observed, such as phone use at home or in private. During the interview period, the students were given still cameras, audiocassette recorders and diaries to record their phone-related activities.

The field study resulted in a substantial collection of both observational field notes and group interview transcripts. Some of the results of the field study have been reported in detail elsewhere [19,20]. In this section, we briefly describe the key findings from this work and, specifically, those that relate to the design exercise we describe later.

Social Exchange

One of the overriding themes to be uncovered through the ethnographic field study was that the teenagers who were observed and who took part in the interviews appeared to use their mobile phones to participate in the social practices of exchange. Specifically, their phone-mediated activities sometimes resembled the patterns of *gift-giving* described in the anthropology and sociology literature [3,13,17,18]. This literature has its routes in the early ethnographic studies of tribes in Polynesia and Melanesia [12,13], but has also received attention in more recent research [2,4]. Generally, gift-giving is described as the exchange of material objects that embody particular meanings. It is also viewed as subject to the obligations to give, receive and reciprocate, and available as a means to demonstrate social ties and allegiances.

Embodied meaning

Amongst the teenagers, the phones were regularly used as a way to *embody* particular thoughts, feelings and meaningful events. For example, the text messages that were exchanged were sometimes described as objects that evoked particular memories. The messages were the embodiment of something personal that could be stored, retrieved, re-read and shared, becoming tangible mementos for individuals and groups. Thus, the phone appeared to provide a means to participate in social exchange in so far as it enabled particular objects to take on symbolic meaning and for the objects to be seen as meaningful between people.

From this perspective, the mobile phone might be seen as a tangible memory store or 'box' of sorts; as one of the interviewees contemplated, the phone is "like a box of stuff that reminds me of certain people… It's like a diary isn't it?" Phones and, in particular, text messages are thus seen as sentimental objects with emotional and social value. As with the gift exchanged, the value is not merely determined by the object's material features but also through its presence in and contribution to social exchange.

Obligations of exchange

In the fieldwork, it was evident that phones enabled teenagers to meet what are termed the *social obligations of exchange*: to give, receive and reciprocate. This was achieved in clear and observable ways through the exchange of text messages. The mechanisms for sending, receiving and replying to text messages allowed the exchange with relative ease. Text messaging, or 'texting' as it is colloquially known, provided the teenagers with a means to make the offer of something special or personal, to receive that offer in a mutual show of solidarity, and to reciprocate, completing the unspoken contract that establishes the bond between giver and receiver.

As well as text messages, the phones and the credit used to pay for call charges also served to meet the obligations to give, receive and reciprocate. Both were used as offerings in larger systems of exchange. For example, call credit might have been given in return for say a drink and the phones were swapped so that the charges imposed to call phones on different networks were avoided.

Some of these forms of exchange were made poignant through their role in ritual ceremony. The 'goodnight' messages sent between boyfriend and girlfriend demonstrate this. The messages of well wishing are sent nightly and performed in an orderly sequence of turns so that each party can meet their obligations of exchange and, in doing so, occasion a mutually constituted ritual that has its own unspoken rules and formalities.

Demonstration of social networks

The phone-mediated forms of exchange that took place between the teenagers in the fieldwork also had much to do with the building of allegiances and the cementing of social networks. The phone, and its content, seemed to offer a means to

demonstrate the ties between social groupings and, occasionally, the status of friendships or possible rivalries.

Ties would be made observable through the use of the phone. The teenagers would frequently write or read their text messages together, passing the phone from person to person or leaning over each other to view the displayed messages. The mere sharing of a phone and the coordinated participation in texting would serve to bring individuals together and demonstrate their intimacy with one another. Text messaging was shown to be a collaborative endeavour through which teenagers found a way to reinforce their social networks and demonstrate their friendships with their peers.

