

# Pervasive Image Capture and Sharing: Methodological Remarks

## ABSTRACT

Although multimedia phones have become pervasive in the market, most of our knowledge about the phenomenon comes from what can loosely be called “design studies” – studies of technology that do not yet exist on the marketplace. Design studies offer a unique opportunity to combine technology, design, and behavioral issues to inform technology and service development. However, methodology for these studies has received little attention so far. This paper outlines two design research practices in studies of mobile multimedia, and analyzes their pros and cons by comparing them to evidence from the first studies of actual uses of mobile multimedia. The final section asks what kind of research would best improve understanding of mobile multimedia.

## Ippo Koskinen

School of Design

University of Art and Design Helsinki

ikoskine@uiah.fi

<http://www.uiah2.fi/~ikoskine/>

## INTRODUCTION

Although multimedia phones have pervaded the market, most of our knowledge about the phenomenon comes from what can loosely be called “design studies” – studies of technology that do not yet exist, and often is not meant to exist, on the marketplace. Design studies offer a unique opportunity to combine technology, design, and behavioral issues to inform technology and service development. However, methodology for these studies has received little attention. This paper outlines two design research practices in studies of mobile multimedia, and analyzes their pros and cons by comparing them to evidence from the first studies of actual uses of mobile multimedia. The focus of the presentation is specifically on studies that focus on social uses of this technology. The review is selective, focusing on the most elaborate studies.

In this paper, I will review three research practices on mobile multimedia in an attempt to outline how to improve them methodologically. The focus is on how technology development can be informed with studies of people using technology. These three practices are described in the next section. For two reasons, I will not go through experimental studies of individual features with prototypes [1]. The problems of this approach are well known. It is difficult to generalize from these studies to other situations; systems

specified for research purposes are typically unrealistic; observer effects play a crucial role in these studies, typically conducted in a usability laboratory or with clumsy phone cameras; the differences between virtual and products are assumed away; and N is typically small, which makes generalization questionable. Most importantly, they focus on details of design – typically the user interface – rather than social uses analyzed in this paper.

I will occasionally follow Campbell and Stanley’s [3: p. 6] notation for describing research designs. X represents the exposure of a group to an experimental variable or event. O refers to the process of observation or measurement. Xs and Os in a given row are applied to the same specific persons, and the left-to-right dimension indicated the temporal order. R means random assignment of people to groups.

## DESIGN RESEARCH WITH EXISTING TECHNOLOGY

In several studies, people have been given access to multimedia phones and an ability to share messages with them. They have received minimal instructions from researchers, who have followed messaging and interviewed people to understand their experience. The justification is that by now, mobile multimedia has been too small a phenomenon to be studied purely from statistics [3].

Ling and Julsrud [3] focus on the “genres” of multimedia messaging (MMS) in Oslo, Norway. They argue that existing media – and other – genres provide people formats for compiling multimedia messages. Ling and Julsrud studied mobile salespersons of a soft drink company, real estate agents and carpenters for 6 months in Norway. They interviewed, observed during this period. At its end, they conducted group interviews. They do not report the number of people studied, but they learned that the main genres were documentation of work related objects, visualization of details and project status, snapshots (developing camaraderie), postcards and greetings, and chain messages (standardized messages, usually downloaded from Web sites). Soft drink sales persons used MMS most, followed by carpenters. These groups used it for all purposes mentioned above. Real estate sales persons used MMS only for postcards, greetings, and snapshots. Carpenters also used MMS for “clarification”: taking and sending pictures of problems at work to get advice from colleagues.

Another variant of this design builds on classical ethnomethodology [4], a perspective followed in the series of studies in Helsinki. In *Mobile Image*, Koskinen et al. [5] followed the messaging of four user groups – two mixed-gender, one male and one female – for approximately 2 months each. Unlike Ling and Julsrud, they collected actual messages. Users were not observed, but there was a pre-interview and a post-interview. In the second study, they followed three mixed-gender groups (7, 7, and 11 members) for five weeks during an MMS pilot of a local mobile carrier *Radiolinja* [6, 7, 8]. In these studies, the focus was on how messages were constructed and responded to by recipients. In classic

conversation analytic vein, these studies built on the notion that each message is shaped by the context in which it takes place, while it simultaneously reshapes that context. Because interaction is “situated,” neither users nor analysts do not normally know what is going to happen after a few turns. Instead, we have to act here and now.

