NTNU

Norwegian University of
Science and Technology

Activity Based Computing

Health workers and the principles of ABC

Hans Kristian Jasmin Ormberg

Master of Science in Computer Science

Submission date: June 2009

Supervisor: Dag Svanæs, IDI

Co-supervisor: Ole Andreas Alsos, IDI

Norwegian University of Science and Technology
Department of Computer and Information Science

Problem Description

In the PocMap-project at IDI, work is done giving doctors and nurses support for multitasking and co-operation through session based user interfaces. This is done in collaboration with the IT-university in Copenhagen. With this in mind, the ABC-framework was developed and an instance of it (the ABC-approach) has been used when answering the question: "Is the ABC-approach useful in a hospital setting?".

With this question two sub-question arise:
What principles of Activity Based Computing do health workers find most useful in their everyday work?
What should be taken into consideration when designing the next generation ABC-system?

Assignment given: 15. January 2009
Supervisor: Dag Svanæs, IDI

Abstract

This thesis takes a closer look at Activiy Based Computing (ABC), at health workers and how they use computers, at what aspects of ABC they find useful for their everyday work and at what should be taken into consideration when designing the next generation ABC-system.
For answering these questions, doctors and nurses were asked to participate in a workshop where the theme was: “Next generation clinical infomation systems”. In all seven health workers participated in two workshops.
Previous work has produced the “ABC-principles” and the “Attributes of session-aware systems”. The cross-section of the two sets of principles have been derrived, and yielded the list used as the base in the evaluations:

- Multiple patients
- Multiple tasks
- Mobility
- Collaboration
- Handover
- Interruption

The two workshops both started with an introduction of the differet principles, before a usability evaluation (evaluating the principles), a role play and finally a focus group (containing a card ranking). In addition some of the participants were observed in their natural environment.
The results of the different methods conclude that the evaluated *principles* all are appreciated by the health workers, but have to be implemented in a satisfactory way. They should all be taken into consideration when designing a new computer system for use within the health sector.

Preface

This thesis has been carried out at the Department of Computer and Information Science (IDI), at the Norwegian University of Science and Technology (NTNU).
I would like thank my supervisor and co-supervisor, Dag Svanæs and Ole Andreas Alsos at the Department of Computer and Information Science, for guidance throughout the work on this project. Thanks to NSEP for letting me use their lab and to all the participants of the workshops performed for the purpose of this thesis.
I would also like to give a special thanks to my girl-friend, Ine, who has been patient and understanding of late nights at school and the limited time we have had together during this semester.

Hans Kristian Ormberg

Trondheim, June 10^{th}, 2009

Contents

Chapter 1

Introduction

1.1 Motivation

Working in a hospital today means, among others, being mobile. In [5] Bardram states that an average nurse walks several km per shift. This combined with the lack of necessary functionality, shortage of computers and mobile devices contributes to inconveniencing the health workers.

Another aspect is the use of computers in a hospital setting. Health workers are good at what they are educated to, but are not (necessarily) computer experts. Making better computer systems for health workers can relieve doctors and nurses of stress provoked by "uncooperative" computer systems. This should result in the health workers being able to concentrate on their actual work, saving lives.

After having studied professional hospital workers at work, researchers noticed that although the hardware resources available have undergone many rather large changes over the years, creating smaller and more mobile devices, the software for these devices are often a basic, scaled down version of the original [5] [15]. The main drawback of this approach is that the scaled down versions are not always tailored to fit the smaller mobile devices and are not always as easy to handle (e.g. a software application originally for a desktop computer with a keyboard and mouse, will not be just as easy to handle on a smaller mobile device such as a PDA). Another issue they observed was the interaction between the different devices. Although there were many different state of the art devices not all of these interacted in a satisfactory way.

A proposed solution to this is Activity Based Computing (ABC). ABC is a new way to think about user interfaces, adding a new dimension to the standard desktop. ABC is, as the name indicates, computing with an activity as a "base". By having an activity as a first class object and treating it as you would a file or an independent program, these activities can be shared, suspended and resumed and be "mobile". It also opens for multiple instances of an activity in parallel, and for synchronous collaboration.

Based on the thoughts behind ABC the ABC-principles and the ABC-framework has arisen [3].

The ABC-framework is one instance of ABC and was designed by Jacob E. Bardram and his team of students at the IT University in Copenhagen. The ABC-framework will be studied in detail in chapter 2, where we will take a closer look at the history and the structure of the framework.

Much work has been done on the implementation of ABC-systems, but little on the empirical validity with real health workers. Jaatun and Bardram are two pioneers within ABC, and much of the work in this thesis is based on their work.

Figure 1.1: The health workers day consists of both working with patients and working on the computer.

1.2 Research goal

The question this thesis will answer is: “Is the ABC-approach useful in a hospital setting?”. With this question two sub-question arise:

- **Research Question 1:** What principles of Activity Based Computing do health workers find most useful in their everyday work?
- **Research Question 2:** What should be taken into consideration when designing the next generation ABC-system?

1.3 Outline

This master thesis is composed as follows:

- Chapter 1 is an indication of what is to come, and is an introduction of the thesis.
- Chapter 2 will present all the necessary information needed to create a basis when reading this paper. The chapter is divided into two parts, the first part creating a basis for understanding the context of this thesis and the second focusing on the ABC-framework, it’s components and it’s features.
- Chapter 3 will present the research done for the workshops.
- Chapter 4 describes the work done during this master project including the work done with the ABC-framework and the workshops that were performed.

- Chapter 5 will present an objective view of the results from the workshops.
- Chapter 6 will present an analysis of the work done.
- Chapter 7 will discuss the results of the work.
- Chapter 8 will conclude the project.

Chapter 2

Background

Background

The prestudy chapter contains necessary information for understanding the rest of the thesis. The most central issues, terms and methods are described here.

2.1 Attributes of session-aware systems

In [17] it is stated that the future for clinical computer systems has to be context-aware and mobile. They loosely define a session as “a shareable, referable, persistent representation of interaction between two or more actors, one of which is an information system”. They also propose taking “personal computers” a step further and suggest “shared sessions” as a solution to this.

The main attributes of such a system are

- Mobility and interruptions, being able to access the same data “anywhere”.
- Multidevice, to have a system that supports multiple platforms and devices.
- Handover, being able to collaborate and transfer ownership of information.
- Pause, postpone and plan to resume in future, being able to pause, postpone and resume sessions.
- Abstraction and parametrization, being able to create templates.
- Plan instantiation, having rules that instantiate several other “activities”.

These theories are backed up by Jacob E. Bardram [5] [15]. The core of his theories and information about the ABC-framework will come in the following section.

2.2 Activity Based Computing

2.2.1 The ABC-principles

The ABC-principles were derived through various workshops including more than 20 health workers and are the principles the ABC-framework is based on. We will give an overview of these principles [15]:

Activity Centred One of the issues in today's system, as mentioned above, is that not all devices or software applications have the ability to cooperate. In such a system there are many stages in completing a task. For example one task could be "Diagnosing Mr. Smith". Viewing the x-rays requires one application, looking at his medical history requires another and ordering a blood test requires a third application. This principal suggest the activity to be a first class object on the same level as for example documents and files.

Activity Discovery The principal of activity discovery suggests that the computing infrastructure should be able to aid the users to identify, create and manage activities in everyday work. The infrastructure should, to some extent, be able to suggest new activities based on different factors like e.g. time, schedule, previous and current activities and events.

Activity Suspend-Resume The "Activity Suspend-Resume" principle suggests that users should be able to suspend activities, and resume them at a later time. Working in a hospital introduces many challenges, among them interruptions. Choosing to suspend an activity will give the users an opportunity to work with other activities, leaving the suspended activity dormant until later resumed.

Activity Adaptation "Activity Adoption' suggests that an activity should adapt to the resource where it is resumed. E.g. A PDA would have a different screen size than a desktop computer. This principle helps users utilize heterogeneous devices for the same activity.

Activity Roaming Another challenge in working at a hospital is location. Not all employees have a private stationary computer available, and many of them travel great distances during the working-day. Therefore the principal of "Activity Roaming" supports the nomadic style of a hospital employee by suggesting that activities should be independent of the device, meaning that activities should be able to resume on an arbitrary device.

Activity Sharing Cooperation between co-workers and information exchange is one of the greater challenges in today's world. Activity sharing provides support for asynchronous(two or more participants at different times) and synchronous(two or more participants at the same time) collaboration between users.

2.2.2 The ABC-framework

The ABC-framework is an implementation of the ABC-principles (stated earlier in this chapter) [4] [3]. The main goal of the framework is to provide a runtime and programming platform for the development and deployment of the ABC-applications [3].

The ABC-framework can be seen as one instance of ABC and is the instance that is used in this master thesis.

ABC-framework v3

This project is based on version 3 of the ABC-framework. This version is implemented in Java. Figure 4.6 shows an image of the client.

