

# Methods in Design of Groupware for Health Care Use: Experiences from Fieldwork and Workshops

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**Abstract.** This paper reports from 2 studies, both aimed at improving a nurse call system. Study-1 used rapid ethnography while Study-2 used workshops inspired both by role-playing and participatory design. This paper discussed the outcome of the workshops in relationship to the methods. Study-1 was less demanding in terms of access to nursing resources, as study-2 demanded nurses to leave their current work in order to participate. Both studies have resulted in publications relating to redesign of the system. By using predefined scenarios (which were constructed based on findings from Study-1) Study-2 was efficient in zooming in to problems of interest. Study-2 revealed several new and important aspects regarding improvements of the nurse call system and possible enhancements. We obtained appropriations, transformations and confrontations as signs of successful workshops. The paper concludes by summing up the novelties in our workshop design compared to other methods of role play and scenario based design workshops.

**Keywords:** rapid ethnography, participatory design, nurse call system, wireless communication

## 1 Introduction

Nurse call systems can be seen as a groupware system for nurses and patients. Even though several variants of such systems exists (in various parts of the world<sup>1</sup>) each system may typically have a long history and has evolved over time, and they are mostly well integrated with the daily work. The hospital in this study has moved to new building with architectural changes such as single bedded rooms. As described in [28], these changes may require new ways of cooperation between nurses. A new

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<sup>1</sup> There are several variants of old nurse call system, which are using signals, light, sound and voice communication to various degrees. Details on a Norwegian nurse call system consisting of a fixed part and a wireless part (without voice communication) can be found in [16]. Other nurse call systems may differ from Norwegian systems, a description of a US nurse call system utilizing voice is described in [22].

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wireless nurse call systems is introduced at the same time, and also this may challenge the existing work practices. In particular the personal aspect of the wireless phone may challenge the collaborative aspects of nursing [17].

Designers and technicians responsible for a system may believe the system is used as planned, when in reality the system is used quite differently. They may believe that the new wireless technology is useful, when in reality the nurses want to communicate with patients face to face [12].

We have carried out 2 studies, one using rapid ethnography, and one relying on these studies and expanding the research with participatory design (PD) workshops. The main purpose of the studies has been to improve the ICT-system, by paying attention to new requirements and implications for design. This paper will not focus on the ICT-system and possible improvements of the ICT-system, but will aim to answer the following research question:

What can we learn from these studies in terms of method improvements? Can we formulate guidelines / design changes for the use of PD-workshops in design of groupware systems for health care?

The rest of the paper is organized as follows: In chapter 2 we introduce some concepts from the research field of computer supported collaborative work (CSCW) and describe various former methods to inform design such as ethnographic methods and various forms of scenarios and workshops. Chapters 3 and 4 describe the two studies with methods and findings for each of them. This is followed by a discussion in chapter 5. The paper ends with chapter 6 where we formulate our contributions in terms of changes and guidelines for the use of our PD-workshops for groupware for healthcare.

## 2 Theory

Several concepts from CSCW literature was in use in the original studies with a focus on system functionality. These concepts are briefly introduced in 2.1. In this paper we will analyse the same material based on the theories and concepts from methodological literature as presented in 2.2 and 2.3.

### 2.1 Concepts from CSCW / groupware research

*Awareness* is defined in [9] as "an understanding of the activities of others, which provides a context for your own activity." It is also pointed out by Simone and Bandini [25] that awareness requires that cues needs to be produced for others to observe, understand and react to.

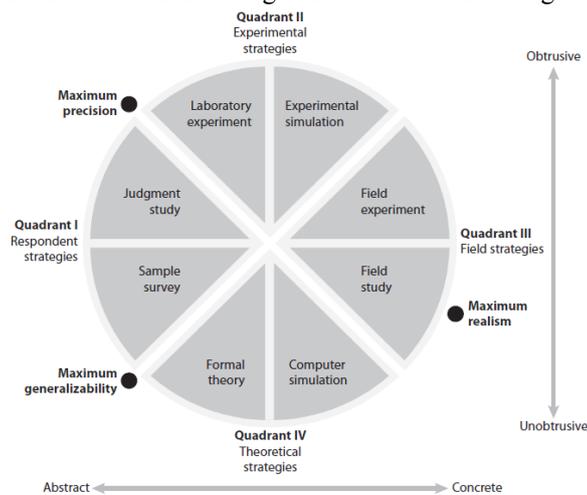
*Functional redundancy* support flexible ways to perform colleagues' work and contributes to efficiency in health care [8]. Awareness supports this [31]. Redundancy will increase the quality of a socio-technical system if carefully designed.

