

Managing safety by mobile multimedia communication (MMC) (491)

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Abstract

With the rise of multimedia and the electronic superhighway different forms of multimedia communication have become available. This will enable new forms of work and interaction. In the future, multimedia will also serve the interests of mobile users. Companies with mobile workers (e.g. in transport, field service engineering, emergency services) can substantially improve safety, efficiency and service quality with mobile multimedia communication (mmc). However, the usefulness of mmc will depend on the kind and area of application. Earlier research indicates that mmc could be useful for the management of incidents and accidents, especially in the area of emergency response. However, to be useful, the development of mmc systems should better address task performance and outcomes, from a contextual perspective. This approach is illustrated through the case of ambulance services.

1. Introduction

The potential benefits of mobile multimedia communication depend on the specific 'context of use' (Thomas & Bevan, 1995), i.e. the characteristics of (see figure 1):

- the tasks (e.g. complexity, criticality)
- available tools (equipment, information systems, paper and pencil tools)
- the users (knowledge and education, work experience, skills, personality)
- the working environment (organisational rules, aims, relations, but also physical working conditions)

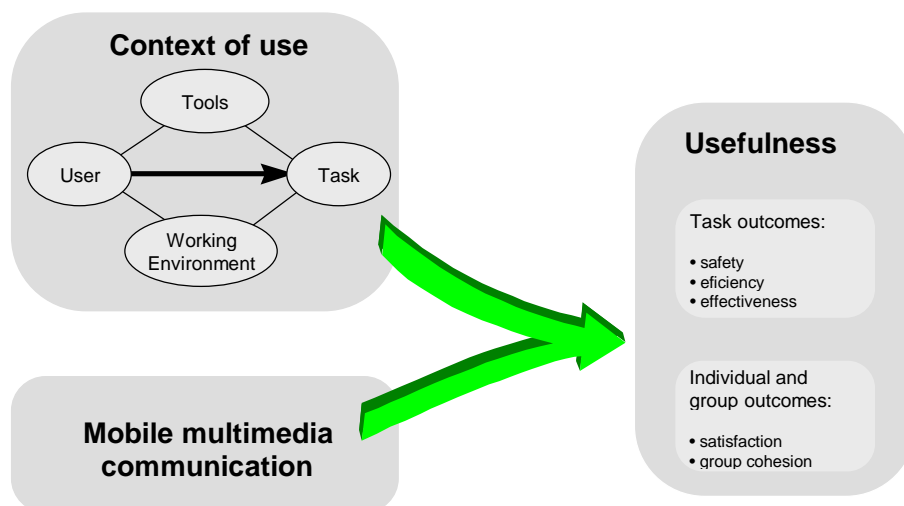


Figure 1 A model for the use of mobile multimedia communication

2. An orientation on mobile multimedia communication

- The use of multi-media (including video) is not suitable for every work situation. So-called 'rich' media are particularly useful for performing non routine tasks by reducing the uncertainty and ambiguity of unstructured situations (Rice, 1992).

- From several potential areas of application for mobile multimedia communication, experts rated incident- and accident-management in the areas of emergency response - especially remote assistance in ambulance services - as well as remote support in service engineering as most suitable for multimedia communication (Van den Anker & Arnold,1995).
- There is, however, little evidence that rich media improve task performance. Rich media rather support social activities, and may only be effective when the personal relationship is important for the task at hand (Gale,1990). To be of use for mobile workers, system development should be more oriented towards supporting task performance, instead of communication as a goal in itself. At the application level a move from ‘talking heads’ video towards ‘video-as-data’ (Nardi et al.,1996) could be a step forward.
- The ‘action facilitation design method’ (Arnold, in press) may have a guiding function in the development process, starting with the analytic phase, i.e. a description of tasks and usage scenarios. Based on a context of use analysis two deliverables are produced, i.e. criteria (in terms of user performance and effort investment) and requirements or proposed system attributes. Such an analysis was applied to the case of ambulance services, as a first step in the development of useful mmc systems. Field observation and interviews led to the identification of task requirements and usage scenarios. A similar approach for identifying potential applications is based on ‘activity theory’ (Kuuti & Arvonen,1992).

3. The case of ambulance services

In complex emergency situations the ambulance paramedic can get local assistance, from the chauffeur, other ambulances, or the mobile medical team (see figure 2). Early treatment is crucial in these situations. At present mobile communication is mainly used for the announcement of the patient’s trauma score, to enable early preparations in the hospital. But it also provides the basis for remote support from the hospital. Different scenarios of mobile multimedia communication have been identified, that will enable remote assistance for local decision making at the place of incident.

- ⇒ Mobile speech communication and the transmission of physiological data (ECG) in the case of cardiac emergencies
- ⇒ Speech, images and/ or moving video in the case of (poly)trauma.