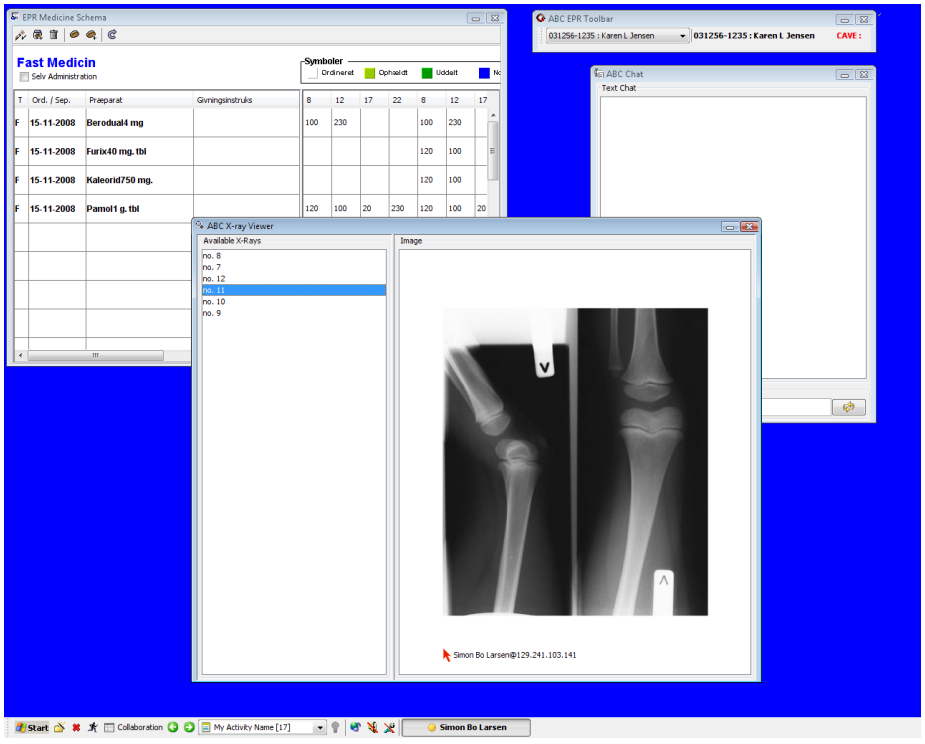


Figure 2.1: A screen shot of the client

From the image we can see that the client is implemented to look as much as possible like the Windows graphical user interface, with a taskbar along the bottom of the screen with buttons and a start menu, and windows with the traditional close and minimize buttons.

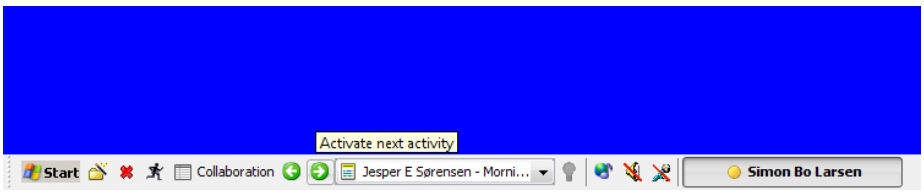


Figure 2.2: The toolbar in the ABC-framework

On the taskbar (figure 2.2), instead of traditional program shortcuts (like "Quick Launch" in Windows) there are shortcuts for handling activities, like creating a new activity, finalizing an activity, adding participants to an activity, switching between activities and creating a "memo".

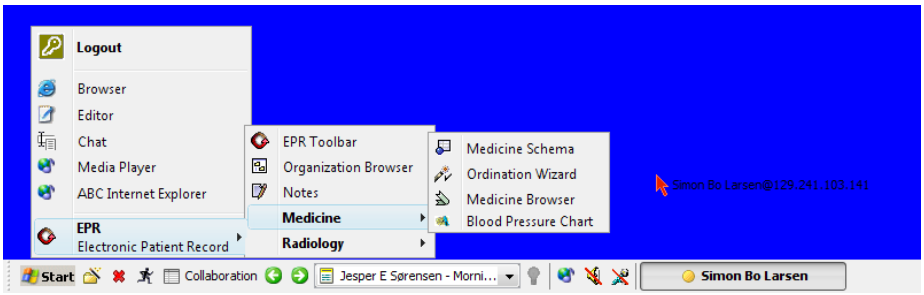


Figure 2.3: The start menu unfolded

The start menu is like the one in Windows, figure 2.3 shows an image of the menu unfolded. The observant reader has also noticed that the pointer has an IP-address tailed to it, this makes it easier to avoid accidentally mistaking another pointer for your own when collaborating between two or more colleagues.

ABC-framework v4

There also exists a version 4 of the ABC-framework implemented in .NET. This version is implemented as an integrated part of the Windows XP operating system. Figure 2.4 shows an image of the ABC-activitybar.

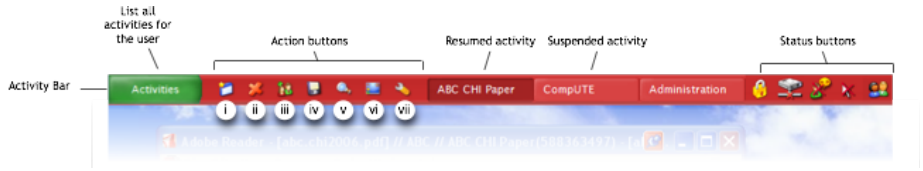


Figure 2.4: The activitybar in the ABC-framework v4

The taskbar is added along the top of the screen, in addition to the standard Windows taskbar. Via the new taskbar the user can access the activities as in version 3 of the framework. The windows are standard Windows windows with a twist; some of the windows are “ABC Aware”, meaning that they have been implemented for use in the framework. An ABC-aware window can be distinguished from normal windows by a “pin”-button in the top right corner (beside the minimize button, see figure 2.5). Pressing the pin toggles this window off and on the current activity.

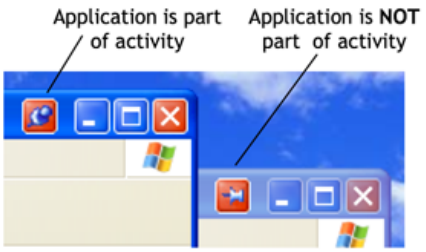


Figure 2.5: Making windows a part of an activity.

Due to it’s lack of stability and cumbersome structure, for the purpose of this project, we decided to find the answers to the questions at hand by using version 3 of the framework.

2.2.3 What is an activity

To get a better grip of what an activity really is, the explanation provided by Jacob E. Bardram in his article “Support for mobility and collaboration in ubiquitous computing” is replicated below [3]:

> An activity is a collection of tasks, having multiple users as participants, and can be suspended and resumed over time and space. ABC allows users to preserve continuity in their work when moving between different devices in a fixed computing infrastructure. The key advantage of this approach over more traditional approaches (e.g., thin clients or portable equipment like laptops or PDAs) is that it allows the system to adapt the user’s task to the computational resources in the environment, making it possible to use several of these resources concurrently.

2.2.4 Architecture

The main areas of the architecture are described in this section.

The Activity Store is an interface to creating, deleting, or getting activities. It keeps track of usage history, enabling stepping forward and backward between activities.

The Activity Manager manages the runtime behaviour of the activities (i.e. enabling the creation, initialization, suspension, resumption and finalization of the activities by the clients).

The Activity Controller (located on the client side) is the link between the client and the server. The activity controller handles events from the server processes, for example invitations to join other activities.

The Collaboration Manager handles the real-time requirements for synchronous collaboration among active participants within an activity. To do this, it manages a session object for each ongoing collaborative activity currently activated by one or more users at different host machines, including the same user on several hosts.

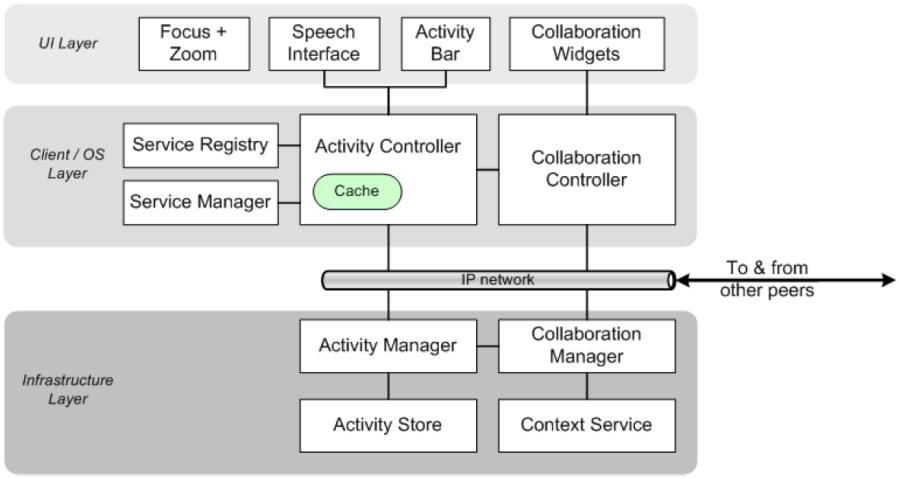


Figure 2.6: A layered view of the ABC-framework

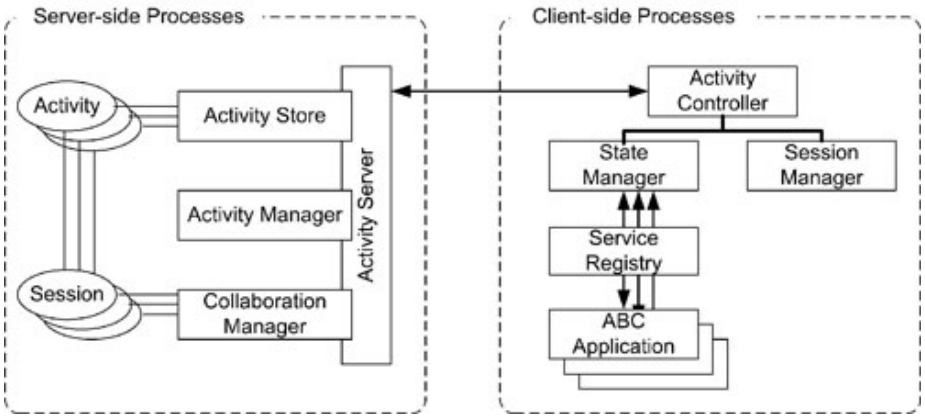


Figure 2.7: A client/server view of the ABC-framework

2.3 Earlier work

2.3.1 Jaatun

Jaatun performed several tests on the ABC-framework (version3) and presented his findings in [7]. Inter alia, Jaatun evaluated the ABC-principles: Activity Roaming, Activity Sharing and Activity Centred.