Health care workers are highly *mobile* [2]. Incoming calls to a mobile device may occur in a context unknown to the caller/initiator. This may cause problems with interrupts from wireless devices for physicians [26] and for nurses ([20], [19], [17]). [11] gives an overview of *interrupt research*. They argue that such studies should take

place with real co-workers having real social relations (as opposed to being recruited and teamed up for the test) and in real environment doing real tasks. But as discussed below, such field experiments may not always be possible in a health care setting.

## 2.2 Methodological background

An overview of various research strategies for social sciences is given in Figure 1.



**Figure 1 Different research strategies (based on McGrath) From [1]**

The line between *laboratory experiment* and *experimental simulations* may be blurred. Some labs (such as [30]) are set up to represent several aspects of the real field thus scoring high on the concrete axis by having real patient beds etc installed. Studies in such labs may be referred to as *experimental simulations* (see [1]) as opposed more classical usability lab experiments.

There may be ethical issues with patient safety if a new nurse call system is deployed in the field by researchers (as a *field experiment*), but also when it is deployed in the field by hospital management without prior research. If this system fails (due to software errors, or bad usability) a nurse call or even worse an urgent nurse call indicating a heart arrest may not be delivered correctly and on time. This may put the life of the patient at risk. In some cases of action research the line between field experiment and field study may be blurred.

Ethical aspects are valid also for *field studies*. The most obvious issue is patient privacy / confidentiality. But during observation the researcher may stand in the way or disturb a health care worker. In the worst case a researcher standing in the wrong place in the hallway during the movement of a patient needing acute caesarean cut may put the lives of both a mother and her unborn baby at risk.

The nurse call system is a groupware system with multiple users where each user has various displays at various locations at their disposal (some located in a pocket, and some available on the wall within sight), while nurses' hands may be busy. All this indicates that many practical aspects are important, and that one should aim for a

research strategy that is concrete (in the right part of Figure 1). Examples of HCI-related multi-user / multi-terminal work can be found in studies such as [1]. However, this work seems to focus on one clinical worker at a time. The groupware aspects of the nurse call system may indicate that a research strategy involving many users simultaneously may have advantages over traditional HCI lab research which according to [4] often focus on a single user with a single computer. Both observations and group based workshops will satisfy these group aspects.

When we want to design (or improve) new ICT systems, observing how users work today using some ethnographic methods is relevant. However, there are several issues when using ethnographically inspired methods to say something about design of new ICT systems. As discussed in [5] an ICT system may remove (or make obsolete) a manual procedure which turned out to be important to *awareness* [9] and coordination and hence to safety. The paper also point out the difference between *ethnography* and *design*. Ethnography is aimed at *understanding* something given, and design aimed at *creating* something new. Millen proposes to use the method *rapid ethnography* when doing requirement elicitation for design of new ICT-systems. This method includes observations in the field (field studies), interviews and document studies [20]. Bardram advocates scenario based design were also future (hypothetic) scenarios are described, as new ICT systems may typically carry the possibility to change work practice [2].

### 2.3 Involving users: Role play and participatory design (PD) methods

The paper [29] describes one way to carry out workshops involving participants. They recommend “to put the users center stage”, and argues for workshops where the facilitators are not allowed to contribute to the design of the technology or the scenarios. The roles of the facilitators are: I) Design of the research questions; II) Facilitate during the workshop, so that the workshop answers the research questions. This workshop technique is used in health care settings (see figure 2 in [29]). Part of the role of the facilitator/researcher is to bring in relevant material to support the role play in the workshop. Howard et al. is using a similar technique, but with support of professional actors [12]. Both [29] and [12] emphasise that the material brought to the workshop has a strong impact on the outcome. Possible material are foam models in “watch size, mobile phone size, PDA size, laptop size, and tablet PC size” ([29], page 481), while [12] is also bringing in wrist straps etc, to provide a somewhat broader spectrum of what they term props. A prop is describes by the form factor, but is otherwise like a blank canvas [12]. A prop is thus less defined than a “mock-up” with some pre-intended functions.

In the PD tradition for ICT design the designers and users (participants) are seen as peers obtaining mutual learning [10], [18]. The emphasis is on the two-way learning: “[K]nowing about the technology and design does not give (enough) understanding of the effects of the technical choices, and knowing the practises does not give (enough) imagination for possible other ways of doing things” (From [6], page 132). The users are seen as co-designers and in some cases also as partners in the analysis phase (see [22]). The use of predefined scenarios (termed situation cards in [22]) is advocated

as a starting point for participatory workshops in [22]. These scenarios should be designed by the designers/researchers after initial ethnographic studies. The use of field data -such as video- as input to the workshops is discussed in both [29] and [22]. As the papers have a different view of the role of the designers it is not strange that it is emphasized in [22] that the designers should have knowledge of the field before the workshop, while [29] is viewing the role of the researchers more as a facilitator, and see the use of field data as input to the workshop as optional.