The status of relationships would be played out through the obligation of *reciprocity* in exchange. By not replying to received messages or reciprocating with offerings of lesser value, teenagers could display the tensions between sender and recipient. The use of free messaging services provided on the Internet was seen, for instance, to be cheap and an affront to the mutual and fair exchange of text messages.

The mobile phone's roles in the embodiment of meaning, the obligations of exchange and the demonstration of social networks point to the ways in which the practices of exchange are present in teenagers everyday lives. Importantly, they reveal how the use of the phone has offered new ways for teenagers to participate in these practices and, in doing so, organise and manage their social relationships. In the following section, we describe how we worked with these findings to consider what features a phone with 3G services might have to accommodate the points raised above. Crucially, this investigation has been guided by our belief that practices such as social exchange are commonplace in everyday life and that digital technologies provide ways for them to be practically accomplished.

FROM THE FIELD TO DESIGN

The main points to be taken from the field study for the purposes of design can be summarised as follows:

1. Phones and their content are used to participate in the social practices of exchange.

2. Phones and particularly text messages embody meaning for teenagers, meaning derived from their form and the syntactic and grammatical style messages take.

3. Through their phones, teenagers are able to participate in the obligations of exchange: to give, accept and reciprocate.

4. The participation in the ritual ceremony can make the exchange special because it evokes a mutual and shared understanding.

5. Social ties and rivalries can be demonstrated through the participation in phone-mediated exchange.

Informing design

With this understanding of teenagers' mobile phone use we set about considering how a device might operate and what

it might look like if it were to take advantage of 3rd generation technologies. Given that much of our research confirmed what has been recognised as the popularity of text messaging amongst teenagers [6,10,11], we chose to focus on developing a multimedia messaging (MMS) facility for teenagers and a method for displaying contacts designed to support this. Importantly, the design ideas that we considered were not necessarily chosen because of their novelty, but rather to develop a set of features that tied into our findings on social exchange.

In the following, we describe how a number of the early design suggestions were born out from the forms of phone-mediated exchange that were seen to take place between teenagers.

Information capture and communication

In considering a MMS system, particular attention was paid to the capture and communication of information. These concerns were seen to be closely tied to the issues related to exchange. The ways in which information was reportedly entered and communicated using the mobile phone, for example, was closely related to the embodiment of meaning in exchange. The success of text messages in this respect appeared to rely on the manner in which text messages could be crafted and personalised for specific recipients using particular abbreviations or language styles.

Thus, in sharing multimedia messages, we felt it to be important to capture the significance of a particular exchange of messages and to allow possibly meaningful information to be associated with the messages so as to personalise them. As with text, then, the mechanisms for capturing and inputting content, would have to be designed so that information could be combined in unique ways – ways that would allow meaning to be crafted into the message. For example, one possibility might be to allow video to be combined with talk, or to incorporate text or hand drawn sketches with still pictures.

So as to make the delivery and receipt of messages meaningful, a solution might also allow communications to be made in playful ways that may not, for example, rely on the explicit or obvious methods for exchanging information, but rather allow contact to be made using more subtle means. Particular information crafted by a sender could be displayed on a recipient's screen, for instance, so that it might be discovered through a passing glance. This would allow surprise 'gifts' or possibly 'gifts' intended to be understood only by the recipient.

Sorting and organising information

The sorting and organising of content on the mobile phone was seen to be another way in which teenagers managed their participation in social exchange. With texting, messages that were important and those that had personal significance were stored so that they could be reread and sometimes shared. The teenagers in the field study came up with inventive ways to get around the limitations of memory capacity by, for instance, moving their messages to their phones' outboxes

(from the inboxes). Some of the study's participants also reported writing out their messages by hand so as to preserve their content, if not their form. Notably, the name, time and date stamps attached to messages were seen as important to teenagers because they provided yet another means to place significance upon a message.