Jaatun concludes that the principles he evaluated got positive feedback, and that the ABC-principles has a great utility. The technological level of the activities were considered too high by his test subjects, and he proposes changing the conceptual model from activity based to task based, where a task is a type of function, containing one or several patients, and every patient has his or her own activity.

2.3.2 Ormberg

Based on earlier work by Jaatun [7], stating the poor usability of the ABC-framework, the ABC-framework was extended and improved by Ormberg [11]. The main changes were the creation of the “Activity Matrix” and the “Activity Creator”, and by heuristic evaluation, these features were assessed as improvements to the user interface in addition to extending the functionality. A description of the two can be found in the following sections.

Activity Creator

The activity creator is accessed by pressing a button on the taskbar. This triggers a dialogue-box to appear (see figure 2.8). The first of many alternatives presented to the user is to choose the patient he wants to create a new activity for. The second is the type of activity, and the third is what programmes to open. When selecting what activity type to create, the activity creator checks off the most appropriate ones. These activity types are based on templates and can be altered and deleted (and additional templates and activity types can be added).

Although selected, the programmes to open can be deselected, so that the user can open the programmes of his choice.

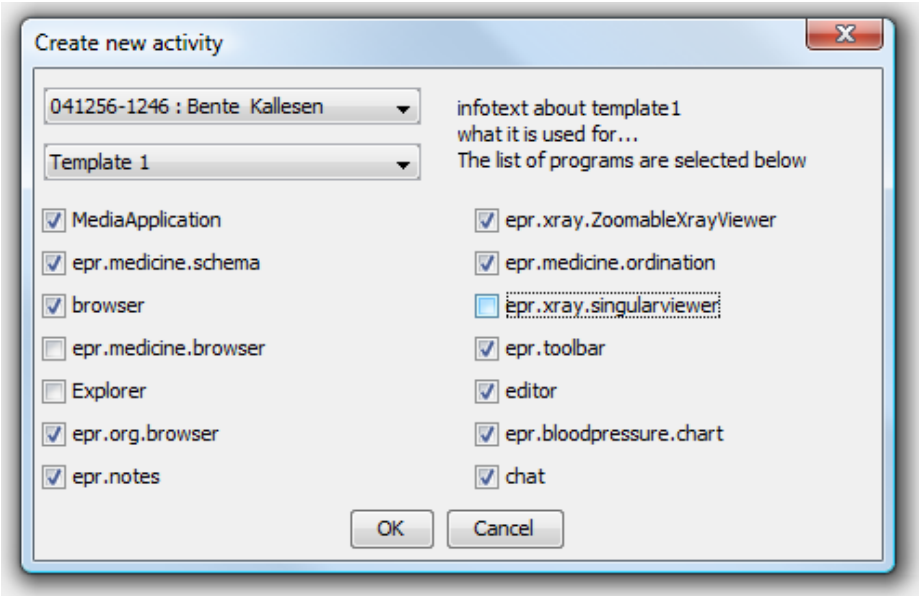


Figure 2.8: Activity Creator

Activity Matrix

The Activity Matrix is a representation of the active activities a user has. The matrix can be accessed by holding in the alt-button on the keyboard, and another activity can be chosen by navigating with the arrows (while still pressing the alt button) and finally letting go of these buttons. Another way to access this feature is to hold in alt- and ctrl-buttons (instead of just alt). These two access-methods also decide what representation the matrix will have. The first alternative presents the matrix with patients along the x-axis, and the patients activities placed on top. The second alternative presents the type of activity on the x-axis and the patients having this type of activity on top of this (see figure 2.9).

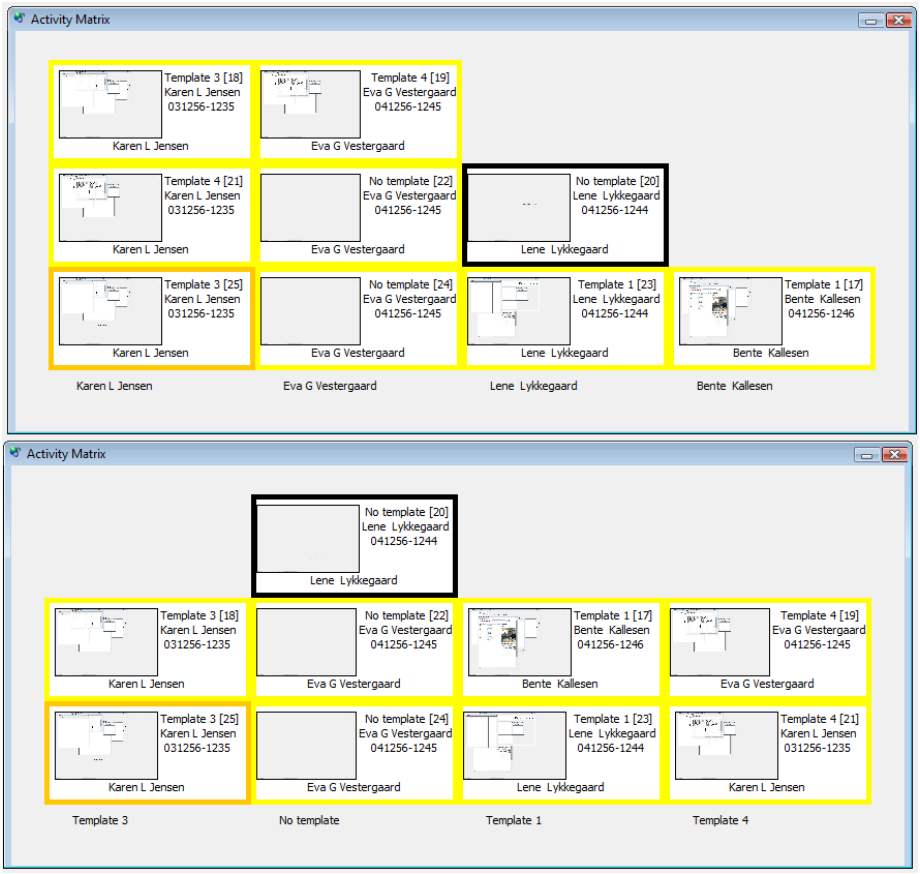


Figure 2.9: Activity Matrix

Chapter 3

ABC-concepts

ABC-Concepts

The research done for the workshops are stated in this chapter. The chapter also includes the principles that will be the base for our evaluation and analysis.

3.1 Pre-workshop measurements

3.1.1 Preparing the ABC-framework

As described in section 2.3.2 and 2.3.2, the ABC-framework was improved in several ways by expanding functionality and giving some central components a "makeover". The most central and visible changes are the implementation of the "Activity Matrix" and the new interface for the "Activity Creator".

The Activity Matrix is a list of all the "activities"[1] that a specific user has. The list is represented as a matrix where the activity name is listed along the x-axis, and the patients attached to the activity placed on top. Alternatively, by using another hotkey[2], the activity name could be replaced by the patient name and the patients activities placed on top (see figures 2.9).

The New Activity is an improvement of the current activity creator. The new functions include choosing what applications to open upon activity creation and an automatic name creation (following a naming standard) (see figure 2.8).

3.1.2 Principles

Although subtle and overlapping, there are differences between the ABC-principles (section 2.2.1) and the attributes stated in [17] (replicated in section 2.1). Therefore, in order to find a solution to the problem, the superset of the two lists will serve as a base in our evaluation. Table 3.1 depicts the differences and similarities between the two sets of principles.

As we can see from the table, the principles from both sets overlap, with the exception of one (Activity Centred).

[1] The term activity comes from the term Activity Based Computing (ABC). However, this term is not necessarily appropriate in a clinical setting. This is discussed in chapter 6.6

[2] keyboard shortcut, in this case <ctrl + alt>, and <alt>

	B1	B2	B3	B4	B5	B6
A1						
A2					X	X
A3				X		
A4	X					
A5			X			
A6		X				

The ABC-principles		Nyrø et al. principles	
Activity Centred	A1	Mobility and interruption	B1
Activity Discovery	A2	Multidevice	B2
Activity Suspend-Resume	A3	Handover	B3
Activity Roaming	A4	Pause, postpone and resume	B4
Activity Sharing	A5	Abstraction and parametrization	B5
Activity Adoption	A6	Plan instantiation	B6

Table 3.1: The overlap between the two sets of principles.

From the cross sections in the list, there was created new principles, and in all seven principles have been created from the set of twelve. Six of them will form the basis of our evaluations. The principles are described in the following sections with a short example. The images used in these sections were used in the workshops (described in detail in chapters 4 and 5), and therefore have Norwegian labels.

The cross-section between the “Activity discovery” and “Abstraction and Paramatrization” and “Plan Instantiation” create the Awareness principle, but will not be evaluated during the course of this master thesis.

Mobility

The first principle created is “Mobility”. This comes from the cross-section between the Activity Roaming and Mobility and Interruption, and Activity Adoption and Multidevice principles, stating that an activity is location and device independent. Figure 3.1 shows the card we used to show the mobility principle in the workshop (English/Norwegian: mobility/mobilitet, office/kontor, on-call room/vaktrom, chief physician/overlege).