The paper [22] uses both cardboard mock ups and computer based prototypes. They emphasize that it is important that all artefacts are physical and persistent and designed in an *open* way in order to facilitate discussions of practice. In the paper the terms *appropriation*, *transformation* and *confrontation* are central and they claim that these 3 phases are indications of a successful workshop. Appropriation is needed for the artefact to be more than “something standing in the corner”. Transformation occurs when the participants “*on their own* transform its use context” (from [22], original emphasis). Thus transformation can be seen as somewhat similar to design-in-action from [29]. In the confrontation phase typically either the artefact or the current work practice is being questioned.

Most PD methods focus on allowing the users to speak their own language (including body language) [6]. Role play and acting out in a relatively realistic setting is very important in [29], while [22] seems to use more (oral) discussions of practice. Both [29] and [22] propose video recordings during the workshops. As will be apparent later our workshop design in Study-2 has combined elements [29] and [22].

### 3 Study-1: Using rapid ethnography (2009-2010)

#### 3.1 Method

Study-1 included two wards and can be seen as following rapid ethnography [19]. Both interviews and observations were carried out at both wards. We also studied documents like the training material for the wireless nurse call system and the wireless phones, as well as some documents by the architect describing the floor plan and the single bedded rooms, including the research paper [27]. In total approximately 10 nurses have been talking to us during the observations. Total hours of observation were approximately 8 hours and we interviewed two head nurses for 50 minutes each. We did some observation prior to the interviews and more observation after the interviews. Both interviews were transcribed verbatim. We did *place based* and *role based* observation. Field notes were taken during all observations and supplemented with further notes as soon as possible afterwards. To ensure a correct understanding during the observations, nurses were inquired for clarifications when appropriate. At more quiet moments during the observations the nurses would also approach us to voice their opinions and concerns about the system as a whole or about particular details. They would also express views on ID-cards on door locks etc.

The findings reported here are related to the axes given in Figure 1 (abstract vs concrete and obtrusive vs unobtrusive). The concepts awareness, redundancy and

mobility have also guided the analysis. For simplicity and anonymity all nurses are referred to as “she”.

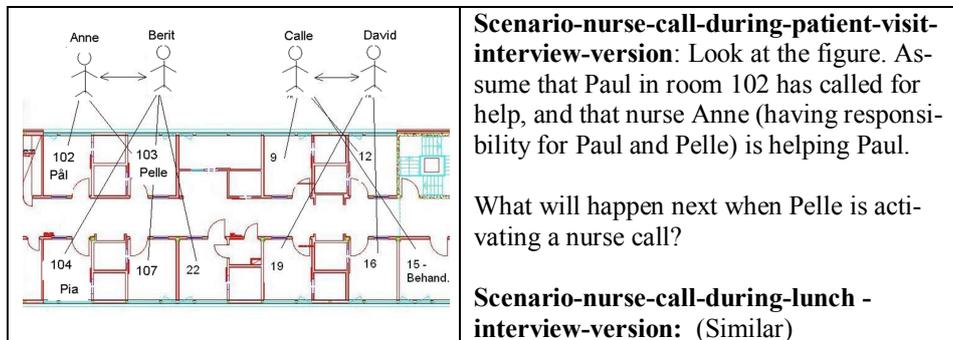
### 3.2 Findings from observations in the field

In addition to findings directly related to the nurse call system (as reported in [16]), we experienced the following interesting observation session:

We observed a very busy period where the head nurse as well as two extra nurses (called in from neighbouring departments) all participated in the nursing. This was two hours with just *one* nurse call. The following was observed:

*The physician in room 214 put his head out of the door frame asking: “Can anyone prepare 10 ml of XXX<sup>2</sup>”. The message sounded urgent, and one nurse reacted immediately to this request and the physician returned quickly to the patient. The physician later asked the primary responsible nurse Ann for the patient in room 214 about medication XXX, but she was not informed about this at all (as she was busy with other matters). The head nurse could inform both of them that this task was being carried out by nurse Carla. The head nurse had observed this by being on the spot, actively involved in some other nursing activity. The medication XXX then arrived with Clara and primary responsible nurse Ann followed the physician into the patient room and continued the treatment.*

### 3.3 Findings from combined interviews and observation



**Figure 2 Scenarios (interview versions)**

During the initial phase of study-1 we came up with a two abstract<sup>3</sup> scenarios (see Figure 2), which we used during the interviews with two head nurses. Note that these scenarios can be created purely analytically, thus it would be possible to carry out

<sup>2</sup> Not being trained in medical terms, we were not able to catch the name of the medicine, but we believe that this was an urgent issue. We did not ask for the name of the medicine or the detailed condition of this patient. Raising that question during the observation would have been extremely interruptive and we saw no need to ask about this in an email after the observation session.