In both groups of studies, people have got an access to technology they would not have without the study, but they have been given minimal instructions about how to use it. Both groups of studies have used fairly long-term use periods, which makes it possible to study social action [9], users’ methods in social interaction, and how they invent new uses to multimedia technology.

Jacucci et al. [10, 11] have studied the uses of MMS in capturing and sharing – or co-experiencing [8] – “large-scale events.” They studied two participant groups in World Rally Championship Race in 2004 in Jyväskylä, central Finland. The rally is a 3-day event with approximately 300.000 spectators. Jacucci et al. gave 8 multimedia phones to two groups, one consisting of 7 men in their early thirties, recruited from a small town. Another group consisted of 3 men and one woman, and was recruited from the Helsinki region. They were instructed to use the phones, and told to save all material, but no other instructions were given. During the rally, researchers shadowed the users with a video camera. After the rally, cameras were collected: videos, MMS pictures were extracted for analysis. Pictures were fairly evenly divided between rally-related events (N=255, out of which cars in action 75%) and “non-events” (N=272, of which group members doing something 43%). Also, the first group broke in two on the second day. Consequently, researchers were able to gather about 50 sent messages. However, they do not analyze these data separately.

In terms of research designs, all these studies are non-experimental. In Campbell and Stanley’s terminology, Ling and Julsrud’s study is a pre-experimental static-group comparison. The rally study, on the other hand, can best be characterized as preparatory design ethnography aimed to inform requirement specification for Internet support for MMS applications in one specific class of surroundings (large-scale events). *Mobile Image* has quasi-experimental features, following the logic of nonequivalent control group design, but *Radiolinja* is partly interpretive [8], partly ethnomethodological [5, 6, 7] in its aims. However, both studies built on a strong theoretical framework that guided methods to interpretive social science.

#### **CONSTRUCTIVE DESIGN STUDIES: EXPLORING METADATA**

A recent body technology-oriented body of work elaborates the previous practice by building a more elaborate technological environment for people. A group of researchers led by Van House and Davis have conducted a two-stage study on metadata and MMS building on activity theory and ethnomethodology [12, 13]. In *MMS1*, they gave MMS-capable phones for over 60 users for 4 months to study capturing images, learning that sharing is as essential as capturing. In *MMS2*, sharing was supported with a Web-based system, which used metadata of various sorts to support sharing. The main question is whom do people want to share pictures with. *MMS2* used a pool of 60 users (40 students, 20 researchers), but this time, the trial lasted 6 months. Six weeks into the trial, the researchers did a preliminary analysis that confirmed the importance of sharing: when people are given an access to a system in which it is easy to share images, people do that. The increase between these studies was significant, increasing from 0.06 daily photos to 0.95 daily photos (+1363%, tasks assigned for students are removed from this

figure). The main reasons for this increase were related to better image quality, increased familiarity with camera phones, and the availability of a better sharing system images with others.

To solve problems in getting off photographs from the phone easily, finding and managing them, and sharing them, *MMS2* used three kinds of metadata [14]: spatial (CellID, Bluetooth-enabled GSP, fixed-location BT devices), temporal (network time servers), and social (who is co-present is sensed by locating mobile Bluetooth devices present). Also, additional metadata could be added either on the phone or on the web through a text application. The UI application built makes simple guesses about with whom one wants to share photos with – for example, the first guess is that one wants to share it with those who are present when the picture is taken (“share guesser”). The availability of the share guesser application increased messaging significantly [12].

What is unique in these studies is the *length* of the study, the number of users involved and the rooting of the study to one user community. Furthermore, the main strength of the study is that it is based on a set of technological innovations like the share guesses, connection to GPS, innovative use of metadata, and careful analysis of use statistics. When contrasted to a traditional design study with a mock-up virtual prototype of an interface [1], or with mere usability studies, this study pay serious attention to sociability as a driving force in mobile multimedia.

#### **FOLLOWING EXISTING TECHNOLOGY WITH CROSS-SECTIONAL DESIGNS**

In contrast to design studies, another line of research has begun to explore social uses or actual users by following existing technology with ordinary users through interviews, by discussing messages they have taken, and sometimes, by observing them. Of course, these studies are aimed at understanding mobile multimedia as a “social fact” – i.e. as something that exists in society.