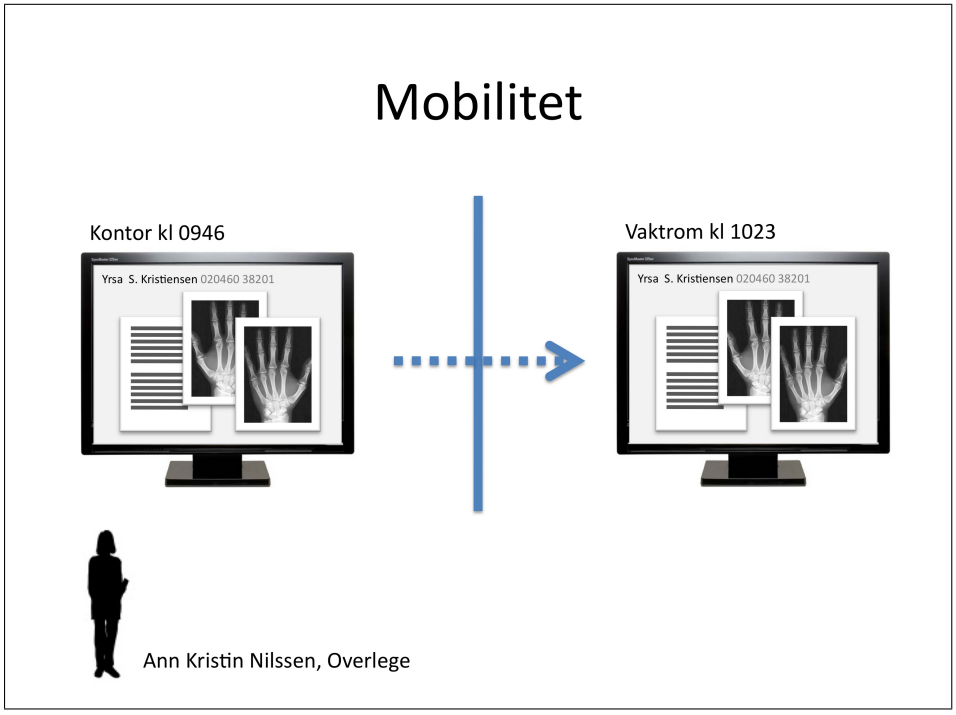


Figure 3.1: Mobility

Mobility

Nurse Pedersen is doing some paperwork in the computer room when she is called for by one of the patients. She suspends her work by logging off the computer (giving access to anyone else wanting to use the computer), and tends to the patients needs. Later that day, she wishes to resume the work she was doing in the computer room, but all the computers are occupied by other nurses doing their paperwork. Nurse Pedersen goes to the computer room in the neighbouring ward, logs on and continues her work from where she left off earlier.

Collaboration

The second principle created is “Collaboration” and is the cross-section between Activity Sharing and Handover. This principle states that two or more users should be able to co-operate on a specific activity. Figure 3.2 shows the card we used to show the collaboration principle in the workshop (English/Norwegian: collaboration/samarbeid, assistant resident/assistentlege).

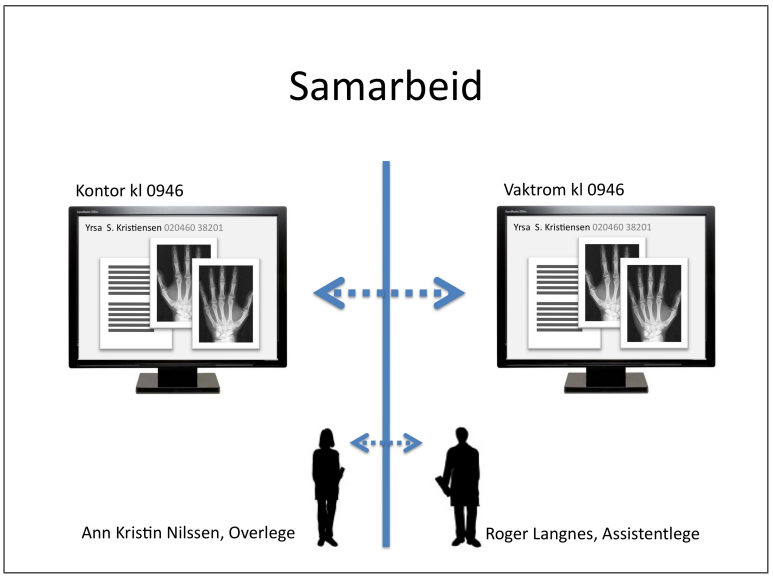


Figure 3.2: Collaboration

Collaboration

Doctors John and Jane Smith both work at the same hospital, but at different wards. Jane, working in pediatrics, wants the professional opinion from John, working in the orthopedic ward. Jane wants help assessing the further treatment of one of her patients, a six year old boy with a fracture in his right tibia. Jane, having created an activity on her computer with all the necessary information, sends a request to John. John accepts the request, and now has access to the activity created by Jane. Both John and Jane can now edit the activity, synchronous (at the same time), or asynchronous (not at the same time).

Interruption

The third principle created is “Interruption”, and is the cross-section between the Activity Suspend-Resume and Pause, postpone and plan to resume in the future. Working as a health worker, being interrupted is a common situation. The interruption principle suggest that the users of the system should be able to suspend an activity and resume it again later. Figure 3.3 shows the card we used to show the interruption principle in the workshop (English/Norwegian: interruption/avbrudd, “Can we give more painkillers to the patient?”/“Kan vi gi pasienten mer smertestillende?”, “Yes, it’s ok”/“Ja, det er greit”).

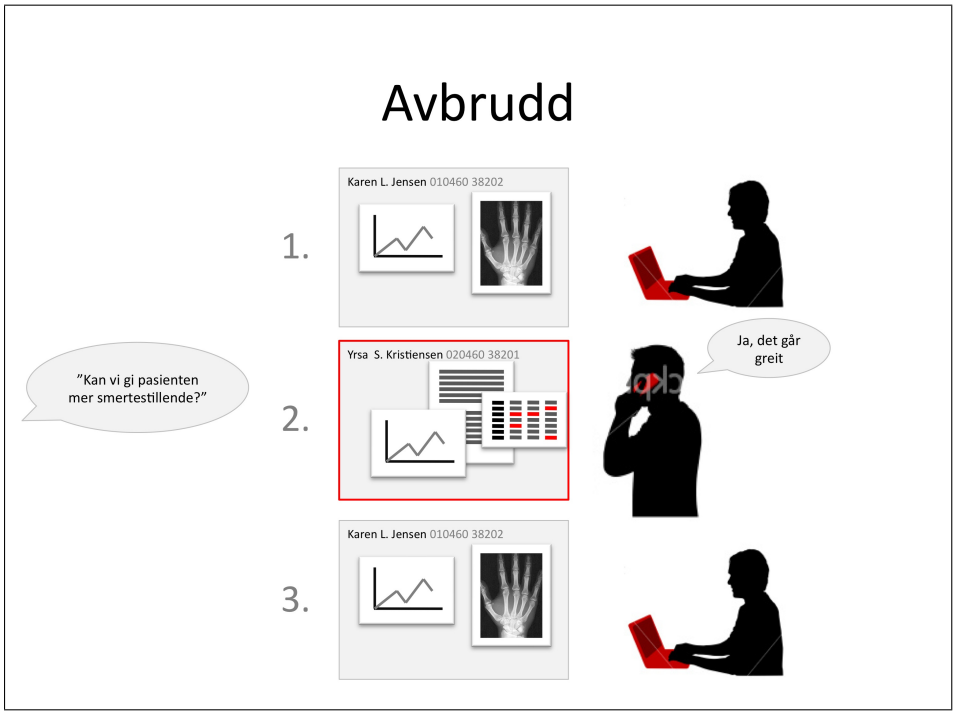


Figure 3.3: Interruption

Interruption

Doctor Jane Smith is a doctor at the pediatric ward. While working with her computer in her office, she is interrupted by a medical emergency. She logs off the computer and thereby suspends her work, and tends to the emergency. Returning to her office she wishes to resume her work. She logs on, and within seconds she's back where she left off.

Multiple patients and multiple tasks

The Activity Centred principle (having an activity as a first class object) from the ABC-principles will give birth to two new principles: "Multiple patients" and "Multiple Tasks". These principles can be viewed as dimensions of an activity, and will be referred to as "Multiple Activities" or simply "Activities" when discussing them both. Figure 3.4 and 3.5 shows the cards we used to show the multiple patients and multiple tasks principles in the workshop (English/Norwegian: multiple patients/flere pasienter, multiple tasks/flere oppgaver, pre-visit/previsitt, epicrisis/epikrise, x-ray analysis/røntgenanalyse).

Multiple patients

Doctor John Smith has just received a new patient at his ward. The patient, a young female, has been diagnosed with the swine flu. Dr. Smith has two other patients with the same diagnosis and wishes to compare the newly arrived patient with the two other patients. Dr. Smith toggles between the three patients with the use of keyboard shortcuts and before continuing his work on the new patient.

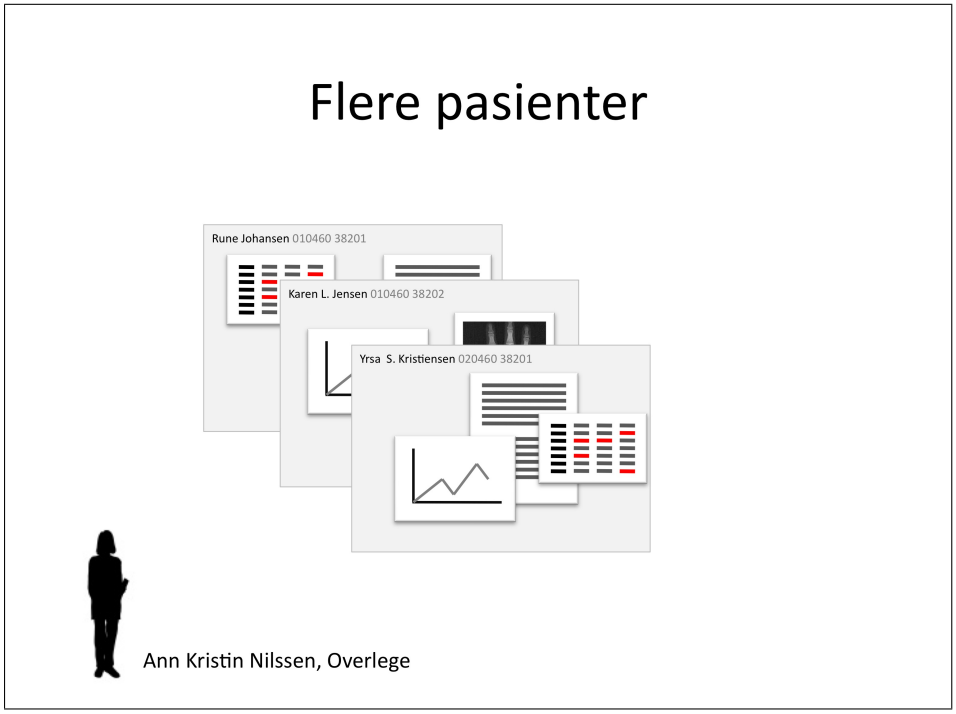


Figure 3.4: Multiple patients

Multiple tasks

Doctor John Doe wishes to get some paperwork done and, working in the orthopedic ward, he knows he has many similar cases. He has four fractures to tend to at the moment, three of them being fractures in the femur, and one in the ulna. After finishing with the first case, Dr. Smith toggles to the next case by pressing a keyboard shortcut. After finishing all the three similar cases (fractures in the femur) dr. Smith changes to the next case (fracture in the ulna), again by the aid of keyboard shortcuts.