In considering multimedia messaging, these features could be augmented so as to provide new methods for teenagers to store and organise their messages. A system might be designed so that messages could be marked and personalised by the recipient. Information about when a message was sent, or when it should be sent in the future, could also be added, thus allowing the obligations of giving, receiving and reciprocity to be tracked and organised. This would offer users with the ability to withhold messages, to be sent when they saw fit, or to give messages on special occasions.

Recipients might also be given a greater capacity to arrange their messages into meaningful groups and do so in a way that adds to the idea of messages having embodied form. For example, messages might be stored in virtual containers or boxes that could be labelled. These boxes could also be shared, thereby solidifying the ties between groups or possibly sustaining rivalries; 'boxed' messages might be shared amongst friends or kept from rival groups.

Displaying social networks

Also of interest with respect to design was the problem of displaying social networks on the mobile phone's small display. As we have noted, teenagers appear to have established several ways to demonstrate their social ties based on physical proximity; the phone offers a legitimate reason to bring people into close proximity and also to exclude others. Teenagers have also found that their use of particular features and services have value that can be used to display their allegiances to one another – conforming to common abbreviation methods, for example, reveals a teenager's alliances to particular social groupings.

Thought was given to how the design of features on the phone might contribute to these demonstrable practices. The address book on phones was seen as one possible facility to augment. Address books on existing phones are relatively restricted, showing basic details of contacts and, occasionally, offering an ability to display photographs. Using animated graphics, an address book might be designed to incorporate the sense of networks and people's social proximity. For instance, the navigation between contacts could simulate 3D space, where contacts move closer or further away based on their social allegiances. Contacts might also be able to display expressions through their pictorial icons to demonstrate their feelings towards the phone user.

Design concept

To help develop our ideas and to support the design activity itself, our attempts to draw on the field study's findings were combined with lo-fidelity prototyping using paper models and Macromedia Flash animations.

Feedback from people who were thought to be potential users of the concept device was also used throughout the design cycle. The feedback was obtained through individual interviews with twenty-two young people, aged between 15 and 25. The interviewees were asked to respond to various questions and materials including questions on their current Internet use (including instant messaging), their opinions of existing PDA and camera devices, and to provide their responses to the early mock-ups.

In the later stages of the design exercise participants were also asked for their responses to the device using three scenarios. One of the scenarios had the participants imagine they were exchanging "goodnight" messages with their partners. A significant problem raised from this scenario was the lack of expressiveness provided using existing text messaging services. A second scenario was based on the collaborative use of a phone and the sharing of the phone in small groups. Here, one common problem was that of display size and the problems encountered with sharing the phone with several people. One other issue was that of negotiating access privileges to content (i.e., how phone users manage who can view the display). The final scenario offered an example of a chance meeting in a public space (i.e., a hallway) through the phone. The points raised here had to do with displaying one's identity and social status.

Overall, the iterative and cooperative prototyping process helped to uncover a number of usability issues, as well as obtain some reactions to the device's capacity to support social exchange. The usability issues and people's responses to the mock-ups gradually evolved into a broadly encompassing set of criteria that guided the ongoing design. Some of the criteria that related to social exchange were:

1. Admit usage/viewing of content in small groups (2 to 4 people).

2. Admit combination of photos, sounds, type and drawing in same message.

3. Provide individual memory sticks for saving messages/ other content.

4. Admit communication of identity, feelings, mood and other status of users.

5. Express and add to the user identity.

6. Express the preciousness of a private object.

7. Express playfulness.

Although, individually, these criteria seem fairly modest, we believe their strength lies in viewing them together and considering how they might guide the design of a device so that it can contribute to the practices of exchange. In the following, we present an overview of one concept that came out of this process and describe a few of its features that relate to the field study's findings.

Concept overview

A mock-up of the user interface for the phone, offering basic functionality, was designed using Macromedia Flash. Figure 1 presents an overview of the user interface and general form of the device.

Figure 1. Overview of design concept.