<sup>3</sup> The scenarios are abstract because very little contextual information is given. Names and numbers are used to identify persons and rooms. No patient stories were used.

these interviews without prior observations. However, the scenarios illustrated in Figure 2 are interesting also because of the concept of functional redundancy as described briefly in 2.1.

The head nurses explain that there is not one answer to the question, instead they point out that “*it depends*”, and various contextual parameters like patient stability, general work load and staff’s competence are mentioned. It is also pointed out that staff competence may be a particular challenge during the summer holidays, and thus vary greatly with time.

One head nurse says the following about coordination and back-up (functional redundancy): “*It is a hectic place. Staff is busy with different things. Some are involved with pre-visits; some follows a patient (...). The optimal solution is that the primary responsible [nurse] follows up on a nurse call as much as possible, and that the whole group<sup>4</sup> –we are a small group- functions as a backup.*” This is a rather general answer and provides little knowledge of *how* the group may act in a way to have enough *awareness* to act as a backup.

#### 4 Study 2: PD workshops (2011-12)

In the later Study-2 (2011-12) we had developed a design idea where a new function *nurse message* was included. This new function was intended for cases where it was more important to speak to the right (responsible) nurse, rather than obtaining a quick response. One of the aims with this design was to reduce unwanted interrupts, by allowing the patient to choose nurse message instead of nurse call in some less urgent cases. The nurse message is a newly designed feature which is different from the design proposals already described in [16], and the new feature may possibly have more impact on the organization of the work than the simpler proposals from [16].

A nurse message can briefly be described as a short message from a patient carrying some information about the reason the nurse is wanted, and the message is delivered to the right nurse as a kind of SMS (with some beep sound, as opposed to the heaving ringing sound of the ordinary nurse calls). Our initial design idea included an option for the nurse to indicate that she had read the message, and options to answer “I’ll be there in 5-7 minutes” or similar on a sliding scale from 1-10. The answer could be given several minutes after the message was delivered (similar to an SMS, and different from a nurse call, which automatically is sent to another nurse after 15 seconds without response).

Some of the proposals for improvements in the design based on these workshops are described elsewhere (see [26]). But the workshops also contributed to an analysis of existing work practice (and hence to other possible changes in the nurse call system). This paper will report on findings of particular relevance to our methodological discussions.

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<sup>4</sup> The term “group” here does not indicate “team” as in team nursing. See [22] for an overview of nursing models like team nursing, functional nursing and primary nursing.

#### 4.1 Method / our PD-workshop design

We decided that the best way to get reactions relating to the design idea of a nurse message was to create a workshop design inspired by [29], but taking also [22] into consideration. (See Sect. 2.3)

In order to “thicken the descriptions“ (i.e. increase the concreteness) of the scenarios from Figure 2 Scenarios (interview versions) we included two patients stories designed by the researches. These stories were carefully designed (by help of a master student and nurse) to match the scenarios that followed. I.e. creating situations that we knew from previous research would be problematic, and most likely not result in a simple answer like: “I will leave my current work as the new issue is more important”. We also included a scenario for a handover meeting to see how responsibility allocation took place. Then several scenarios similar to that in Figure 2 were “acted out” using the patient stories, now using the existing technology (nurse call and phone call) to make it concrete. The existing scenarios with nurse call were supplemented with new scenarios including the new feature *nurse message*. We list two of the scenarios<sup>5</sup> from the workshop here:

**Scenario-phone-call-during-wound-dress-shift:** Nurse <real name> (having responsibility for Paul and John) is visiting Paul for a wound dress shift and hence wearing a disposable coat as a contamination barrier. Then nurse receives a phone call on her wireless phone. (This scenario was acted out using existing technology)

**Scenario-nurse-message-drink-during-wound-dress-shift:** Nurse <real name> (having responsibility for Paul and John) is visiting Paul for a wound dress shift and hence wearing a disposable coat as a contamination barrier. Then John is activating the nurse message: ”I want something to drink“. The message is delivered on the nurse’s phone together with a short sound. (This scenario was acted out using mock up “phone” for two workshops, and using a real Android prototype with sound for two other workshops).