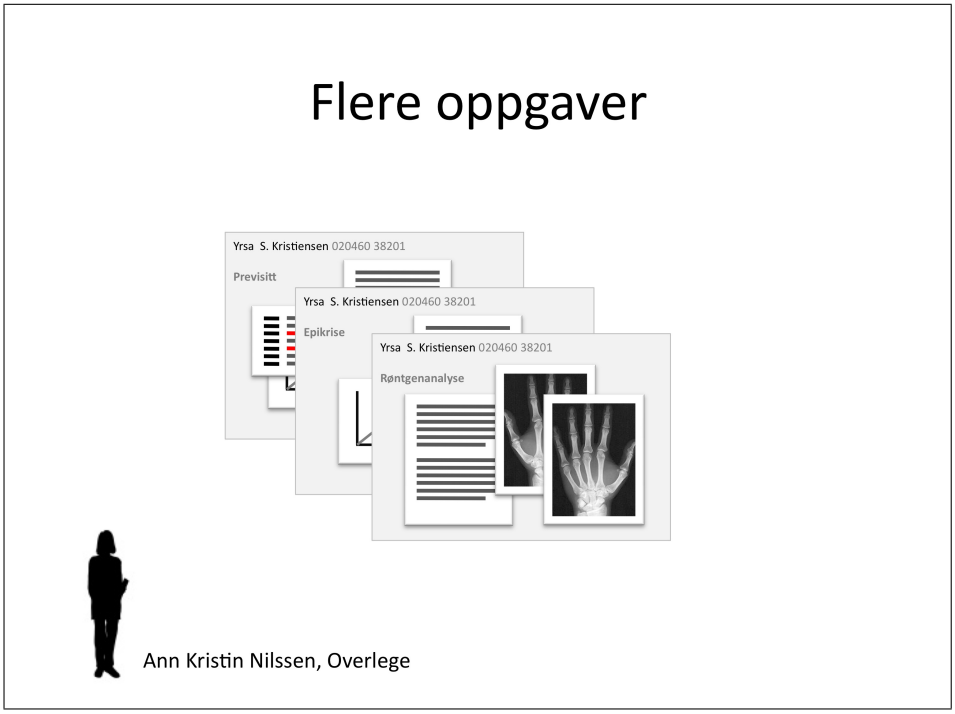


Figure 3.5: Multiple tasks

Handover

Because the Collaboration can be done in many different ways, the Collaboration principle has been divided into two, namely Collaboration and Handover. Handover is the act of giving an activity (and it's responsibility) to a co-worker. Figure 3.6 shows the card we used to show the handover principle in the workshop.

Handover

Nurse Pedersens shift is soon over. During the overlap between the shifts she discusses what she has done with one of her colleagues, and before the shift is over she logs on to one of the computers in the computer room and transfers ownership of her patients to her colleague. Her colleague now has the responsibility for these patients.

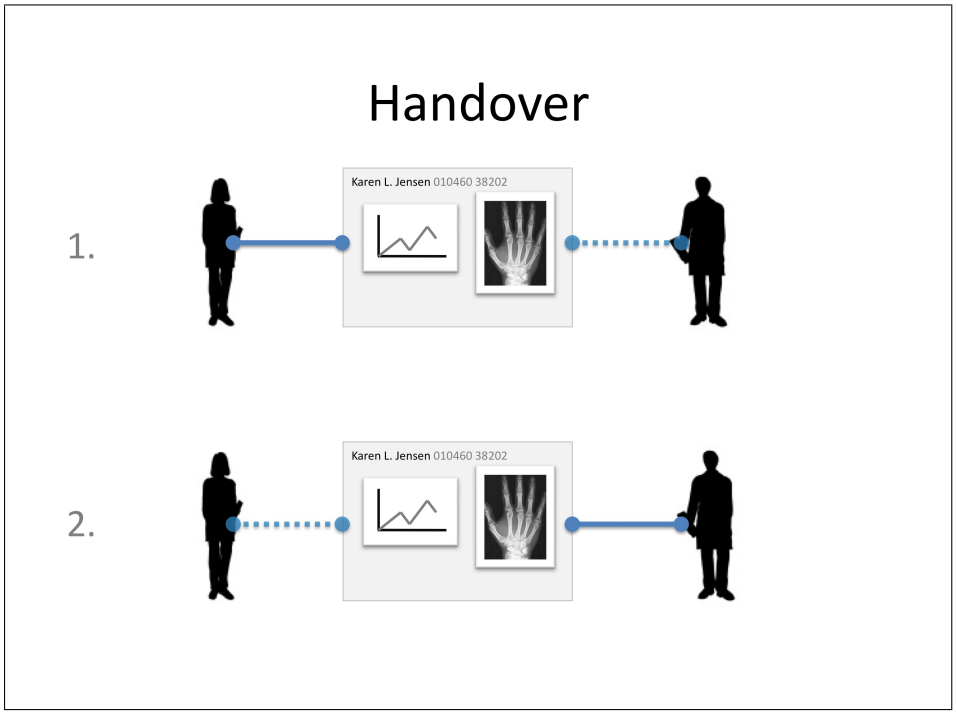


Figure 3.6: Handover

Chapter 4

Methods

Methods

For this project there were performed two workshops containing several different methods. In this chapter the theory behind the different methods will be described. Because of the limitations that the project sets, these methods have been altered to better match the workshops and the time frame. These changes are described towards the end of the chapter. The location for the workshops are also described in this chapter.

As described in [11], a heuristic evaluation of the improved and extended ABC-framework was applied. To further this work, the methods described in this chapter have been applied to the ABC-approach.

4.1 Qualitative evaluation methods

4.1.1 Usability evaluation

The goal of a traditional usability test is to observe people using the application or product in order to discover errors and areas of improvement. Usability evaluations generally involves measuring how well test subjects respond in four areas: learnability, efficiency, memorability, low error rate, satisfaction [6].

A typical test includes both participants and facilitators. The participants receives a list of tasks to perform, while the facilitators observe and take notes. Pre- and post test questionnaires can also be issued, or alternatively a discussion to capture how the participants experienced the product.

Learning the participants to “think out loud” is a common technique, and can help the facilitators understand the actions of the participants.

Performing a standard usability test can take from 30 minutes to several hours.

4.1.2 Role play

Role play can be a powerful tool in system design. Used and analysed correctly the facilitators can extract valuable information. [14] states that role play can be a particularly useful in projects involving mobile technology and multiple users.

The goal of a role play as a system designing tool, can be both concrete or undefined. Having a concrete goal will lead the participants to focus on the goal, and having an undefined goal gives the participants freedom to explore, and possibly define a goal them selves.

The main advantage of a role play is that the participants themselves can act out and thereby also communicate their wishes and concerns, which they might not have expressed as easily with words.

However, role play should not be used as the only evaluation method, but rather be supplemented with others [13].

Although not necessary, professional actors or acting teachers can be hired to instruct participants with little or no acting experience.

4.1.3 Card ranking

Card rank[1], created by Alsos and Dahl [2], is a method used for ranking different concepts against each other. The procedure starts with a usability test (including all the concepts to be evaluated). After each concept has been evaluated a short interview is performed, and after the usability evaluation a post usability debrief is conducted.

During the debrief, A5-sized cards depicting the concepts are presented to the participants (one card at a time). For each card the participants are asked to comment the card.

After all the cards have been discussed, the cards are placed faced up, randomly on the table. The participants are then asked to rank the cards in preferred order, while stating the reason for his or her choice.

Card ranking can be applied in groups as well as individually.

4.1.4 Focus Group

A focus group is in practice a group interview. The group usually contains from 6 to 9 participants, who has some knowledge about the focus groups “theme” [8]. To keep the conversation running, the facilitators should be in prepared with predefined questions. It is important that the facilitators don’t ask leading questions and keep an open mind to the participants thoughts [1].

[1] not to be mistaken for card sort as described in [9] and [10]

4.2 Workshop details

Because of the constraints this project set, changes were made to best match the workshops that were planned. These changes are described in this section. The entire workshop was be recorded (both sound and image), with ceiling mounted cameras and a hand held camera (when the ceiling cameras weren't available).

4.2.1 Location

For the location of the workshops NSEP[2] was chosen. NSEP provides an environment for performing the workshops with their state of the art laboratory (used primarily for usability tests). The layout of the lab can be altered with it's movable walls and has 4 cameras and several microphones placed in the ceiling. The layout of NSEP is depicted in figure 4.1.