A physical model of the device was also produced using foam material (i.e., Ureol and Sibatol) to allow a sense to be had of the size, shape and feel (e.g., Fig. 2). The device has a 'flip-open' or 'clamshell' form. It has been designed to look and feel like a personal, private object: a container of personal information, similar to a box or diary. A camera and microphone are built into the phone and can be used when the device is closed.
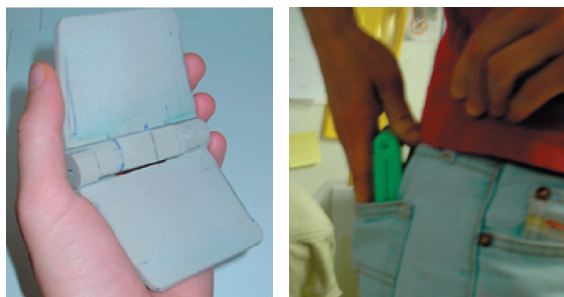

Figure 2. Physical model of device.

Open, the device provides two, 55x70 mm, touch-sensitive displays that can be controlled either by hand or with an input device such as a pen. On the left and right sides of both displays there are narrow, touch sensitive areas to scroll through the respective screens. These areas are operated by sliding the finger along their surface. The microphone and camera, which can point towards or away from the user, are placed

in-between the two displays. At the bottom of the device is an input so that additional memory modules can be attached.

Contacts

The view at the top of the device displays the user's contacts (equivalent to an address book) in a 'virtual world' (Fig. 3) that can be navigated using the scrolling areas on the sides of the display.
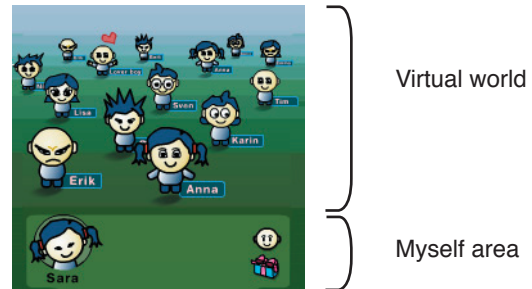

Figure 3. Contacts view.

In the Contacts view customised icons represent every contact added to the device. These icons are designed individually by each contact. This way an icon can express the 'identity' of the person it represents. The icon can also express a particular mood or emotion. Thus, a contact may choose to present himself as angry or happy. The icons are composed on the phone by combining hairstyles and faces and setting simple animations (Fig. 4). The icons belonging to the contacts are arranged according to the frequency of communication, so an icon representing a person the user often communicates with will, for example, be shown in the foreground. This use of spatial layout is somewhat similar to 3D document management systems [e.g. 20] where documents are displayed using a 3D interface and their relationships are represented using spatial proximity.
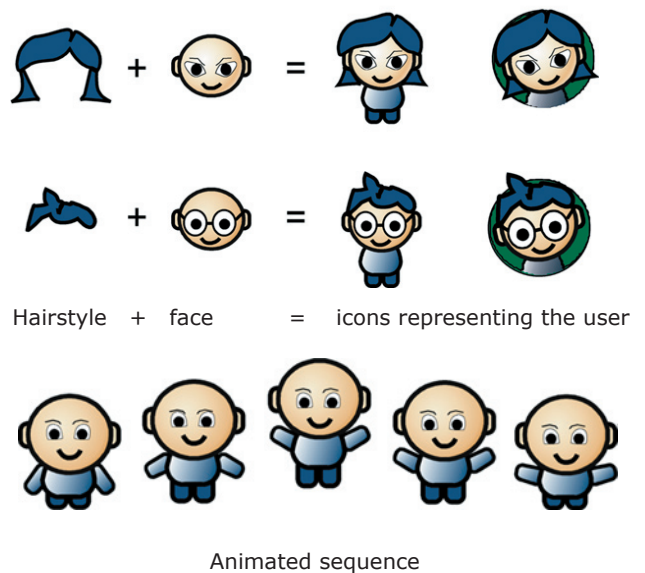

Figure 4. Composing icons for contacts.

