

Role Playing with Fire Fighters – Using a Worst Case Scenario and Verbal Re-enactment in the Role Play

Paula Valkonen

Aalto Univ. School of Science and Technology
Department of Media Technology
P.O. Box 15500
FI-00076 Aalto, Finland
paula.valkonen@tkk.fi

Marja Liinasuo

VTT Technical Research Centre of Finland
Human Activity and Systems Usability
P.O. Box 1000
FI-02044 VTT, Finland
marja.liinasuo@vtt.fi

ABSTRACT

The paper presents a case in which the new method for studying user-related issues in dangerous working environments was used. An innovation of reshaped role play, named as here as Worst Case Role Play, accompanied by reality checks in the form of verbal re-enactments, was used in searching for use context and information needs of a fire fighter performing smoke diving in a burning building. The specific purpose of this study was to gain knowledge of fire fighters' potential need for wearable electronics. The method, described and discussed in this paper, proved fruitful in eliciting user-centric information, usable also for technical design.

Author Keywords

Role playing, Method, Use context

ACM Classification Keywords

H5.2 User Interfaces: User-centered design, Theory and methods

INTRODUCTION

The work of a fire fighter as an elementary part of emergency response is a textbook example of work performed in a safety-critical domain. The main purposes for the emergency response are protection of life, environment and property. Furthermore, the protection of life is required to involve in practise not only the victim of the accident but also the protector, fire fighter him/herself. In a dangerous situation, the fire fighter must balance the purpose of saving the life of the victim with the requirement of staying alive by him/herself.

One of the most dangerous activities is to examine a house full of smoke to find victims and to localise the initial fire and other possibly dangerous or important items (from the rescue point of view) in the building. The method

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the reconnaissance in such an environment is called smoke diving. Smoke diving means that the fire fighter performs the task in smoke in the burning building wearing heavy, protective garments and tools. Smoke diving takes place in pairs, arranged so that while other team members are smoke diving, others have simultaneously tasks mostly outside of the building.

SAWUI (Supporting situation Awareness in demanding operating environments through Wearable Interfaces) project is an EU project active during 2008–2010. The aim of the project is, among other things, to gain knowledge of potential wearable electronics for use by fire fighters, and to understand the use context and information needs during smoke diving. The scope of the present paper is also within the one of another EU project COPE (Common Operational Picture Exploitation), active during 2008–2011, where the aim is to develop ICT tools and new practices to improve emergency response activity (see more in [9]). In the present paper, the knowledge about the work of fire fighter originates from both projects and the specific aim of the paper to introduce a new method originates from SAWUI only.

This paper presents the method of an enhanced role play as a means to deploy in difficult working contexts when user needs are to be studied as naturally as possible but without extensive arrangements that are hard to bring about.

BACKGROUND

Role play is a quite widely used method in HCI nowadays. Role play means a method, where a group of end users, designers and/or other product development team members assume a role in a constructed scene [8].

Role play is a flexible method to gather and create information to support design; it can and has been used in different phases and for different purposes in the design process (e.g. [2, 3, 4]). Hence, role play can be used as a means to enhance research or design among researchers and other product development members for idea generation in situ or in studio or for concept testing with mock-ups.

Role play has also started to be used for user studies and user centred design in use contexts where a researcher could not participate with the potential end users in the

real-use situation. For example, Mattarelli *et al.* [5] designed a web-based role play for operating room staff. The purpose of the role play was to gather information on the master schedule of an operating room unit and to understand how interruptions to the schedule affected personnel's ability to continue to fulfil their work. By simulating fire with pen, paper and physical space as well as in cyber space, Klann [6] was able to design, with end-users, wearable computing solutions for firemen. He also noted that direct observations of certain types of activity are often impossible to make, so simulations are needed.

Regarding the risks in using role play as a research method, it was found by Svanæs *et al.* [7] that the facilitator of the role play has to understand the goals of role play; otherwise the play does not concentrate on its purpose. They [7] also found important to include real end users as participants in the role play workshop to ensure that the sight of the goal was not lost. They emphasized the role of the facilitator to keep the structure of the discussions in the topic during the play and the need for reality checks for the scenarios at the end of the role play workshop.

Hence, when seeking for fire fighters' needs for tools in the context of smoke diving, role play appears to be a feasible method: It allows the researcher to be present as a facilitator in a simulated smoke diving situation where the focus of activities is spatially extensive as they occur in both inside and outside the burning building. By using professional fire fighters as players and by defining the context and purpose of the role play to the players, the goal of the play will be better in mind and achieved during the play. Finally, to guarantee the reliability of the role play, the reality check for the scenario should also be taken care of.

Reality checking has not been presented in the articles known to the authors; it was implemented in the present study in the form of two different types of verbal re-enactments after the initial role play. Furthermore, the role play itself was reshaped for the purpose of facilitating information expression during the role play. The reshaped role play is here named as Worst Case Scenario or Worst Case Role Play. These special methodical innovations and the main results obtained by them are to be presented and discussed in the present paper.

