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Abstract

A location-aware multiuser messaging (LAMMS) application was user-tested to explore a possible future form of mobile text-based communication that may develop alongside short message service (SMS). Two sets of user trials were performed with the prototype: Study 1 involved a peer group communicating in an unconfined space; Study 2 was associated with a group of strangers using the device in a shopping centre. Chat was observed to be a prominent aspect of communication, in both studies. Chat among strangers, in particular, may benefit from location-awareness, in that location may provide a talking point and structure the conversation in the absence of knowing the communication partner. The fact that location-based and informational messages were more common among users in Study 2 suggests also that location-based commercial information may be acceptable in a setting that is associated with non-acquainted users. The results point toward the importance of creating a high message density environment in future studies associated with the use of LAMMS.

1 Introduction

Text-based SMS messaging, texting, has become a prominent aspect of mobile communication. Rheingold refers to the SMS culture as mass communication [1] and in the same way as personalising the appearance of mobile phones [2], sending SMS has been found to constitute a social glue, enabling the individuals to collectively engage each other and sustain their mutual relations [3]. The SMS culture, characterised by messages limited to 160 characters, continues to thrive while contributing to the emotionally and socially enriched mobile user experience. It is unlikely, however, that the nature of SMS will remain unchanged in the face of the quickly evolving mobile services. The introduction of the multimedia messaging service is an indication of the fact that services combining text-based communication with other features are already being introduced. The question is whether these services will run in parallel or replace the existing SMS communication.

Ubiquitous computing may also have an impact on mobile messaging. Since Mark Weiser coined this term in 1991 to refer to calm technology receding in the background of our lives [4], the use of this technology has come to mean a variety of features, such as sensors and actuators, wireless networks, distributed and embedded systems, and localisation and positioning technology. From the point of view of mobile messaging, the ubiquitous philosophy could imply the utilisation of location-aware information systems, i.e., connecting information pieces to positions in outdoor and indoor space, using positioning technologies, such as Global Positioning System (GPS), or Wireless-Local Area Networking (W-LAN)[5]. The status of positioning changes when used as part of messaging. Instead of using positioning for determining the location of an individual, location-awareness could in this case be seen as structuring the communication between individuals, i.e., as an enabler of communication. Location-aware messaging also has implications on the number of people communicating with each other. SMS incorporates one-to-one communication whereas location-aware messaging may conceivably be associated with posting messages to an environment accessible to a number of users.

This paper presents a user study that was performed to investigate one possible direction of the evolution of mobile communication services. During the user study the participants were given prototypes that they could use in their own environment. The prototype included an application that enabled location-sensitive messaging. That is, messages could be placed to and retrieved from a representation of the surrounding environment. The messages could be a starting point for longer discussion or they could be used as short expressions of opinions like in the scenario in Figure 1.

Figure 1. Use scenario related to the prototype that was user-tested.

The mode of communication could be referred to as LAMMS. The application studied deviates from traditional SMS in three important ways. First, location is used to structure the access to the messages. Second, the messages are accessed by multiple users. Third, replying to a message posted in the environment creates a thread, giving rise to chat functionality. Note that the application also enabled the users to include pictures in the messages. To keep to a manageable length, the findings relating to the use of multimedia will not be discussed in this paper.

We do not claim here that LAMMS will become the de facto service alongside texting. Instead we assert that location-awareness represents a potential direction for the evolution of SMS, therefore constituting an area worth exploring. The study is approached from two perspectives. First, we conduct a qualitative analysis on the messages that were sent during the user trials. Second, we describe the use patterns that were observed in the course of the study.

1.1 Scope of the study: two contexts of use

When deriving research questions, the issue of communication partner became prominent. It has been observed that despite saving a large number of contacts in their phones, individuals communicate with only a small percentage of these [6, 7]. In contrast, sending messages with a LAMMS application is analogous to publishing notes [5], as the messages are accessed as a function of location, not receiver. Provided no filtering of the recipient of the message takes place, the use of LAMMS may lead to a situation in which information with individuals not known to the user is exchanged. To compare peer-to-peer communication and that taking place among strangers, two sets of user trials were devised. Study 1 involved a group of friends communicating with each other using the prototype, whereas Study 2 concentrated on messaging among strangers, using the same prototype.