At the bottom of the Contacts view is the 'Myself' area where the phone user's own icon is displayed. The icon shows the 'default identity' the user has chosen to display to her social network and the specific mood she has chosen for a selected contact. To set or change her icon or alter the mood expressed, the user selects the face icon on the right-hand side of the Myself area and chooses from a variety of displayed options.

The Contacts view is designed to reflect the social ties of the user. People, such as friends and family, who are frequently communicated with are presented as closer in proximity. Contacts are also able to express their form of friendship – their allegiances or possible rivalries – using customised 'gift' icons that can be picked from the menu displayed when the present/gift icon to the right of the Myself area is pressed. These customised 'gift' icons could be used to offer a gift of sorts. In the form of a flower, a heart or a short text message, such icons could serve as simple expressions of emotion displayed at a poignant moment. An expression of love might, for instance, be displayed at night along with the regular goodnight ritual.

In addition, it could be envisioned that contacts might be grouped into certain areas in the virtual world, reflecting the frequency of communication between several people. This would display not only the relationship between individual contacts and the user, but also social groupings.

Communication and creation tools

The three tools for communication are placed in a "communication area" that connects the two screens. The tools allow three different forms of contact to be made:

1. Two-way, real-time visual and audio communication.

2. Synchronous chat, featuring photo, type, drawing and sound input and transfer facilities.

3. Asynchronous messaging, featuring photo, type, drawing and sound input and transfer facilities.

To start communicating with a person/group the user drags the person(s) to the Myself area and pushes one of the communication tools (Fig. 5). The device then switches to the chosen mode of communication.

Figure 5. Dragging contact to begin communication.

The creation tools are used to select the type of input. There are four different input modes: audio, type, drawing and picture taking (e.g., Fig. 6). The user can combine all four tools any way she wants to and when she is satisfied with the created content she pushes "submit" and the content is submitted into the ongoing communication.

Video input mode

Type input mode

Figure 6. Examples of input modes.

The communication and creation tools are designed to enable users to combine information in creative ways. As with the object of exchange (e.g., the gift), communications made with the phone can be crafted and made special for particular people – through the creative combination of tools, the com-

munication is transformed from the exchange of words or talk to the sharing of personalised and meaningful objects.

File System and External memory vessel

The file system and external memory vessel are located in the bottom half of the device. Both offer 'space' to save communications and created objects. The file system operates in a similar way to the desktop on a personal computer. Collections of, for example, communications from particular people or specific types of content can be stored, organised and managed. The external memory vessel is a storage facility that allows collections to be saved on an external medium. The vessel can be removed and replaced, or exchanged between phones.

Both the file system and memory vessel provide a mechanism for communications, such as audio conversations or text messages, to be further embodied. The file system allows communications to take on a form that can be grouped, stored, labelled and arranged in meaningful ways by the user. The external memory vessel takes this a step further, allowing collections of messages and objects to take on a tangible form so that they can be physically kept, swapped or, possibly, disposed of. It is envisaged that memory vessels might take on several forms so that they can be, for example, worn as rings on attached to a necklace.

Notably, we have chosen not to detail the low-level interactions with the device in this paper. Although these are important, we see them as peripheral to the primary purpose of the paper: to illustrate how field studies can be used to inform the design of next generation mobile technologies.

User trials

As mentioned above, tests with both the user interface (UI) and form of the design concept were undertaken throughout the design process to gain an ongoing sense of the device's level of acceptability and to inform further developments. In this section we briefly report on some of the users' preliminary reactions to the device's UI and form. It should be noted, however, that users' reactions to the gift exchange features have not been reported here; our work has yet to reach a stage where the design concept can be fully evaluated with respect to these features. In the near future, our plan is to implement several of the design suggestions laid out above so as to undertake a more thorough evaluation—particularly of those features related to messaging and gift-exchange.