METHOD: WORST CASE ROLE PLAY

The Worst Case Role Play method was used in this study for clarifying user needs, especially information needs, and use context during smoke diving indoors and other fire-fighting activities outdoors in the same time. The role play helped to understand where and how user would move wearable electronics in the use context as an individual fire fighter and as a team member, what information they need in each part of the task and finally, how and with whom they communicate during the task.

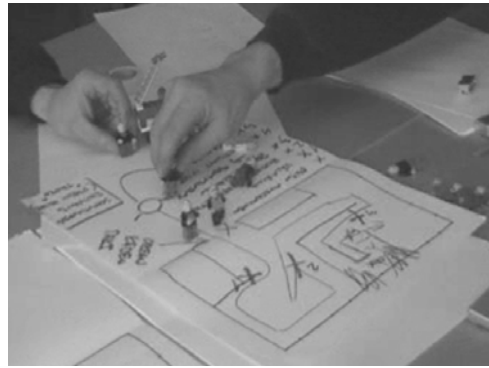


Figure 1: Fire fighters role playing with figures

Role play arrangements

Six fire fighters participated in the role play session. They had worked together for periods ranging from 9 months to 20 years. The role play was arranged at a fire department's lecture room during the participants' workday. The session took 2.5 hours. The session was video and audio recorded.

Group Interview

The fire fighters were first interviewed in a group. The group discussion included topics of (i) smoke diving and its special characteristics in different typical work situations and (ii) the fire fighters' special clothes and wearable equipment. Every participant was also instructed to (iii) write notes about a specific smoke diving situation they have experienced themselves; the arising keywords were discussed in the group.

The proceeding of the Worst Case Role Play

After the interview, the fire fighters were asked to draw a floor plan of an accommodation with at least 3 rooms. They were also asked to mark at least 5 notable things that should be taken into account during fire fighting and to define the location of a victim.

The hypothesis was that role play involving role-related problems might help the role players to actively identify the information needs, including information regarding the context of the play. Hence, the fire fighters were asked to play out smoke diving with figures on the floor plan so that the situation goes wrong somehow and that they have problems in communication. Hence, role play members were told to perform the play in the spirit of a worst case scenario, brought about by bad luck or other reasons.

Reality check: Verbal re-enactments after the play

Verbal re-enactment of the role play

The fire fighters can be over or under excited about the role play. As the played situation was re-enacted verbally directly after the figure playing, it gave the researcher an opportunity to ask focused questions about the role play. The main function of the verbal re-enactment was to ensure that the fire fighters' actions were valid. Thus, it was a means to provide a reality check on what had occurred during the role play.

Positive verbal re-enactment of the role play

Finally, the role play themes were re-enacted verbally from a new point of view at the end of the role play session. This procedure was based on the hypothesis according to which positive verbal re-enactment motivates the role players to articulate their information needs and context information in real life outside play context, providing possibly further information. Hence, the fire fighters were asked to describe how the process would have proceeded in an ideal way. Also this verbal re-enactment worked as a reality-check tool in the role play workshop.

Data-analysis

The video and audio records were replayed several times and the role play session was transcribed, coded and sorted. The analysis of the data took into account several points of view. Firstly, the increased knowledge of fire fighters' smoke diving use context was studied; secondly, the information needs during smoke diving were determined; and finally, the role play method's suitability for user studies in critical and hazardous use contexts was contemplated.

RESULTS

In the group interview, information of the different kinds of fire fighting tasks was arisen. It was also clarified, what a fire fighter should take account in smoke-diving related tasks and what equipments are then needed. All in all, both information and fire fighters' needs and values related to fire-fighting equipments got elicited in the interview.

In the role play, the whole picture of the smoke diving situation was clarified. Questions like how and why move outdoors and indoors, what information is definitely needed in each task and what information would be appreciated if it were available got an answer. Also the communication systems and practices among fire fighters were found out.

In the verbal re-enactment of the role play, the fire fighters explained in detail what had taken place during the role play and also mentioned aspects not listed earlier. In the positive verbal re-enactment, information related to the spatial factors inside and outside the burning building was missing but task-performance-related information needs were discussed in detail.

Use context during smoke diving

The role play presented a lively picture of the use context, that is, the key elements affecting smoke diving performance, yielding to over 30 different qualifiers. The central theme was that the activities during smoke diving depended a lot on surprises inside the building. Every case is different and the features of the environment are case dependent. In all cases, the environment is always very hot and filled with smoke.

The fire fighters reckoned equipment necessary and very important as they can save the wearers' life. On the other hand, fire fighters need both hands free during smoke

diving, one hand for exploring the environment and another for holding on to a fire hose or walkie-talkie. This implies that if electronic devices are designed for fire fighters, they should ideally be hands-free.