The role of positioning technologies operates on the dimension of confined versus unconfined space, because in some cases, such as when inside, the positioning service is functional in a small and well-defined area only. When navigating outside, the service might be used anywhere, as long as the satellite connection remains undisturbed. To investigate this difference, the positioning in Study 1 took place in outside space. Importantly, the

messages could be retrieved and constructed over long distances, as the maximum visibility range for the messages was 10 km. Additionally, the device could be used in inside spaces, with the exception that the location was in this case determined on the basis of the last successful GPS contact. In contrast, Study 2 prototype utilised W-LAN in a shopping centre and the participants were not able to use the prototype, and consequently embed messages, anywhere else.

Two independent variables, each of them associated with two levels, emerge: communication partner, and communication space. There is no valid way to tease out which of the two factors end up causing the potential differences between the studies, as only two "experimental conditions" are incorporated: Study 1 (communication partner: friend; communication space: unconfined) and Study 2 (communication partner: stranger; communication space: confined). Using these variables should thus be viewed as attempts to explore two contexts of use for LAMMS and any attempts to derive causal relationships between the variables in this paper should be viewed as speculative. The procedure and findings of the two studies will be described in the subsequent sections.

2 Study 1

2.1 Method

2.1.1 Participants

Six individuals participated in Study 1, three males and three females. The age of the participants varied between 23 and 29, with the average being 25. The participants spoke Swedish with each other and the researchers mainly used English to communicate with the participants. The occupational backgrounds of the participants varied. Four were students, one was a housewife and one was a service coordinator.

Study 1 consisted of a peer group. On average, the individuals met each other once to twice a week. As regards to other communication means, the participants called each other weekly, mostly using mobile phone. They also used SMS to communicate with each other. The participants were daily mobile phone users and weekly users of desktop computer. None of the participants had used a handheld computer before.

2.1.2 Procedure

The participants attended an introductory meeting upon commencing the study, in which the general operating principles of the application were introduced. The prototype was allocated to each participant in individual meetings, in which they were also taught to use the application. The participants were asked to always carry the device with them when moving about in the city. They were asked to send at least one message a day. They were told that they could use the device in any way they wanted to, and that the study was about investigating how they would end up using it.

The participants attended individual interviews at the end of each trial week. The messages sent by the participants were acquired from the server maintained by the experimenters prior to the interviews, and were used as stimuli to prompt the participants to reflect on the context of sending each message. The study lasted for a total of three weeks. A focus group concerned with general perceptions toward the device was held at the end of the trial period.

2.2 Findings

This section is divided to the following subsections: message analysis and use patterns.

2.2.1   Message analysis

169 messages were sent in Study 1, on average 28 messages per participant. The messages were on average 13 words long, i.e., less than half of the length of an SMS. In addition to creating standalone messages, the participants were able to create a chat thread by replying to existing messages. Chat was an integral part of the communication: 61% of the messaging in Study 1 consisted of chat and on average, half of the users participated in each discussion. Given that chat could traditionally be perceived as being relatively independent of location, does the high proportion of this type of communication allow us to conclude that location-awareness was irrelevant for the participants? This may not be the case. A closer analysis indicates that of a total of 23 threads in Study 1, 14, i.e., 61 %, were such that the initial message was associated with location:

- jummijammi [store]. In the corner of Fredrikinkatu and Merimiehenkatu, cheap movies and candy. Nice service!
- picture doesn't work!
- now it does
- push the buttem
- i wasn't talking 2you, you you damn swedish meatball!you'll know when i'm talking too you couse i'll use your christian name
- No need to be ruuuud. By the way MY BRAIN HURTS

A qualitative analysis was performed on the messages. The messages were broken to smaller units when they were associated with multiple topics. Messages that could not be interpreted were omitted from the analysis, as were the ones sent by mistake (messages containing no text). The resulting set of extracts that was analysed was 160 and 75, for Studies 1 and 2, respectively. The following categories (and distributions) emerged in the studies.