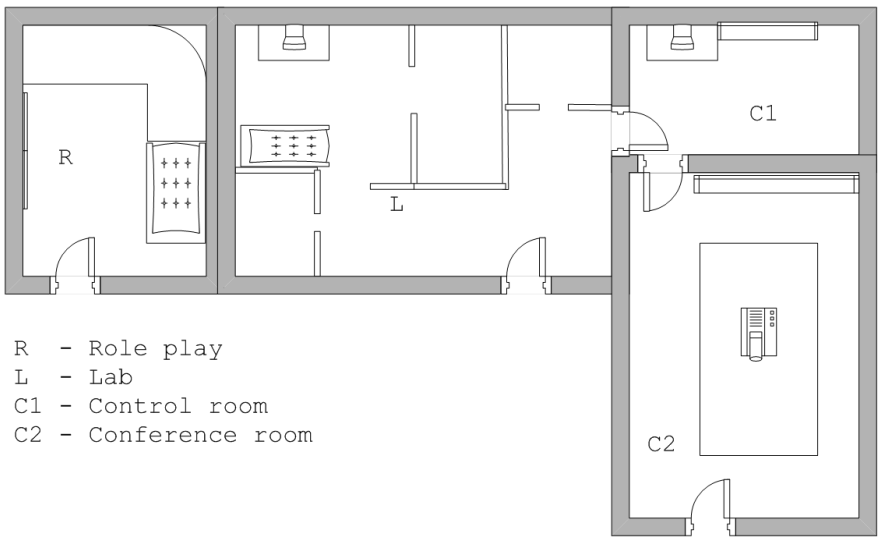


Figure 4.1: The layout of NSEP.

NSEP also provided equipment such as hospital beds, several rooms, a laboratory, computers, cordless telephones, a big screen TV and a projector. Additionally to make the workshop more realistic, equipment like hospital clothing and props could be used.

[2]Norsk senter for elektronisk pasientjournal

4.2.2 Usability evaluation

For the workshop the usability test is slightly altered. Because the time frame of the workshop is set to three to four hours, the usability test also has to fit accordingly.

The agenda for the usability evaluation is as follows:

- An introduction to the concepts that are to be evaluated.
- An introduction to the ABC-framework.
- The actual usability evaluation.

Needed equipment:

- Two computers (with screen, keyboard and mouse)
- Two telephones
- Two separate rooms

During the introduction of the concepts the participants were shown a presentation (replicated in appendix A.2). The main goal of this was to spark the mentality of the participants and prepare them for what was to come.

Because only the newly derived principles were to be evaluated, a walkthrough of the basic functions in the ABC-approach[3] was necessary. This was given after the introduction of the concepts, and showed the participants one instance of the ABC-framework. Therefore usability evaluation is a better name for this item, rather than usability test, seeing as it was the principles that are to be evaluated and not the GUI[4].

The participants were then divided into two groups of two (one doctor and one nurse in each group), G1 and G2. G1 was placed in the control room and G2 in the laboratory (see figure 4.1).

The groups were then handed a set of tasks (found in section A.3). Although touching all the principles, the sets of tasks were not identical for the two groups. The ordering of the tasks were also not the same.

[3] An instance of the ABC-framework
[4] Graphical User Interface

At the groups' disposal, in both locations, were two chairs and a table with a computer (with the ABC-approach installed) and a telephone. In addition a 50" screen TV was available in the control room.

Because there was only one computer per group the group has to decide who should "control" the computer and who would assist. The groups had a free hand in choosing this themselves. The groups solved each task either by finding patient information (e.g. looking at x-rays or medicine charts) or by sharing information with the other group.

Figure 4.2: Image from the usability test in the second workshop.

While solving the tasks the groups were interrupted. The phone rang, and the person answering the phone on behalf of the group was asked to find information that the calling group had shared with them. After finding this information and discussing it on the phone, the called group could continue solving the task from which they were interrupted.

Towards the end of the tasks, the groups met in the control room (as a part of the tasks). There one of the participants in G2 logged on to the computer connected to the big screen and performed the rest of the tasks.

4.2.3 Role play

To better fit the scope of this project and meet the time limitations from the workshops, there was not enough time to run a complete workshop exclusively based on role play. So, the workshops that were planned featured a role play exercise.

The following equipment was available:

- Post-it notes (at least one pack per person)
- Foam models (to simulate the electronic devices)

- Props and costumes
- Whiteboard

The exercise divided the participants into two groups of two. Group one (G1) was sent to the office (denoted “R” in figure 4.1), and group two (G2) was placed in the laboratory (denoted with a “L” in figure 4.1).

The two groups were given a subset of the principles and were then asked to express their thoughts (their thoughts being anything related to the keyword, e.g. scenarios that they have experienced or futuristic approaches) about these principles on a post-it note (or write it on a whiteboard). Figure 4.3 shows an image of the scenario creation.

Figure 4.3: Image from the role play creation in the first workshop.

When the participants were finished expressing their thoughts, the facilitators reviewed the post-it’s one by one with the participants. Based on the review, a scenario was built and rehearsed before it was performed in front of the other group.

In the scenarios, the participants were given small foam models of PDA’s, cell phones and other devices when needed. For a more realistic experience the facilitator could help simulate the screen by drawing it (after an explanation from the actor) on a post-it and placing it on the device (see figure 4.4.

Because the groups consisted of only two participants, the participants were allowed

Figure 4.4: Image from the role play in the first workshop.

to take multiple roles. For example actor A can both be a doctor and a nurse (preferably asynchronously, but if needed also synchronously).

To document the scenarios the workshop had one hand held camera (used in the office) and three ceiling mounted cameras in the laboratory. Therefore the best recording possibilities were in the laboratory, and the scenarios were acted out there. After the performances by the two groups, the scenarios were discussed in a plenary session.

4.2.4 Focus Group

To keep the workshop running smoothly, the card ranking method was applied after the role play, and not right after the usability evaluation. This was due to the fact that the same principles are incorporated throughout the whole workshop. The only equipment needed for this exercise is X copies of the principles, laminated on a A5-sized piece of paper chairs and a table (X being the number of participants). Images of the cards used can be found in section 3.1.2.

Sitting around the table, the participants received the six cards. As a group they reasoned for and ranked the principles. After the first workshop this was changed due to difficulties in ranking the principles. To counter the groupthink that arose, the participants of the second workshop were given two minutes to rank the principles individually before presenting their ranking to the rest of the workshop. After this the

Figure 4.5: Image from the card ranking in the focus group.

participants did the same again, but this time in a plenary session, taking in to consideration the rest of the participants arguments and discussing their choices.

To supply the different tests with additional information the workshop also consisted of several debates where the participants could discuss the different aspects of the principles.

These debates were placed after the usability evaluation of the ABC-approach, and after the card ranking. This giving the participants concrete experiences, and time to reason about, the different principles before discussing them.

4.3 The Workshop

Two workshops were planed for this master thesis. The reason for having two workshops was to ensure the validity and quality of our findings, and as stated in [8] and [12], performing a single focus group, and presenting it's results as a solution is misleading. One group might find one set of solutions, while another might find the direct opposite. Therefore one should perform several groups, and supply the results with additional sources of information. Also performing several smaller tests, rather

than few large, helps avoid the pitfalls of "group think" [5].

The two workshops had the following structure:

- Introduction of the principles to the participants.
- Demonstration of the ABC-framework to the participants.
- Usability evaluation, giving the participants a "hands on" experience with the ABC-framework.
- Role play, where the users can act out scenarios with regard to the principles.
- Focus group (with Card ranking), discussing the principles.
- Observation, observing the participants in their natural environment.

Having an introduction of the principles for the participants as the first item on the agenda gives the participants of the workshop a superficial view of the principles (described in detail in section 3.1.2). Although this doesn't present any concrete ideas it sparks the creativity of the actors.

To supplement the first item a demonstration of the ABC-approach is presented next. This will give the participants a more specific view of the principles and will show some of the possibilities of the framework.

The third step is a "hands-on" "usability evaluation" of the ABC-approach including a post-usability evaluation debrief. Here the participants can test the system for them selves and discuss their findings plenary.

The next step is a role play where the users can show typical situations during their workday and express desires and needs. The role play ends with a discussion and is finally topped off with a focus group. In addition to the workshop there will be observations of some of the participants.

The reason for choosing these methods was to best answer the research questions, and an evaluation of the methods will be given in the discussion.

[5] Group think is a type of thought exhibited by group members who try to minimize conflict and reach consensus without critically testing, analysing, and evaluating ideas. A variety of motives for this may exist such as a desire to avoid being seen as foolish, or a desire to avoid embarrassing other members of the group.

Figure 4.6: A short introduction of the principles was given to the participants at the start of the workshop.

Chapter 5

Results

Results

This chapter will present the results of the two workshops described in the previous chapter.

Where possible, each section will present the participants views and ideas[1] of the principles.

Because the system is to be used by health workers, workshop I included two doctors and two nurses, and Workshop II included one doctor and two nurses, most of whom came from different wards. In addition the nurses and doctors were both male and female.

As described in the previous chapter the workshop participants were divided into two groups of two[2]. These groups were used in both the usability evaluation and role play sections. The group compositions can be found in table 5.1.

Alias	Group	Gender	Nurse	Doctor
Workshop I				
D1	G1	M		X
D2	G2	F		X
N1	G1	M	X	
N2	G2	M	X	
Workshop II				
N3	G3	F	X	
N4	G3	F	X	
D3	G4	M		X

Table 5.1: Participants in the two workshops.

5.1 Usability evaluations

As described in chapter 4, after a short introduction of the ABC-principles[3] we performed a usability evaluation of the improved and expanded ABC-framework. Despite smaller technical issues, the participants mastered using the system without any major problems.

[1] All quotes are translated from Norwegian to English

[2] One group with two and one group with one in workshop II, due to a late cancellation.

[3] Unless explicitly mentioned the term ABC-principles or simply principles, from here on refer to the principles derived in section 3.1.2.

5.1.1 Multiple patients and Multiple tasks

Being able to change between patients is a feature that is not supported in today's systems (in computer systems in Norwegian health). Therefore, being able to have multiple patients "active" at the same time introduced a new and time saving way to use the computer. This is also applicable to multiple tasks.