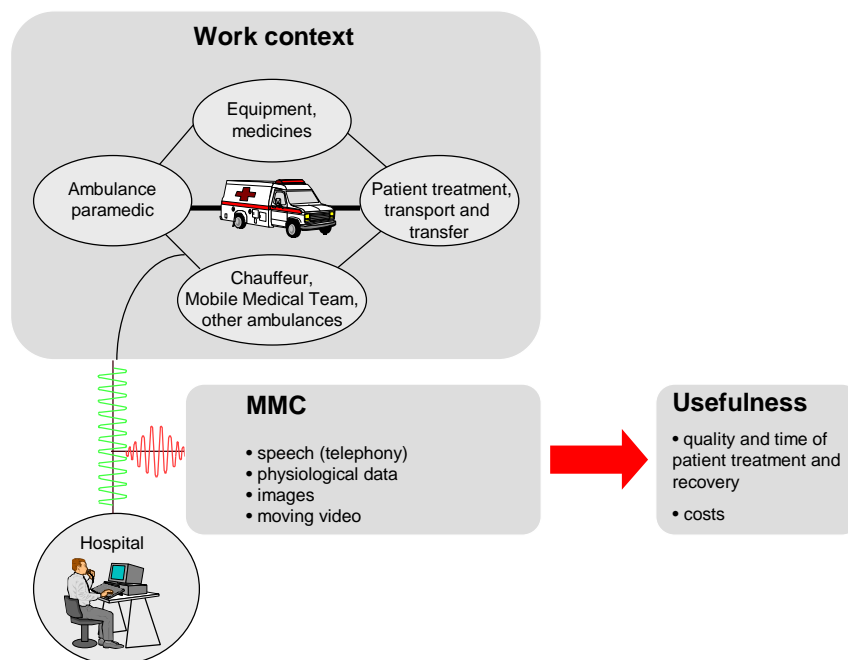


Figure 2 Mobile multimedia communication between the place of incident and the hospital

The step from analysis to design is not straightforward. The potential benefits of mmc support will not only depend on media choice but also on decisions with respect to the context of use. Crucial factors for ambulance services are:

- education, training and task experience, related to the senso-motoric skills of the (para)medics on the spot, as well as knowledge and decision making skills of the users at the place of incident as well as in the hospital.
- protocols for patient treatment, the division of roles and responsibilities, coordination and communication procedures, worker control, attitudes and culture.

4. Discussion

- A context of use analysis is a prerequisite for the development of useful mmc systems, establishing a fit between system and work context. Furthermore, as shown by the ambulance case, design requirements not only concern the mmc system but also the work context, because the usefulness of systems of mmc will also depend on choices made with respect to individual skills, training, education, as well as the organisation of work (the procedures, responsibilities, task division).
- The concept of 'fit' turns out to be problematic, not only because it should be based on a future (instead of the actual) context of use, but also because users seem to adapt to a poor fit between work context and system by increasing the amount of communication and work (Kraut et al.,1996). Therefore, early evaluation is crucial, not only through the evaluation of the implications of usage scenarios (Eason,1995), but also through more quantitative testing of the effects on task performance, in terms of safety, efficiency, effectiveness and mental effort.

5. Conclusion

In this article we assessed the potential use of future systems for mobile multimedia communication and proposed a contextual approach to the iterative development of mmc systems. User-involved evaluation is needed before the stage of actual design. Scenarios for the support of task performance prove a powerful way for the early assessment of the impact of new technology on daily working practice. However, as the case study shows, usage scenarios should not only be based on the actual context of use but should also be related to their future impact on the structure and outcomes of work activities (Kuuti & Arvonen,1992). To enable the safe and efficient performance of tasks with mmc, user as well as organisational aspects have to be taken into account within the iterative development process of analysis, design and evaluation (Andriessen et al.,1996).

6. References

- Andriessen, J.H.T.H., R. Koorn, A. Anderson, A. Fleming, J.J. McLeod, J. Mullin (1996), *Methods and guidelines for the assessment of telematics applications quality (MEGATAQ)*. Telematics Application Program EC.
- Arnold, A.G. (in press), *Action facilitation and interface evaluation*. Delft University.
- Eason, K. & W. Olphert (1995), Early evaluation of the organisational implications of CSCW systems. In: P.J. Thomas (Ed.), *CSCW Requirements and evaluation*. London: Springer-Verlag.
- Gale, S. (1990), Human aspects of interactive multimedia communication. *Interacting with computers*, 2(2),175-189.
- Kraut, R.E., M.D. Miller & J. Siegel (1996), Collaboration in performance of physical tasks: effects on outcomes and communication. *CSCW '96 Conference Proceedings*, Boston, USA.
- Kuuti, K. & T. Arvonen (1992), Identifying potential CSCW applications by means of activity theory concepts: a case example. *CSCW '92 Conference Proceedings*, Toronto, Canada.
- Nardi, B.A., A. Kuchinsky, S. Whittaker, R. Leichner & H. Schwarz (1996), Video-as-data: technical and social aspects of a collaborative multimedia application. *Computer Supported Cooperative Work*, 4, 73-100.
- Rice, R.E. (1992), Task analyzability, use of new media, and effectiveness: a multi-site exploration of media richness. *Organization Science*, 3 (4), 475-500.
- Thomas. C. & N. Bevan (1995), *Usability context analysis: a practical guide*. National Physical Laboratory, UK
- Van den Anker, F.W.G. & A.G. Arnold (1995). *Multimedia in the work environment: towards a task- and user-centred approach*. Internal report, Delft University.