Over the course of the design stages, groups of 3 to 6 participants were asked, individually, to interact with both the developing screen mock-ups and physical models of the hardware. Participants were then asked to perform tasks, e.g., to take photos or combine text messages with video. The participants' behaviours were observed and their reactions and comments to the mock-ups noted. The early hardware mock-ups were rough models made in foam material. Later tests involved more precise mock-ups of the hardware, still using foam but with cleaner surfaces and more accurate measurements.

The screen mock-ups, in the early stages, were drawn on paper, illustrating the layout of the different screens. Interaction was simulated by manually moving between the illustrated screens according to the participants' 'inputs'. Later, the participants were asked to perform several operations with the interface mock-ups designed in Flash. The testing method was similar in principle to 'screen prototyping', as described in [14], where participants are asked to accomplish a task using a simulated screen-based UI. However, one key difference is that the designs of both the user interface and hardware in this study were seen as crucial to one another and thus done in parallel.

The results from early tests of three hardware mock-ups provided an indication of what was an acceptable size for the device. They also indicated that users liked the 'box' or container metaphor for the device, with a lid to open and close. In later tests, it was discovered that participants were eager to point directly at the screen on the hardware prototype instead of using the sensors at the side of the product for input; the sides were intuitively used for scrolling, while selection was performed by pointing at objects on the device's display. This encouraged us to incorporate the touch sensitive display.

To perform the paper-based trials with the UI, participants were shown the illustrated screen mock-ups whilst holding the hardware models. One key finding was that the "address book" as a primary interface was preferred to concepts where it was given less space on the display. The tests also indicated how icons and functions could be grouped in logical ways and how to structure the hierarchical levels of the UI.

In the later tests, with the Flash animation UI, participants handled the final hardware mock-up while performing specified tasks on the computer. The tests indicated the need for some minor changes in the structure of the UI and simpler graphics. Features such as displaying the presence of 'friends' in the device and ability to express 'feelings' and change the 'appearance' of one's self were most popular. Overall, the reactions from the participants indicated that the device had a high level of acceptability and was keenly anticipated by potential users.

CONCLUSIONS

The design concept presented in this paper offers an indication of how a mobile communications device might be designed using the findings from a field study alongside various established prototyping techniques. By paying particular attention to the ways in which teenagers use the current generation of mobile phones and their views of other communications systems, we have designed the features of a concept device to support the participation in social exchange. In a specific attempt to consider MMS, a 3G service, we have attended to the ways in which media can be used and combined in message exchange.

Broadly speaking, various criticisms have been levelled at the use of ethnographic field studies that aim to inform design. The approaches have been described as focused on the wrong

level of detail for design, producing design requirements that are too vague or modest, and concerned with commenting on existing practices rather than prescribing new forms of computer-mediated activity [7,9,16].

In the work presented, we have attempted to tackle this problem of using field studies to inform design. We provide a practical example of how fieldwork and qualitative analysis can produce specific and concrete design suggestions for future 3G mobile devices. We describe the concept for a mobile phone that offers just one possible set of features that might be derived from ethnographic field data. As a whole, the user interface and form factor of the phone aim to support teenagers' social practices and specifically, their participation in gift-giving.

By tackling the problem of using ethnographic field study data to inform the design of mobile devices, we have come to see the possibility of an approach that may be generally applicable. This approach is based on the premise that some social practices are relatively persistent within social groups. It follows that if these practices can be uncovered, the potential exists to propose and consider future technological solutions that are likely to be compatible with and useful in people's everyday social lives.

This approach could be targeted at discovering those social practices that are common amongst people and, importantly, *how* such practices are routinely accomplished. It could then be used to consider the ways in which new technologies might impact upon and either contribute to or detract from commonplace, social activity. To explore this possibility further more studies that aim to reveal persistent social practices need to be undertaken. Time could also be given to investigating a more systematic method for uncovering and using such practices to inform design.

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