Fire fighters' information needs during smoke-diving

The group interview generated 19 information needs during smoke diving. The role play generated 18 information needs.

The understanding of the tasks of an individual fire fighter and his/her activities in the target area grew during the role play. The individual fire fighter is a member of a team and when smoke diving, also one of a pair. The communication and information needs depend on the task and the phase of the fire-fighting situation. The most important issues to note during fire fighting were positions of separating walls, checking rooms, looking for the origin of the fire, looking for the victims, perception of the fire and how to extinguish it, and the need for additional air. Hence, important factors ranged from the basic elements in the outside world to the accident-related determinants and the safety of the fire fighter.

According to the results of the role play session, the team members do not always know where other team members are or what they are doing in a smoke-diving situation. Despite the fact that fire fighters are well-trained in the practices needed to perform tasks, the surprising changes in the use context, as well as human errors, cause extra challenges for the fire-fighters during smoke diving.

The evaluation of Worst Case Role Play with verbal re-enactments as a method

Performing the simulation from a negative perspective seemed to be an effective way to clarify the information needs and critical points of the fire-fighters' smoke-diving situation. Without any pressure of performance, as it was defined beforehand everything possible may and even should go wrong, the participants were enthusiastic about role playing, noted additional points and mentioned information actively during the role play session. However, re-enacting the situation verbally was important because of the participants' over-enthusiasm for the playing. Without verbal re-enactment it would not have been possible to recognize the overplayed parts of role play, and the verbal replay also helped the participants to pick out more information needs and critical points. Moreover, re-enactment gave the researcher a natural opportunity to ask focused questions about the role play. Positive verbal re-enactment did not bring as much new information needs as was assumed beforehand, but further discussion of the details was natural during it.

Control is needed in the role-play situation. The researcher should have especially good knowledge of human nature or a lot of experience in conducting role plays. Without these capabilities, it is difficult to have firm control of the play. It is possible to achieve control by creating a rigid script of the role play, but that could affect negatively the

atmosphere in the role play and accordingly, diminish the richness of notes and ideas elicited during the session. Now the amount of control seemed to be appropriate as in spite of the relatively free atmosphere, fire fighters were able to produce critical notes and ideas. With a less experienced facilitator or more demanding role play members the production of valuable ideas could have suffered.

On the other hand, in the role play presented in this paper, the participants were independent from the facilitator in the sense that they did not need extra help in getting in the right atmosphere. That is probably due to the fact participants knew each others well and had a built-in trust that did not require a professional facilitator or dedicated warm-up exercises often recommended [7]. Furthermore, as participants were experts and real actors in the area (smoke diving), unlike in [1, 2, 3, 7], and [8], but like in [5] and [6], the participants could act relatively autonomously and produce well based ideas regarding the focus of the play.

The play design in Worst Case Role Play was similar in many ways with the ones used in [5] and [6], but in Worst Case Role Play the participants created the play board themselves, getting so more freedom in the play set-up than in [5] and [6]. Like in [6], the Worst Case Role Play method generated information of patterns of communication and communication breakdowns, but the negative perspective in the present scenario and verbally repetition after the play were new in the domain.

Furthermore, the relation between facilitator and participants was more like in contextual inquiry where the facilitator is in the role of a learner. In the group interview as well as during the verbal re-enactments after the play the participants assumed the mode of teaching the facilitator. That served well the goal of the role play in learning more about the facts that are relevant to fire fighters. From this perspective, it was also natural that the facilitator asked questions, advancing relevant information gathering.

CONCLUSIONS AND FUTURE WORK

The Worst Case Role Play connected with verbal re-enactments seems to be a suitable method for user studies of dangerous environments. The role play conducted with the worst case scenario was powerful in eliciting relevant issues and helped in understanding the information needs of the fire fighters and qualifiers of the use context during smoke-diving situations both indoors and outdoors. Importantly, verbal re-enactment of the play and a subsequent positive repetition of the situation were needed. The role play engrossed the attention of participants, but without verbal re-enactment it would not have been possible to recognize the overplayed parts of role play.

In the role play for fire fighters the participants were all professionals in their workplace. In this case, the role play

worked well without tight moderation and prestructuring of the play. Furthermore, it was found preferable that the facilitator takes a role in which not too much is known about the subject so that a facilitator asking questions is a natural part of the procedure.

The findings of the role play - information needs and use context - need to be transferred to designers into a suitable format. Finally, the real success of the role play is evaluated based on its effectiveness in gathering information for the use of technical equipment development – and the method proved promising also from this indispensable viewpoint. After the role play study, two design workshops were conducted based on the findings from the role play. A total of 47 new concept ideas were created. Part of the concept ideas will be utilized at the end of the SAWUI project, when a new wearable, multimodal user interface for operators in demanding use context will be conceptualized.

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