Table 1. Message categories across Studies 1 and 2 that emerged as a result of the qualitative analysis.

	Study 1 distribution (total set of extracts analysed 160)	Study 2 distribution (total set of extracts analysed 75)
Emotional Expression	61.1 %	12.0 %
Group awareness	7.0 %	14.7 %
Situated Chat	7.0 %	9.2 %
Identity Expression	7.0 %	-
Location Indication	5.1 %	-
Opinion Expression	4.5 %	4.0 %
Meta Comment	4.5 %	18.7 %
Cooperative Principle	2.5 %	10.7 %
Recommendation	1.9 %	16.0 %
Chat Invitation	-	14.7 %

Emotional expression. By far the most common type of communication in Study 1 was one expressing emotion. Messages associated with play and humour were common. Storytelling, i.e., long standalone messages presenting anecdotes, was cast in this category, as these were emotionally enriched. The participants also picked each other through means of black humour, sometimes rather heavily (see the chat excerpt above).

Group awareness. The prototype was associated with the role of a cognitive artifact [8] in that the participants used it as a means in trying to maintain group awareness. The users planned mutual activities using the system, and informed each other as to each other's whereabouts and plans. SMS is probably also used for such informational purposes. The difference here is that the present system enables an entire group to communicate with each other filling a need that may only partially be served by SMS.

Situated chat. A few chat threads centred on activities the users were immersed in at the time of writing the message. In the following excerpt one of the participants initiates a discussion while attending a wrestling event:

- So can you call this culture ?
- yes the idiotic americano culture where you grap the swedish flag and scream"finland"!
- Not culture ENTERTAINMENT. It's a difference you know!
- IT IS FAKE sorry

Identity expression. The messages were sometimes constructed to reflect aspects of self, or to designate others certain roles. For instance, one of the users sent a few photos of himself grinning and making funny faces. In the case of defining others' identities, qualities such as

'blond' or 'mathematician' were used to describe others. An aspect associated with group identity was also that bonding was observed to take place through the prototype:

- I know I'm sentimental, but one could not live without friends. You mean the world to me.

Location indication. The users embedded messages in the environment to inform each other of the location of their homes. The location of the message was complemented with the address of the respective home and photos taken from inside. In addition to indicating the location of one's home, also cultural institutions, such as libraries and cafes, were marked. Interestingly, one of the participants complemented these messages with the open hours of the respective venues.

Opinion expression. A few messages were clearly intended as statements of opinions. They were self-exhaustive in that they did not generate further discussion.

Meta comment. Technical problems associated with the use of the prototype were sometimes discussed using the prototype. The users were observed to help out each other by sometimes providing a solution to the problem.

Cooperative principle. The participants perceived the discussion that took place using the application in conversational terms, as signs of the cooperative principle were observed. This principle has it that parties in a conversation expect that each will make a "conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange" [9]. Thus when constructing messages, phrases such as "you're right" and "you too" emerged in places, where a response to a given comment was to be expected.

Recommendation. The participants provided recommendations to each other regarding shops and bars to visit. This only represented a small proportion of the communication, and was more common in Study 2, in which the communication took place within a confined space.

Interestingly, the analysis above bears resemblance to the corresponding analysis conducted by Persson and Fagerberg [5] on the use of a LAMMS application. These authors identified categories such as meta-notes, expressiveness, information and situation chat, contributing to the reliability of our findings. What should also be noted is that chat was found to be an integral element of the communication also in the Persson and Fagerberg study.