**Table 1 Overview of each 3 hour workshop**

WS part	Description	Where	Approx. duration
Part 1	Information	Meeting table	15 min
Part 2 (3 subparts <sup>6</sup> )	Scenarios (predefined)	Meeting table <sup>7</sup> Patient room	105 min + 10 min break
Part 3	Focus group and coffee/snacks	Meeting table	50 min

These scenarios and stories of what would happen next were acted out at a bed room at the hospital and video recorded. We used still cameras, and no mobility of

<sup>5</sup> The patient names were changed to Paula and Jenny when a female researcher acted as ”patient” in order to match the scene. The patient stories were otherwise identical.

<sup>6</sup> The 3 subparts were: 1) scenario for morning meeting; 2) scenarios using existing technology; 3) scenarios relating to the new feature nurse message.

<sup>7</sup> The scenario of morning meeting took place at the meeting table, the other scenarios took place inside a patient room with a researcher acting as ”patient”.

nurses between rooms was involved. We used “freeze” as explained in [29] to allow for discussions as well as finding alternative actions. Each workshop lasted 3 hours, and ended with a focus group discussion, which was also video recorded. In total we organized 4 workshops, each with 5-6 nurses (or nurse students).

We deemed it important to have the sound of the real wireless phone for phone calls and nurse calls (by using the existing Cisco phone). We also deemed it relevant to have presence panel for the nurse call system fully operational (with active display and sound). For the new nurse message a new Android phone was used in two of the workshops. In addition mock-up devices (foam models) for the nurse message were presents during all workshops, inviting the participants to redesign the system(s). Other props were also present including some with a distinct form factor (see Figure 3 (a) for a device with a form factor similar to a pager). We also brought in props with the form factor of a presence panel, a handheld phone and a patient terminal all covered with a blank sheet.

The findings reported here are related to the axes given in Figure 1 (abstract vs concrete and obtrusive vs unobtrusive). The concepts awareness, redundancy and mobility have also guided the analysis. For simplicity and anonymity all nurses are referred to as “she”.

## 4.2 Findings from the workshops

The use of an empty ward at the hospital proved useful, and so did the use of real sound (from nurse calls, phone calls and from nurse messages). The concreteness was useful, as nurses become aware of their own (tacit) work practice: “*Yes, it seems that I will automatically pick up the phone [from the pocket]*”.

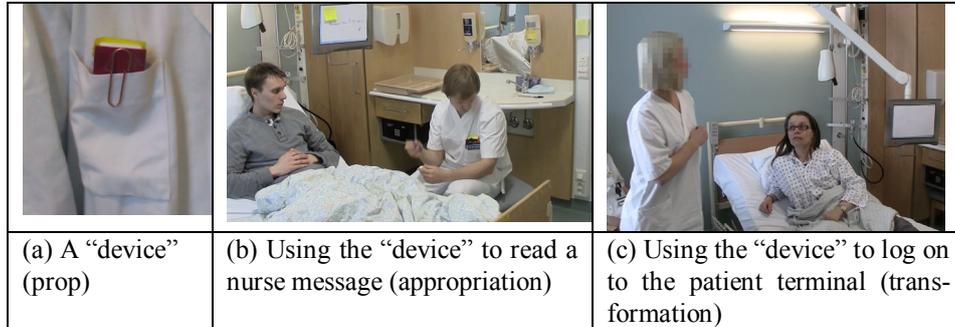
Several of the nurses indicated that the sound for the nurse message was new, and that the whole concept of a nurse message was new and a bit alien. At one occasion a nurse student took the phone out of her pocket while wearing a protective disposable coat (thus breaking hygiene rules). We believe that this was a result of the “alieness”, and that in a real use situation in the field (after some training) the nurses would not be more prone to breaking hygiene rules even if also nurse messages (as well as the existing nurse calls and phone calls) will arrive at their phone.

In the discussions during the workshops a nurse explained that she would always tell her colleagues before going to lunch or doing a wound dress shift and ask them to take over her responsibility. This is consistent with our observations from Study-1. We notice that there is no support in the current ICT system for this, as further discussed in [14]. Another nurse said: “*If I knew that the other nurses were busy, I wouldn't make myself unavailable during that time*”, indicating that she would not do a wound dress shift under such circumstances.

As explained in 4.1 real technology, prototypes and props were used in the scenarios. During “freeze” we invited the participants to create other ways to cope with the situation (other work routines or other technology).