To take an example from these studies, Kindberg et al. [15] classified multimedia messages sent by 34 Britons (9 teenagers, 10 adults) and Americans (4 and 11 respectively, from the Bay Area), recruited from researchers own organizations and their communities. Each participant was interviewed twice, and take the phone with them to the interviews. The first interview collected background information about their experience with imaging technologies using both open-ended and multiple choice questions. When people showed images in the phone, the researchers first asked issued like what the image showed, where it was kept and whether it was captured or received by the subject. Then they asked about the intentions behind taking the image and its context. For received images, they asked when and who sent the image, how it was sent, whether it was annotated, and conjecture as to its purpose. Other questions were about details of any uses of the image (whether it was shared and how, whether it was annotated, the context of use, intentions with regard to keeping it or deleting it). The final questions were about wishes or desires they would have liked to have done with the image. In the final interview

We logged basic data on images sent, received and archived since the first interview, examined five more images at random using the same technique in the first interview, probed more deeply for difficulties and perceived value, examined patterns of image-communication with the subject’s cohort (friends, family, colleagues), and captured more general data about wishes or desires for future use of the technology. [15: 2-3]

Their primary interest was finding out motives for capturing and sharing images. Out of 349 messages they analyzed, 82% were affective. 58% of the affective messages were social in nature – targeted for enriching shared experience, or communicating with absent friends – and 42% individual, intended for personal reflection. Out of 63 functional messages, 53% were for social purposes; they were sent to help other people do some task, 47% supported tasks not involving sharing – that is, they helped the senders of messages in their own tasks.

From a more sociological perspective, Scifo [16: 363] has studied the domestication of camera phones in Milan by interviewing 70 people ranging from 14 to 34 years first in Summer 2003 and then in September – October 2003. What Scifo saw was a rapid familiarization of devices over her research period. For Scifo, mobile multimedia roots experience back in users' physical and social surroundings. It is almost exclusively linked to one's network of strong relationships, where it primarily nourishes sentimental bonds. With MMS, people give others an access to places, individual and social situations, and emotions. People share images of familiar objects and people, private life (like objects, relatives, and haunted places), and social networks. Mobile multimedia also provides an extension of one's experience and memory – with it, one's affective world is reportable in a visual and shareable form.

Using a diary-based methodology and a cultural conceptual framework, Ito and Okabe et al. [17, 18, 19] have studied camera phone uses in the Tokyo-Kanto region in August-September 2003 by studying 15 people (2 high school students, 8 college students, two housewives, and three professionals). They asked people to record several things in diaries: the time of usage; who they were in contact with; who initiated the contact; where they were; what kind of communication type was used; why they chose that form of communication; who was in the vicinity at the time; problems associated with the usage; and the content of the communication. Also, participants were asked to keep records of photos they took, received, and shared. Researchers asked people to submit last 10 pictures for research. These data was completed with interviews [18: 503]. Okabe and Ito learned that mobile multimedia is primarily used for personal archiving, visual notes, intimate sharing, and news and reporting.

Of course, over the long run, cross-sectional research on actual use provides the best data on camera phones. Also, in this area, we will see an expansion in literature as soon as multimedia becomes a widespread phenomenon. When no artificial groups are studied, no "group effects" arise (for example, running jokes). Also, when no attention needs to be given to technology, more resources are available for theoretical work, making a more complex monitoring of action becomes possible. However, this research model does not inform design in advance. For design, these studies are useful as a check of design studies: they provide a test for ideas generated in design and technology research. Still, as Kindberg et al. [15] show, a traditional cross-sectional research design can be conducted in a design context.

#### INTERPRETIVE OR (QUASI-)EXPERIMENTAL?

This review shows that at present, at least three research practices co-exist in literature on mobile multimedia. The best evidence on this phenomenon still comes from design studies, but the first studies of actual users have already been done. Research can roughly be divided in two: field trials with technology introduced to the users, and cross-sectional studies that follow existing users. The former model has two variants: most studies use existing technology to describe use, but at

least one set of studies has actively introduced technological innovations to a massive user study.

Research designs in the design studies have both pre-experimental (Ling and Julsrud, *Radiolinja*) and quasi-experimental features (*Mobile Image*, *Rally*, *MMS1*, *MMS2*). The most elaborate study so far is *MMS2*, in which a careful analysis of data was combined with iterative technological work. This setup has created a possibility to use discontinuities in time series as a method for analyzing the impacts of technological designs. Cross-sectional studies in contrast typically follow one or another pre-experimental design as outlined by Campbell and Stanley [2].

However, these studies share two features that give reasons to use experimental language cautiously.