Table 1 indicates that emotional messaging was readily observed in Study 1, whereas in Study 2, utility-related aspects became important, such as providing recommendations and facilitating aspects of group awareness. A two-dimensional location-utility taxonomy was imposed on the extracts that were used in the qualitative analysis, to yield more systematic comparisons between the studies. The location-dimension is concerned with whether the content of the message conveys aspects of location. Messages could thus be categorised as location-dependent- or independent. The utility-dimension makes a distinction between messages that serve an informational, utility purpose and those that are mainly to do with emotional expression. On the basis of an analysis performed by the first author, 50 % of the messages in Study 1 turned out to be location-independent emotional. 4 % were location-independent utility-based. 35 % were categorized as location-dependent emotional whereas
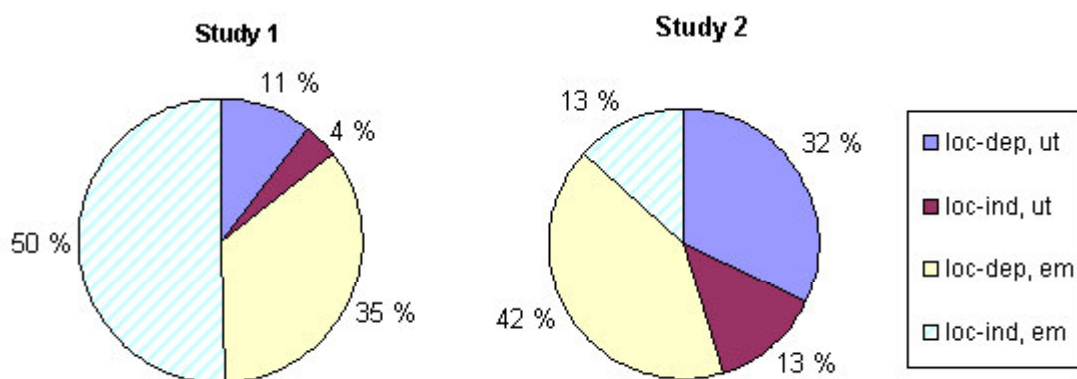
Figure 2. Location-utility taxonomy, as imposed on the messages in Studies 1 and 2.

11 % were location-dependent utility-based. The respective figures for Study 2 were 13 %, 13 %, 42 %, and 32 %. The diagrams below illustrate the proportions, across the two studies.

Due to using the taxonomy as a means of comparing the messaging in the two studies, acquiring an interrater reliability measure on the analysis was considered important. Cohen's Kappa turned out to be 0.64 for both dimensions across two raters, p<.05, suggesting that the categorisation inherent to the taxonomy may be regarded as reliable.

A chi-square statistic of the distribution of the categories in Study 1 yields a value of 8.66 (1, 160), p < .01, confirming that the distribution is not random. By looking at the proportions reported above and depicted in Figure 2, one can notice that the categories that deviate the most from the expected values include location-independent emotional messaging and location-independent utility messaging. The former is overrepresented, and the latter underrepresented. We may conclude that location-independent emotional messaging was predominant in Study 1, as half of the messages were cast in this category. Both the fact that the communication space was unlimited and the fact that the participants knew each other may have contributed to the high incidence of this type of communication.

When looking at the dimensions independently, the peer group adopted an emotional way of communicating with each other: 85 % of the communication was categorised as emotional. Location-independent and dependent messages were quite evenly represented, 54 % and 46 %, respectively, suggesting that despite the high prevalence of location-independent emotional messages, the messages conveyed aspects of location in many cases. Location-dependent emotional messages, in particular were quite common. Messages cast in this category were often part of the so-called situational chat.

2.2.2 Use patterns

Between actions. In line with [10], the most common context of use of the LAMMS application was when the users were in a transition state between various activities. Many participants used the prototype while commuting to work or home, or when experiencing an idle moment at home, at a café, or at work. It was characteristic for these messages to reflect past experiences of the users.

Disassociation of location. The above-described 'between action' bias (which often implied using the device inside), combined with the fact that establishing the GPS connection was

sometimes slow, led to a situation in which the users often placed the messages in the environment in a random fashion, even if the content of the message contained references to a particular place. This, coupled with the fact that the most common type of communication was location-independent emotional, suggests that the users in Study 1 may have benefited from a bulletin board principle facilitating chat rather than having a location-based application structuring the communication. This will be taken up in the Discussion.

Right here right now. Some of the messages were inspired by events taking place at the time of writing the message. Such inspiring, thought-provoking events included, e.g., attending a wrestling event, witnessing a tram accident, and spending a night out with friends. These events exceeded the threshold of the users to interrupt their current task so as to be able to post a message of the event and share it with others.