Figure 3 (c) illustrates a *transformation* [22] (or design-in-action according to [28]), where the nurses suggested a new use of the artefact to fit their context. We also observed several *confrontations*. One confrontation was when the nurses stated

that the new nurse message would need a forwarding mechanism to ensure that patients did not wait too long if the responsible nurse were busy for a longer period.



**Figure 3 Appropriation and transformation of an artefact (from [15])**

## 5 Discussion

This chapter is structured as follows: In 5.1 we compare the two studies and discuss the access to the field. In 5.2 we discuss our PD workshops in more details.

### 5.1 Lessons learnt from the two methods and the cost of access to the field

The state of a hospital ward varies considerably over time. According to one of our informants (a head nurse) it is not possible to tell in advance whether it will be a busy or quiet period when one is planning observations (though some rule of thumbs may be applied). However, both the quiet and the busy periods offered interesting findings. During quiet periods one can almost use the “freeze”-method from [29] and have a small group discussion with 1-2 nurses after an interesting event. This is of course not possible in busy periods or when patients are directly present. Using “less rapid” ethnography with more time in the field may be one solution to this problem, using interviews or workshops or other means to explore the domain are other options (ref. Figure 1).

The busy periods allows one to observe collective work at a high speed and with many interrupts. During the very busy period reported in 3.2 we overheard one nurse saying to another nurse: *“I will soon ask you for some help”*. Due to the busyness we had no chance to follow up on this coordinative speech act during the fieldwork, and we judged it impossible to ask a follow-up question via email afterwards in this case.

These short glimpses into fieldwork in a very busy health care setting illustrates the usefulness of observing real work in the real field. We deem it unlikely that any workshop would create a scenario this busy, not as created by us (the researchers), and not as acted out by nurses using the method advocated in [29]. We will also point out that it was useful to a researcher to see how much busyness there was in the field, even though the activity in the nurse call system was very low.

Our observations in Study-1 and Study-2 were done with field notes. Video was not considered appropriate in a bed ward due to privacy. We found observations in general to be more demanding than interviews. For a researcher with little knowledge of the field it has proven difficult to obtain good field notes, as several things happen in a “simultaneous mess” and it is hard to know what to look for. Interviews are sequential, and can be recorded, but the cost perhaps being less realism and less concreteness. Interview method has proven to give good results for researchers skilled in ICT (and less skilled in ethnography). However, interviews may give less “thick descriptions” (as they are more abstract / detached from practice).

During the workshops all simultaneous activities were planned for, and we obtained a sequential data material. The workshops gave much useful information. Compared to answers from interviews in Study-1 we see that the more detailed patient stories and more detailed scenarios (including disposable coats etc.) contributed to more detailed information about the current work practice in the workshops. We see that the interview with head-nurses as reported in 3.3 gives general descriptions about the need to cooperate. On the other hand the workshops gave us a lot of detailed information about minor coordinative actions the nurses carry out, including “*not doing something while ....*”

However, it is costly in terms of man-hours to carry out workshops with 5-6 participating nurses. We were allowed to use (5+6) nurses from the hospital for 3 hours, a total of 33 nurse-hours without even compensating for their salary. (In addition we used 5+5 nurse student for 3 hours). We believe that even if had paid salary compensation, access to that many nursing-hours may not be easy to obtain. We believe that this was only possible because we had done rapid ethnography before, and presented findings from this research to the management at the hospital, in a way that they deemed as relevant research. We do believe that the workshops “paid back” to the hospital and that we as researchers added value to the workshop in several ways. Of course the hospital could have arranged workshops/meeting themselves, but we believe that doing this by external researchers had some added value as we offered *independence* from hospital management and from the vendors. We judge it unlikely that the hospital management or the vendor would have included the feature nurse message in such workshops.

Several nurses stated at the end of the workshop that the scenarios were realistic and addressed real problems. One nurse student stated during the focus group discussion that the discussion during the workshop was the most important part, and “*more valuable than filling out some paper [questionnaire]*”. This statement can be interpreted as a statement about the concreteness of the workshops as opposed to surveys (which will be placed in quadrant I in Figure 1). But the statement can also be seen as highlighting the value of the *collective* discussion during the “freeze” periods. In particular methods involving one clinical worker at the time will probably not reveal all relevant aspects of the current practice regarding functional redundancy, which may be of vital importance for a well functioning and efficient ICT system for nurses.