- *Naturalistic research designs.* In a strong contrast to standard HCI practice, these studies aim at understanding how people use mobile multimedia, and may use this understanding for design ends. Naturalistic research designs are dominant, and studies are inductive, though not necessarily qualitative, in nature. Observations evolve slowly into concepts that are tested using the same data.
- *Multiple methods.* These studies combine several methods. In consequence, the notion of "observation" is unclear. For example, *Rally* combines a short participant observation period with interviews and an analysis of actual recorded messages with simple statistics.

For these reasons, it is better to characterize most of the current design research as interpretive. The main aim is to understand how people use mobile multimedia technology, and (possibly) feed that knowledge back to design. The interpretive model has an additional benefit over the quasi-experimental model. If taken seriously, the latter approach would lead to overly complex research designs that would still suffer from major validity problems. Also, if technology is developed to "test" theories, technological imagination may be limited too much.

#### DISCUSSION

This brief paper shows that although literature on mobile multimedia is still relatively small, a complex set of research designs exists even in this early stage of research. Methods range from traditional qualitative methods to simple time-series analyses in large-scale technological field trials. In general, research can be characterized as interpretive: the overall aim has been to describe and understand rather than explain or predict the users of mobile multimedia. Methods have been improvised according to the need.

One suggestion of this paper may be that the interpretive basis can be enriched cautiously with quasi-experimental thinking. This methodological tradition restricts technological imagination far less than the experimental mindset typical to usability studies. Quasi-experimental methods are not tied to particular forms of statistics either; they are more abstract than that. However, more careful literature reviews and methodological reflection needed to specify research designs so that systematic comparisons between studies become possible. Also, researchers would benefit from paying more attention to clarifying possible causal relationships before entering into studies. With few exceptions [20, 21], most research has treated mobile multimedia as a dependent variable. What are our dependent, independent, and intervening variables?

Finally, comparative research is clearly needed. Practically all studies have been done in one culture (with [15] as an exception). Mobile multimedia studies share this problem with mobile phone research, as the Tel Aviv-based communication

researcher Akiba Cohen has noted elsewhere.<sup>1</sup> The reason for the call of comparative research is that mobile multimedia devices transmit content that may be even more culturally dependent than talk or text messages. For example, Americans use photographs differently from the French [22, 23], and the meaning of sound differs even within cultures [24]. The problem, of course, is that comparative research is difficult, expensive, and time-consuming, and calls for academic rather than company funding. Meanwhile, one way forward might be to pay attention to possible cultural differences in on-going studies. With a within-cultural research design, research community cannot respond to the fact that mobile multimedia technology is provided by companies that act globally.

Of course, there is a host of other issues that need exploration in the future. These include sound and video [but see 25, 26, 27] and the way in which mobile multimedia finds its place in a technological network – PC, WWW, TV – in which contents migrate and transform [5: 101-103]. How these processes occur? Another possible issue is analyzing the moment of capture and sharing with observational methods [10, 11] or interviews [16, 17, 18]. Finally, theory needs more attention in the future [28].

## NOTES

<sup>1</sup> A closing note at the workshop “Mobile communication: Current research and future directions” in the Annual Meeting of the International Communication Association in New York, NY, May 26, 2005.