Inanimate, inside. Most messages were written when the user was not moving. In addition to writing the messages when being still, the users were often inside, i.e., out of GPS coverage. It is difficult to tease apart the constraints imposed by the difficulties related to the positioning technology and the effects of the general nature of the LAMMS application in leading to this kind of use. Additionally, the user trial was run in cold weather, which is likely to have further influenced the users preferring to use the device inside.

3 Study 2

3.1 Method

3.1.1 Participants

Study 2 also incorporated six participants: three females, three males. The messaging took place in a shopping centre in Helsinki. A sample consisting evenly of both shopkeepers and customers was acquired to yield a representative sample of a shopping centre audience. Both categories of users visited the shopping centre frequently. The ages of the participants ranged between 21 and 38; the mean age of the participants was slightly higher than in Study 1, 30.3 years. A variety of occupational backgrounds was represented (three shopkeepers, a librarian on a maternity leave, a social services clerk and an IT trainer). None of the participants knew each other. The participants were all daily mobile phone users and weekly users of the desktop computer. Five of six participants had never used a PDA before, whereas one was a daily user, being familiar with location-based mobile services and being a regular user of W-LAN connectivity due to his IT-related job. In contrast to Study 1, the participants in Study 2 spoke Finnish.

3.1.2 Procedure

The procedure between the two studies was to a great extent the same. The group meeting organised in the beginning of Study 1 was not held in Study 2, however, to avoid the participants from meeting each other. Like Study 1, also Study 2 lasted for three weeks. The participants were asked to send at least one message with the prototype whenever visiting the shopping centre. Individual interviews were performed at the end of each week of use and a focus group session was organised at the end of the three-week trial. The participants in both studies received a 100 euro reward for participating.

3.2 Findings

3.2.1 Message analysis

Participants in Study 2 were less active at sending messages, with the total number of messages being 70, less than half of the respective number in Study 1. The average message length was 9 characters. The fact that the participants did not know each other may have both contributed to the more passive messaging in Study 2.

Consistent with Study 1, chat was a popular way to communicate. 54 % of the messages were part of a chat thread and on average, two users participated in each discussion. In 12 of 15 cases, i.e., in 80 % of the cases, the initial message in the thread conveyed location. It may well be the case that the location-sensitive functionality in the device contributed to the high incidence of location-dependent content in the chat. Location may have had a particularly strong role in Study 2, in which the participants did not know each other and consequently lacked common topics of conversation. Incorporating a control group of people using a chat-enabling mobile device not equipped with location-sensitivity would yield interesting data in regard to the effects of location-sensitivity on the emergence of this chat dimension.

As indicated by Table 1, the differences between the categories that emerged in Studies 1 and 2 is that the latter communication was not associated with identity expression and location indication. It is likely that the first element lacked because the participants did not know each other and were therefore forced to anchor the conversation to other issues. Why 'location indication' was not observed in Study 2 could be because the shopping centre was small and the users knew the locations of the shops.

The category 'Recommendation' was somewhat different in Study 2 in that in addition to recommending places, also product recommendations were given and requested; these were mainly concerned with ideas for Christmas gifts and tips as to special offers in various shops in the shopping centre. The category 'Group awareness' changed in nature in that mutual activities were not planned, as in Study 1, but instead the participants informed each other when a given user was online.

Although chat took place in both studies, the category 'Chat invitation' was only observed in Study 2. This may be because the discussions were initiated spontaneously in Study 1, without conscious attempts to generate discussion. In Study 2, however, intentional attempts were observed. These chat initiators were mainly concerned with aspects of the shopping centre, such as "Have you bought Christmas presents from here?" or "Should the heating at this shopping centre be improved?"

The main difference between the two studies in terms of messages sent is that emotional expression, which had a dominant role in Study 1, was not such an important aspect of communication in Study 2. The role of emotion was compensated through more utility-based communication, such as through the use of meta comments, or through facilitating aspects of group awareness. The participants also seemed to be more conventional in terms of utilising the cooperative principle. This could be a consequence of the fact that in the absence of knowing the communication style of the conversation partner, resorting to established conventions of social discourse facilitates establishing a common ground.