We have found it relatively easy to gain access to a head nurse for a 50 minutes interview. Doing the interviews in the “native” workplace of the interviewees has several advantages when studying interruptions and coordination: a) It is easier to obtain

access to the interviewee when they can be “partly available“ for colleagues during the interview; b) This makes it possible for us to study the interviewee’s strategies for not being interrupted, as well as her actions when being interrupted (by phone call, nurse call or by a nurse / physician knocking on the door etc.). We observed one head-nurse off-hooking her fixed phone when the interview started, while another head-nurse informed the secretary about her unavailability. Both interviews included some interruptive sounds. The interrupts varied from a nurse call beeping on the wall mounted display without the need for special action, to a physician interrupting to talk about a new Swine-flu-patient by knocking on the door (the latter was causing the interview to pause).

## 5.2 Discussion relating to our PD workshop design

### 5.2.1 Concreteness of the artefacts

Being in the hospital proved to be useful, and one of the nurses explains: “...*entering a patient room, you recognize the place, and you feel what you do every day and what you do not do every day*”. Whether being in a usability lab would have offered the same level of recognition is difficult for us to say. We felt that the hospital was a natural choice, as it was relatively easy for us to arrange for the use of two empty bed rooms at the hospital. This place made it all very concrete, and allowed us to include the real nurse call system in the workshops.

Our finding is that real sound is important (at least for our research where *interrupts* are in focus). A side-effect of using a real working system, as opposed to a paper based (mock) system is that redundancy *bounces back* and *comes for real* in the following sense: We observed situations where the same nurse call returned to the first nurse (after trying all nurses in the call plan). These aspects were important for the workshops, as we were exposed to real ringing sounds lasting 15 seconds during real discussions. Real working prototypes may also be important if one wants to show the same message redundantly on several displays (as advocated in [7]), since using paper notes to illustrate such messages will not be as realistic. This will be even more important if the workshop is more distributed (allowing mobility of nurses between several rooms).

Most of the nurses were dressed in their uniform when attending the workshop and this allowed them to place the phone in the lower front pocket during the role play. However, a few nurses were dressed in private clothes, and during the role play they had to put the phone into their jeans pocket. This minor detail made it different for them to look at the phone to assess the urgency of the phone call by looking at the caller id. Also during the role play relating to the nurse message scenarios we observed a minor detail that mattered: When this scenario was acted out with real sound it was more realistic than when we were “delivering” a nurse message by using the mock-up “phone”. Such details may be important when we want to study how interruptive a particular solution is.

Due to the lack of training material regarding the new nurse message it did not become clear to all nurses that the nurse message was intended to deal with less urgent matters. Unfortunately we introduced “I want help” before “I want something to drink”, while the other sequence would probably have made the idea about the nurse message clearer. The message “I want something to drink” was considered not urgent by the nurses, but some of our other messages like “I want help” was not considered to differ much from the ordinary nurse call. On the positive side the message “I want help” caused a lot of discussion also about the current nurse call and hence about current practice. The lack of training material for the nurse message was intended in order to support openness, which it did.

### 5.2.2 Analysis and design issues

The paper [28] argues for workshops where the facilitators are not allowed to contribute to the outcome of the workshops. We chose another approach more similar to [21] with predefined scenarios (called situation cards in that paper). Similar to the findings in [21] we found that predefined scenarios are useful as triggers during workshops. By using these scenarios, and having the researchers control the timing of the events, we were able to create simultaneous events which illustrated interruptive aspects that we knew were problematic, and this triggered interesting discussions.

We only used one camera per workshop, and the nurses never moved between different rooms. This clearly indicates that we did not aim for *simulation* (of the real work) and thus the term “simulation” in Figure 1 is a bit misleading in our case. The fact that 4 additional nurses were present inside the patient room (with a fake patient) was artificial in some ways. We may see this use of (stationary) video as a limitation, but for the group discussion during the “freeze” this was actually turned into a strength since this enabled rapid group response immediately in the acting including transformation or design-in-action. The focus group afterwards was slightly more detached from the practical aspects of the scenarios, and even though all artefacts<sup>8</sup> were present around the table where the focus group discussion took place, the artefacts were more actively used in the freeze part.

According to Mogensen and Trigg “practice-oriented discussions should (...) be cultivated and encouraged as instances of participatory analysis” ([22]; page 61). Some nurses expressed the view that we should solve their *current* problems, and not engage in “futuristic scenarios”. Based on this view one may expect that the introduction of the new nurse message (which some nurses saw as futuristic) would not act as a cultivating factor for discussions about the *current* practice. However, because the nurse message implicitly assumed one responsible nurse per patient (at a given work shift), the new artefact triggered discussions and explanations about their current practice regarding functional redundancy amongst nurses, and also about their current practice to obtain awareness. The statement “*I wouldn't make myself unavailable during that time*” is one example of a finding that contributed to our co-analysis.