Although a bit unaccustomed, the participants enjoyed the features and managed to use it after some trial and error. However, the participants did not seem to notice the difference between the two. And instead of changing or creating a new activity when a new situation arose, the participants first tried to continue in the current activity before changing to the "correct" one.

As the following example shows the participants received help from each other when stuck.

> D1: Where do I find her (the patient)?
>
> N1: Try pressing the control-button.

5.1.2 Interruption

Together with mobility the interruption principle was the most appreciated by the participants. To be able to resume a task in the same state as is was when it was suspended is an appreciated feature and was commented in the post usability debrief. In use, the users did not seem to notice when being interrupted, and continued their tasks as if nothing had happened after the interruptions.

5.1.3 Collaboration

During the usability evaluation some comments were given about the problems the lack of feedback gave. For example one of the participants said (when talking on the phone with the other group):

> I don't know if you that sent it, or if I created it my self.

Figure 5.1 depicts one of the groups collaborating with another group in the second workshop.

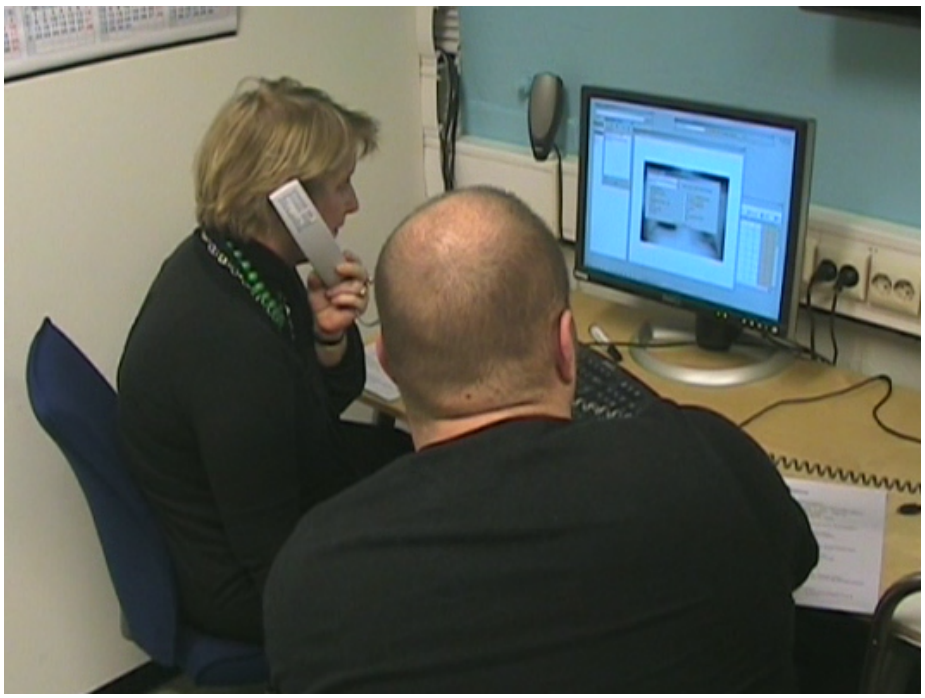


Figure 5.1: The group collaborated with the other group.

In the post usability evaluation debriefing comments were given regarding the "Collaboration"-principle. The participants felt it was a good idea, but the implementation in the ABC-framework was not an ideal solution.

5.1.4 Mobility

Mobility was appreciated by the participants. Being able to resume work on another (or possibly the same) location is a feature that is already implemented at the computer system in Trondheim health, but compared to the implementation in the ABC-framework, the participants preferred the one of the ABC-framework because of it's speed.

5.1.5 Handover

Although handover isn't a supported feature in the current system used by the participants, the use of handover was not appreciated as much as the other features during the usability evaluations. The participants had a hard time knowing if they had

handed over an activity or not, or if they had received responsibility for an activity. As with the collaboration principle, the praised the idea, but not the implementation.

5.2 Role play

The role play (performed after the post usability debrief) gave the actors possibility to show how their workday is and how they think the principles could be used in a hospital setting.

In the first workshop the four actors were divided into two groups of two (one nurse and one doctor in each, keeping the groups from the usability evaluation), given three principles and asked to make a scenario . In the second workshop the three participants (G3 and G4) were merged into one group.

The three scenarios are described in the following sections. To better understand them a short “cartoon” belonging to each scenario is presented. In addition, a Gantt-diagram showing the tasks and who participates in the task is also provided.

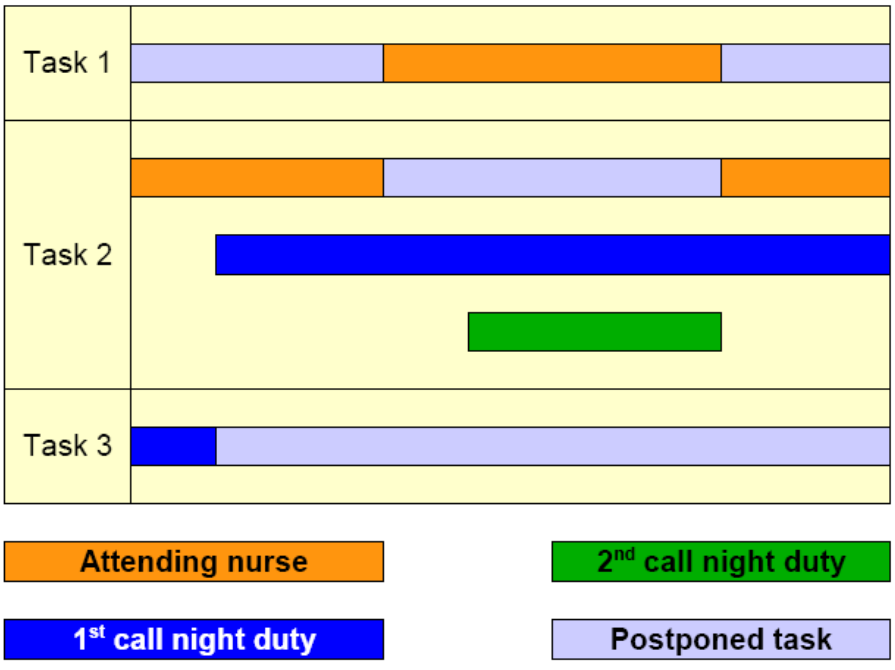


Figure 5.2: Gantt diagram of scenario I

Scenario I

The first group (G1) received the handover, interruption and multiple tasks principles, and made the following scenario:

> *It's in the middle of the night, and the attending nurse informs the doctor working the night shift that one of their patients has a cardiac infarction. After attending to the patient, the first-call night duty at the scene asks the nurse to ready all the data available and send it to him so that he can get a second opinion from a specialist.*
>
> *The nurse readies all the data on his computer and calls the first-call night duty, now situated in another location. The first-call night duty is currently working on her computer with another patient. Receiving the call from the nurse, she changes from her current work to the shared activity received from the nurse.*
>
> *The first-call night duty wants a second opinion, and decides to confer with the second-call night duty cardiologist. The first-call night duty calls the second-call night duty cardiologist, who is at home sleeping soundly in his bed. The first-call night duty shares the activity and collaborates with the second-call night duty cardiologist, and they discuss the patient. They agree to move the patient to the cardiology ward due to his condition.*
>
> *The first-call night duty calls the nurse, and tells him the news, while at the same time showing him on the collaborated activity.*

In this scenario we could find:

Interruption, when the nurse interrupts the first-call night duty.

Collaboration, between the two doctors and the nurse.

Multiple tasks, when the doctor has to change from her current work to the collaborated activity.