## REFERENCES

- Berg, S., Taylor, A. S., Harper, R. Mobile Phones for the Next Generation: Device Designs for Teenagers. Proceedings of CHI 2003, April 5–10, 2003, Ft. Lauderdale, Florida, USA, 2003.
- Campbell, D.T., Stanley, J. Experimental and Quasi-Experimental Designs for Research. Chicago: Rand McNally.
- Ling, R., Julsrud, T. The Development of Grounded Genres in Multimedia Messaging Systems (MMS) among Mobile Professionals. In Nyíri, Kristof (ed.) A Sense of Place. Vienna: Passagen-Verlag, 2005.
- Garfinkel, H.: Studies in Ethnomethodology. Prentice-Hall, Englewood Cliffs, NJ (1967)
- Koskinen, I., Kurvinen, E., Lehtonen, T.-K. Mobile Image. Helsinki: IT Press, 2002.
- Kurvinen, E. Emotions in Action: a Case in Mobile Visual Communication. Proceedings of the 3rd International Design and Emotion Conference D+E 2002.
- Kurvinen, E. Only When Miss Universe Snatches Me. Teasing in MMS Messaging. Proceeding of Designing Pleasurable Products and Interfaces DPPI'03, June 23-26, 2003, Pittsburgh, Pennsylvania, USA, 2003.
- Battarbee, K., Koskinen, I. Co-Experience – User Experience as Interaction. CoDesign Journal 1, 2004: 5-18.
- Koskinen, I. User-Generated Content in Mobile Multimedia: Empirical Evidence from User Studies. Proceedings of International Conference of Multimedia and Expo ICME 2003, IEEE Publication, Baltimore, MD, 2003.
- Jacucci, G., Oulasvirta, A., Salovaara, A. Active Construction of Experience through Mobile Media: A Field Study with Implications for Recording and Sharing. Personal and Ubiquitous Computing, 2005 (forthcoming).
- Jacucci, G., Oulasvirta, A., Salovaara, A., Sarvas, R. Supporting the Co-Experience of Spectators through Mobile Group Media. Submitted to Group 2005.
- Davis, M., van House, N., Towle, J., King, S., Ahern, S., Burgener, C., Perkel, D., Finn, M., Viswanathan, V., Rothenberg, M. MMM2: Mobile Media Metadata for Media Sharing. Proceedings of Computer-Human Interaction CHI 2005, April 2-7, Portland, Oregon, USA, 2005.
- Van House, N., David, M., Ames, M., Fin, M., Viswanathan, V. The Uses of Personal Networked Digital Imaging: An Empirical Study of Cameraphone Photos and Sharing. Proceedings of Computer-Human Interaction CHI 2005, April 2-7, Portland, Oregon, USA, 2005.
- Davis, M., King, S., Good, N., Sarvas, R. From Context to Content: Leveraging Context to Infer Media Metadata. Proceedings of IEEE Multimedia, MM'04, October 10-16, New York, NY, 2004.
- Kindberg, T., Spasojevic, M., Fleck, R., Sellen, A. How and Why People Use Camera Phones. Consumer Applications and Systems Laboratory. H&P Laboratories Bristol, HPL-2004-216, November 26, 2004.
- Scifo, B. The Domestication of the Camera Phone and MMS Communications. The Experience of Young Italians. In K. Nyíri (ed.) A Sense of Place. Vienna: Passagen-Verlag, 2005.
- Okabe, D. and Ito, M. Camera Phones Changing the Definition of Picture-Worthy. Japan Media Review. Annenberg School for Communication, USC. [www.ojr.org/japan/wireless/1062208524.php](http://www.ojr.org/japan/wireless/1062208524.php). Accessed April 15, 2004.
- Okabe, D. Emergent Social Practices, Situations and Relations through Everyday Camera Phone Use. Proceedings of Mobile Communication and Social Change, International Conference on Mobile Communication, October 18-19, Seoul, Korea, 2004.
- Ito, M., Okabe, D., Matsuda, M. Personal, Portable, Pedestrian.. Mobile Phones in Japanese Life. Cambridge, MA: The MIT Press.
- Rivière, C.. Seeing and Writing on a Mobile Phone: New Forms of Sociability in Interpersonal Communications. In Proceedings of Communications in the 21<sup>st</sup> Century: The Mobile Information Society, Budapest 2005.
- Koskinen, I. Managing Banality in Mobile Multimedia. To appear in Pertierra, Raul and Ilpo Koskinen (eds.). The Social Construction and Usage of Communication Technologies: European and Asian Experiences. Singapore: Singapore University Press, 2005 (forthcoming)
- Chalfen, R. Snapshot Versions of Life. Bowling Green, OH: Bowling Green State University Press, 1987.
- Bourdieu, P. (ed.). Photography. A Middle-Brow Art. London: Polity Press, 1990.
- Bull, M., Back, L. (eds.). The Auditory Culture Reader. Oxford: Berg, 2003.
- Frohlich, D. Audiophotography. Bringing Photos to Life with Sounds. London: Kluwer, 2004.
- Koskinen, I. Ambient Sound in Mobile Multimedia. Conference Paper, Hungarian Academy of Sciences, Budapest, Hungary, April 28-30, 2005.
- Kasesniemi, E.-L. et al.. Elävän mobiilikuvan ensi tallenteet. Käyttäjien kokemuksia videoviestinnästä. Espoo: VTT Tiedotteita 2204, 2003.
- Koskinen, I., Kurvinen, E. Mobile Multimedia and Users: On the Domestication of Mobile Multimedia. Teletronikk (forthcoming, 2005).