When it comes to the location-utility taxonomy, although a two-way chi-square performed on the proportion illustrated in Figure 2 did not yield a significant value (X^2 (1,75)=0.24, p>.05),

one can observe that location-dependent emotional messaging became the modal category in Study 2. Location-dependent utility messages (e.g., recommendations, and group awareness) were almost equally common, leading to the conclusion that location was frequently reflected in the messages sent by participants in Study 2.

Interesting differences arise between the two studies. Study 1 communication could mainly be characterized as emotional, and consisting of both location-independent and location-dependent content. Study 2 participants, on the other hand, communicated in a location-dependent fashion, reflecting both emotion and utility in their messaging.

3.2.2 Use patterns

Consistent with Study 1, most of the time, the participants were inanimate whilst constructing the messages. Also, when an event with high emotional value took place, the participants would interrupt their current tasks to send a message regarding the incidence. For instance, one of the users found a record he had been looking for for a long time in a record shop in the shopping centre, and wanted to immediately inform others about this. Another participant, inspired by this particular message, took up the habit of visiting the shop. It should be noted that the disassociation of the messages, observed in Study 1, was not prominent in Study 2. A higher awareness of location may have contributed this.

Location-based browsing. An aspect novel to Study 2 was that the participants who were customers sometimes browsed the messages when walking around the shopping centre. Two of the participants were mothers of young children; they placed the prototype on top of a baby trolley and walked around the shopping centre with the device switched on. Effectively, an immediate, explicitly location-based mode of using the device emerged in Study 2, one that was associated with browsing the system as a function of the primary environment. Using the device in a mobile state was not perhaps as common in Study 1, in which the messages tended to be read and written inside. This difference will be taken up in the next section.

4 Discussion

We described a user trial that investigated a LAMMS service. Two types of users communicated with each other, friends and strangers, across unconfined and confined space. One of the main questions to ask is what, if any, added value is provided by such a service, as compared to texting. What novel does location-awareness incorporate? Due to the lack of control data of the use of SMS for communication, it is difficult to answer this question. What can be done, however, is to compare the two studies with each other, and discuss the design implications of LAMMS in terms of the differences arising from these two contexts of use.

One of the most prevalent findings was that the importance of chat was high in both studies - majority of the messages in both studies were part of a chat thread. This suggests that regardless of whether a group of friends or strangers communicates with each other through a mobile device, chat should be supported. Whether or not chat benefits from location-awareness is another question. Location provided a talking point for the users in Study 2, as majority of the communication was categorised as location-dependent. Consistent with this, 80 % of the discussions in Study 2 were initiated by location-dependent messages. Thus when designing chat functionality to a LAMMS application to be used by individuals not

acquainted with each other, location-awareness may be useful in facilitating the conversation. Not only does location provide a talking point in LAMMS, it also seems to structure the communication. Ad hoc discussions may be inspired by and anchored on physical objects and places, much in the same way as chat rooms would structure the threads in web-based chat applications. The communication among the group of friends, on the other hand, could be more independent of location, as common topics of discussion exist anyway, and there is a need to communicate with certain people, i.e., members of the given group. In this case, location, particularly when using a small range for accessing the messages, would inhibit the communication rather than facilitate it.

Another issue associated with the difference between friends and strangers communicating with each other is that utility-related messages were more commonly observed among the latter group. This may be because aspects related to group identity and expressiveness are not as prominent in the absence of knowing the communication partner, giving rise to utility and informational issues. An obvious design implication regarding these contexts of use is that commercially created content may be more acceptable in systems involving non-acquainted users. Location-based information push was indeed an aspect that was spontaneously taken up in the interviews with users in Study 2. For instance, it was suggested that the hallways of a shopping centre could represent an area open for social, chat-related interaction, whereas upon entering a shop, the user would automatically be provided with information regarding special offers, etc.