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<sup>8</sup> Our scenarios were not presented on persistent situation cards, but all physical artefacts such as real phones, prototype of nurse message and the props were present.

### 5.2.3 Participation issues

The nurses from all wards were selected by their head nurse<sup>9</sup>. The nurses from one of the wards (Ward-I) came to the workshop with statements like “*It is the old system we like the best*”. They also explained that the *assistant-nurse-call-button* was important and should be restored<sup>10</sup> since they have many isolation rooms. As our workshops were not aimed at being “representative simulations” in any way, we do not consider this possible “biased” participation to be a problem, rather it is a legitimate concern from one interest group, in the tradition of PD (see [9], page x). At both workshops where nurses from Ward-I participated also nurses from other wards were present, and this gave good discussions. The use of the scenario with protective coat was designed to address problems in isolation room, (as we knew from previous discussion during observations in Study-1 that phones inside isolation rooms were a problem). Since several of the wards have (some) isolation rooms, and protective disposable coats are used also in some other situations this was a scenario that most nurses could relate to.

The use of nurse students working as interns at the hospital seems a useful resource which is more available to researchers than registered nurses. However, when doing proper PD, we must be aware that nurse students can never represent nurses. The representation “by proxies” in participatory design projects is discussed as problematic in [7]. We also observed several times that the nurses and nurse students spoke on behalf of patients. Again, this is representation by proxies: Statements from researchers acting as patients and from nurses should *not* be taken as the view of real patients.

## 6 Contributions to workshop design

Compared to the role play description in [29] our workshops differ in several aspects. The use of predesigned artifact, including predesigned scenarios is new. As discussed in 5.1 this gave much information in a short time span, as we were able to “zoom in” on relevant issues. This does however require some previous knowledge of the field (which can be obtained via Rapid ethnography). Our artefacts included real working technology (including a full implementation of the new feature nurse message). Using such predesigned artefacts are explicitly not recommended in [29].

On the other hand the PD workshop design in [22] describe that several artefacts designed by the researchers are used in their workshops. Compared to [22] a novelty in our work is the use of role play in a realistic setting with a lot of concrete artifacts (such as patient bed, disposable coats, existing phone and working prototypes etc.).

Especially in a health care setting when researchers may not have easy access to isolation rooms etc. we conclude that the workshops were of value to the researchers.

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<sup>9</sup> As we did not pay salary compensation the head nurse acted as a kind of gatekeeper. This role may allow the head nurse to influence the selection process, and not sending “representative” nurses, but nurses she knew would argue for certain solutions.

<sup>10</sup> This feature existed in the old buildings, but disappeared when they moved to the new building and got wireless phones.

Scenarios often focus on “what to do when”, but our findings of “what not to do if...” (as reported in 4.2) was equally important, and this sort of information is difficult to obtain via observations. We believe that the group aspects of the workshops are relevant also when designing other types of groupware systems and thus that such workshop design is useful also for other types of groupware systems in health care.

Mogensen and Triggs argues that the 3 steps: Appropriation; transformation and confrontation are signs of a good workshop [22]. We obtained all these steps in our workshops. The workshops have already lead to several guidelines for design of ICT-systems supporting redundancy for nurses [15] and new extended communication possibilities [16] as well as more detailed redesign-proposals for the nurse message [27].

## 7 Conclusion and future work

This paper reports from two studies relating to a nurse call system. Study-1 was using rapid ethnography [19] with observation and interviews in particular while Study-2 used workshops and were inspired by both role playing techniques ([29] and [12]) and participatory design [22]. We highlight that the concrete aspects of our workshop experiments were useful.

However, both interviews and observations are also useful methods (and may be an easier way to enter the field). Several of the findings from Study-1 (as reported in [17]) were confirmed by the workshops. But the workshops gave new insight as well, and we conclude that the additional effort (in terms of nurse-hours) was useful to us, and we argue that we believe it was “worth the cost” also for the hospital.

Our conclusion is that the group discussions were more important outcomes from the workshops than the new design proposals (in terms of GUI), as new information were articulated relating to the collaborative aspects of nursing work. We conclude that when designing groupware systems where functional redundancy is important the workshop should have special focus on redundancy and several participants with same training (functional skills) should participate at the same time, even though this may require more resources, we argue that this will lead to new information.

We have already identified patients as a relevant stakeholder, but we have not yet included patients directly in workshops and observation. Currently we are interviewing patients about their experiences with the existing nurse call system. It is for future work to include patients in workshops.

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