What, then, could be concluded regarding the differences between communication in confined versus unconfined space? The participants were observed to use their current location to filter the messages in Study 2. Location-awareness was used in a primary fashion, to browse messages embedded in the immediate environment, and to filter messages as a function of moving about. Participants in Study 1, by contrast, had to use a wider range due to the messages being dispersed over a greater area. A simple reason for this, and one that covaried with the differentiation between open and confined space, was message density. As the messages were embedded in places around the entire city of Helsinki in Study 1, the visibility range of the location-service had to be maximised. An explicitly location-based way of browsing could not emerge, as the referential locations of the messages accessed were in most cases far away from the location of the users, as compared to Study 2. This leads to the conclusion that for LAMMS to be used for filtering messages as a function of one's location, and for accessing local, situated messages, the message density should be high enough to make this type of use of the service meaningful.

It could be argued that one of the biggest problems in the present study was that high enough a message density was not achieved in either of the studies. The ability to use LAMMS application locally may require a kind of 'critical mass' of users, or content, and although this may have partly succeeded in Study 2, the density should conceivably been higher for realistic use of the system to take place. This problem has been encountered also in other studies concerned with LAMMS systems [5, 11] and it places challenges for future research on LAMMS.

An additional limitation associated with the study is that we cannot reliably conclude whether features less intelligent than location-awareness were enough to achieve the effects location had on the use of the prototype. In addition to location-awareness, mobility per se may have made the users more aware of location.

To conclude, although the study lacked a proper lack of control over the variables, it nevertheless appears that a prominent element associated with LAMMS is chat. Location may play particularly pronounced a role in this mode of communication among non-acquainted users, by structuring and inspiring the discourse. Communication among non-acquainted users also provides opportunities for service providers in that this type of communication was associated with utility aspects relating to commercial information. It is likely that a situated, explicitly location-based way of using a LAMMS service is facilitated by high message density. Reaching this in a test environment places one of the biggest challenges on research on LAMMS applications.

References

1.   Rheingold, H. (2002). Smart Mobs. The Next Social Revolution. Perseus Publishing.

2.   Blom, J., & Monk, A. (in press). Theory of personalisation of appearance: why people personalise their mobile phones and PCs. To appear in Human-Computer Interaction.

3.   Kasesniemi, E., & Rautiainen, P. (2002). Life in 160 characters. The text message culture of Finnish teenagers. In M. Aakhus & J. Katz (Eds.), Perpetual contact: Mobile communication, private talk, and public performance (pp. 170-192). Cambridge University Press.

4.   Weiser, M. (1991). The Computer for the Twenty-First Century. Scientific American, 265 (3), 94-104.

5.   Persson, P., and Fagerberg, P. (in press). GeoNotes: a real-use study of a public location-aware community system. To appear in IEEE Journal of Pervasive Computing.

6.   Ito, M. (2001). Mobile phones, Japanese youth, and the replacement of social contact. In Proceedings of the Annual Meeting for the Society for the Social Studies of Science (Cambridge, MA).

7.   Grinter, R., and Eldridge, M. (2003). Wan2tlk?: Everyday Text Messaging. Proceedings of the CHI'03 Conference on Human Factors in Computing Systems (Ft Lauderdale).

8.   Norman, D. A. (1991). Cognitive Artefacts. In J. M. Carroll (Ed.), Designing Interaction: Psychology at the Human-Computer Interface (pp. 17-38). Cambridge: Cambridge University Press.

9.   Grice, H. (1975). Logic and conversation. In P. Cole, and J. Morgan (Eds.), Syntax and Semantics 3: Speech Acts (pp. 41-58). New York: Academic Press.

10. Mäkelä, A., and Mattelmäki, T. (2002). Collecting Stories on User Experiences to Inspire Design - a Pilot. In W.S. Green, and P. Jordan (Eds.), Pleasure With Products: Beyond Usability (pp. 333-344). Taylor & Francis.

11. Kelly, S., Sung, C., and Farnham, S. (2002). Designing for improved social responsibility, user participation and content in online communities. Proceedings of the CHI'02 Conference on Human Factors in Computing Systems (Mineapolis).