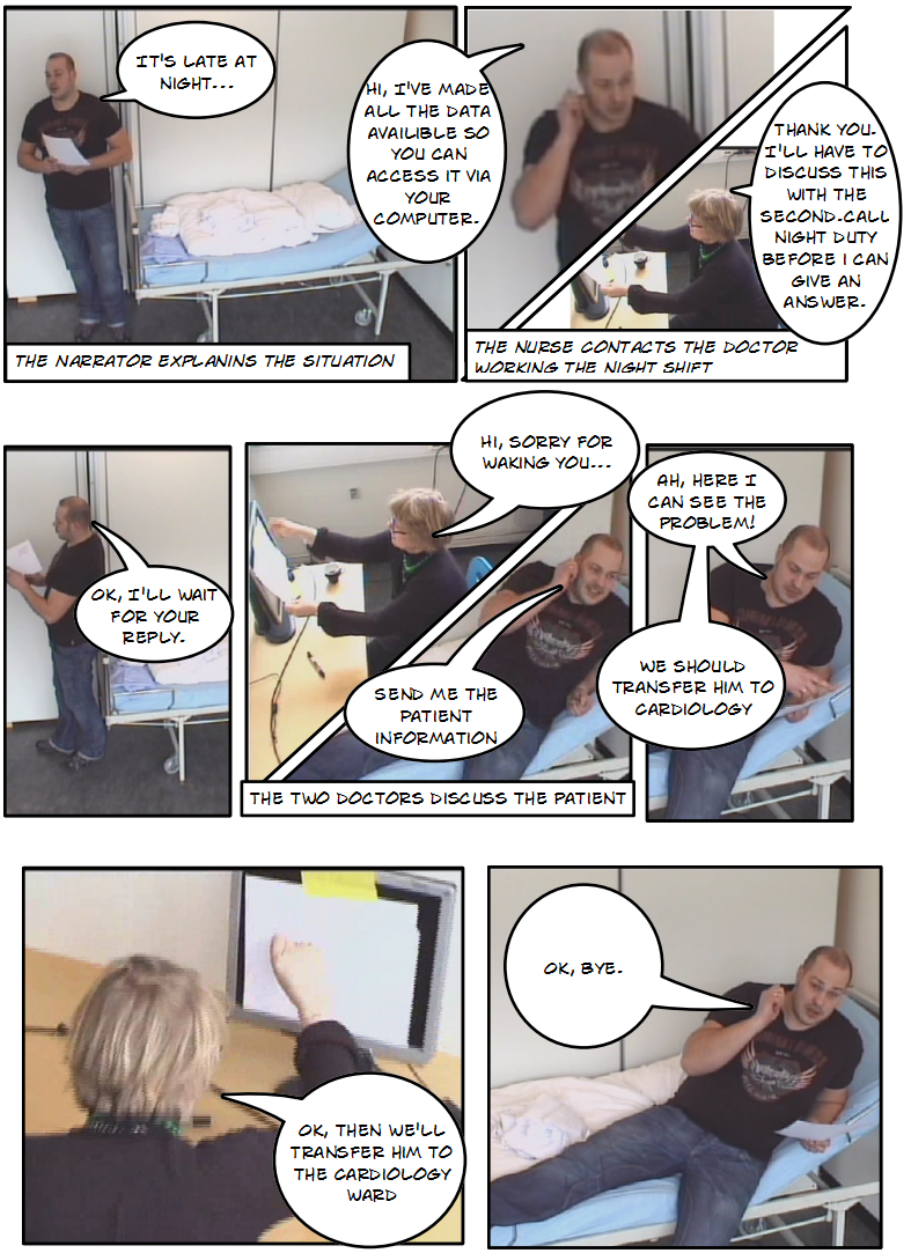


Figure 5.3: Scenario 1

Scenario II

The second group (G2) had the mobility, multiple patients and collaboration principles as a base, and created the following scenario:

It's an ordinary day at the ward. The nurse sitting in the computer room planning his day, notices that the medication prescribed for one of the patients might be too high. Still sitting by the stationary computer he docks in his mobile and portable device and "drags" the patients medication chart to his mobile device. The device receives the medicine chart. The nurse removes his device from the dock, logs of the computer and goes about his business as usual.

Meanwhile the doctor is going his morning round. Using his portable and mobile device he can see a layout of the ward, with patient names and information about the patients.

While talking to a patient the nurse spots the doctor, and having a possibly faulty medicine dosage he decides to wait for the doctor to finish with his patient before confronting him with his problem.

Using the medicine chart the nurse had ported to his device earlier, he shows the doctor the problem while describing the situation. The nurse suggests another medication dose and the doctor agrees. Because only doctors can prescribe medicine the doctor has to sign this prescription. He does so by digitally signing on the nurses hand-held device. Both the doctor and the nurse continue their work as planned.

The principles found in the second scenario was:

Mobility, by the aid of mobile devices, and by the use of viewing the same information on both a stationary and a hand-held device.

Interruption, when the nurse interrupts the doctor in his morning round.

Collaboration, when the nurse and doctor interact.

Multiple patients, by the doctors view of the ward on his hand-held device.

Multiple tasks, by the nurse's view on the stationary computer, when planning his day.

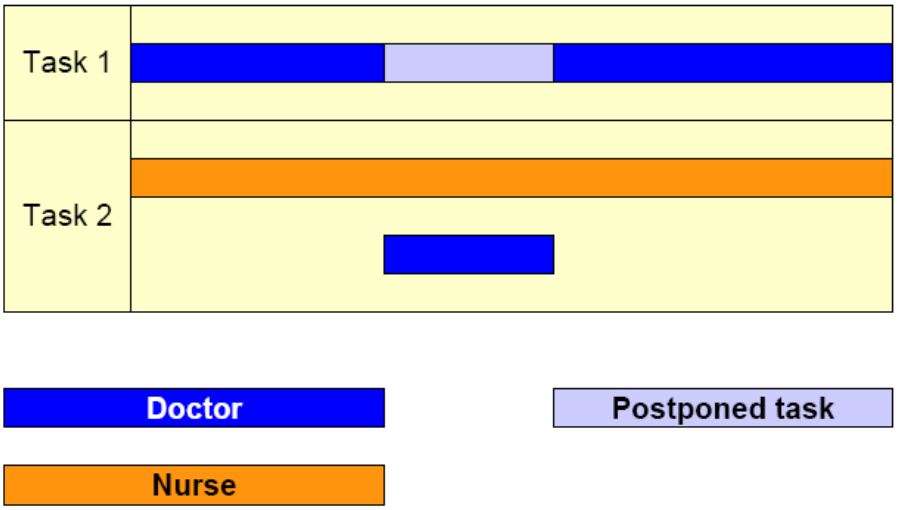


Figure 5.4: Gantt diagram of scenario II

Although the actors also considered having a handover of the medicine chart from the nurse's device to the doctor's, they decided not to. This would have included all of the principles in the scenario.

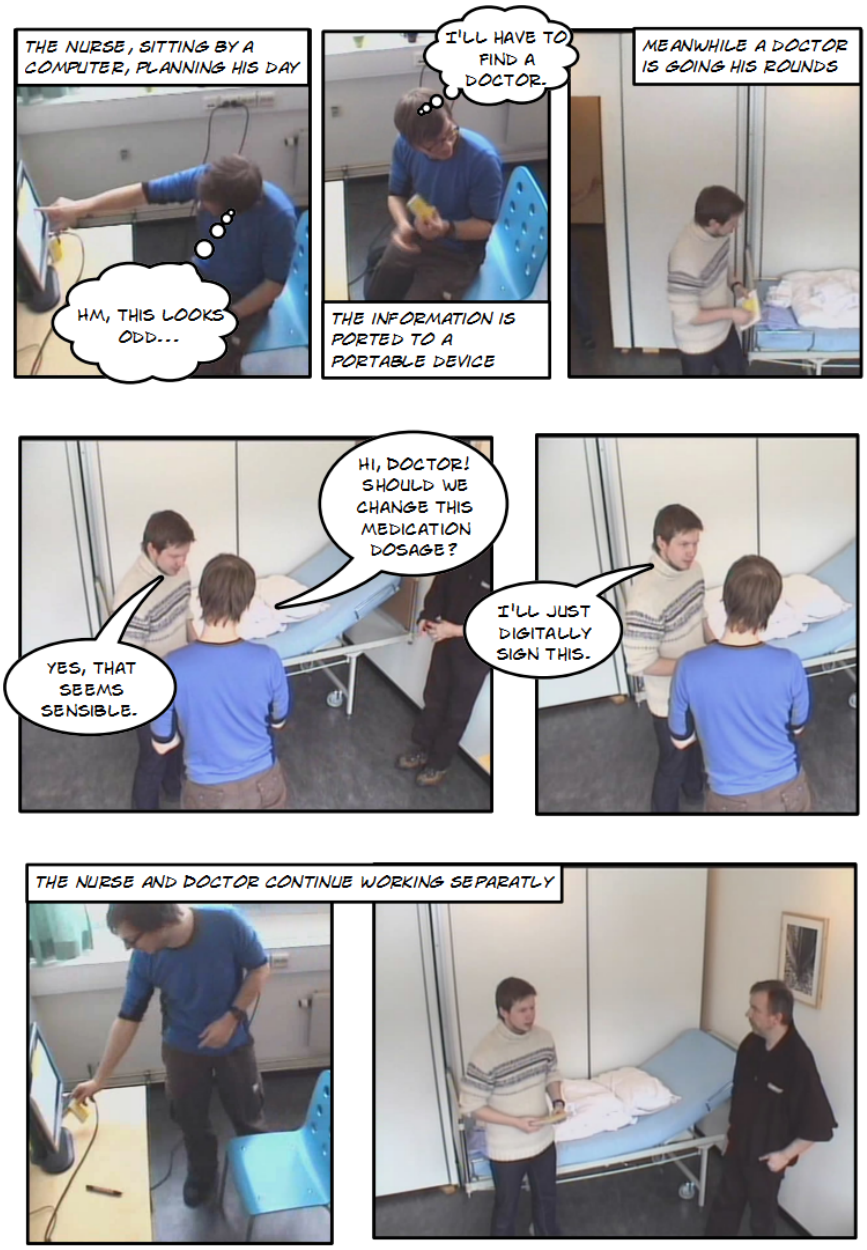


Figure 5.5: Scenario 2

Scenario III

In the second workshop, due to a late cancelling, the actors were given the complete set of principles to create a scenario from. Even though not required, the scenario

dealt with all the principles. The two groups from the usability evaluation (G3 and G4) were merged to one. They made this scenario:

The scenario starts at quarter to ten in the evening at the emergency ward, with the arrival of an elderly female patient. The patient has a fracture in her shoulder and suffers from chest pains. The intern (who usually works at the emergency ward), needs help assessing the newly arrived patient. Although the intern has sufficient knowledge, he lacks the experience of a more skilled doctor. He assumes her chest pains, now causing breathing problems, is caused by her fracture. The chief surgeon is currently in the middle of an operation, and can not come to the ward.

Using the intercom the intern calls the doctor at the operating ward. Because the surgeon is busy the nurse in the operating ward answers the call. The intern sends the patients x-rays over to the nurse. The nurse accesses the x-rays on the computer in the operating room and shows the x-ray on a large screen, so that the surgeon could see.

The surgeon confirms the interns assumptions, and the intern continues the treatment of the patient. His first order of business is running some tests on the patient before preparing surgery on her shoulder.

The test results arrive on a portable device, and the intern is informed by a e-mail like notification (vibration) while talking to another of his patients. He finishes his conversation, leaves the patient room, takes up his portable device and looks at the test results.

The results show that there is pneumothorax[4]*. The condition is severe, and the doctor's first priority changes from operating her shoulder to fixing her collapsed lung. The intern has to present the situation to a lung doctor. The intern prepares all the information on his desktop computer before calling the doctor. The intern sends his information to the doctor and "shares" the screen, so that they can see the same information. The two doctor's agree to transfer the patient to the lung-ward, providing the best care for the patient. While transferring the patient to the ward, the responsibility also shifts from the intern doctor to the doctor at the lung-ward.*

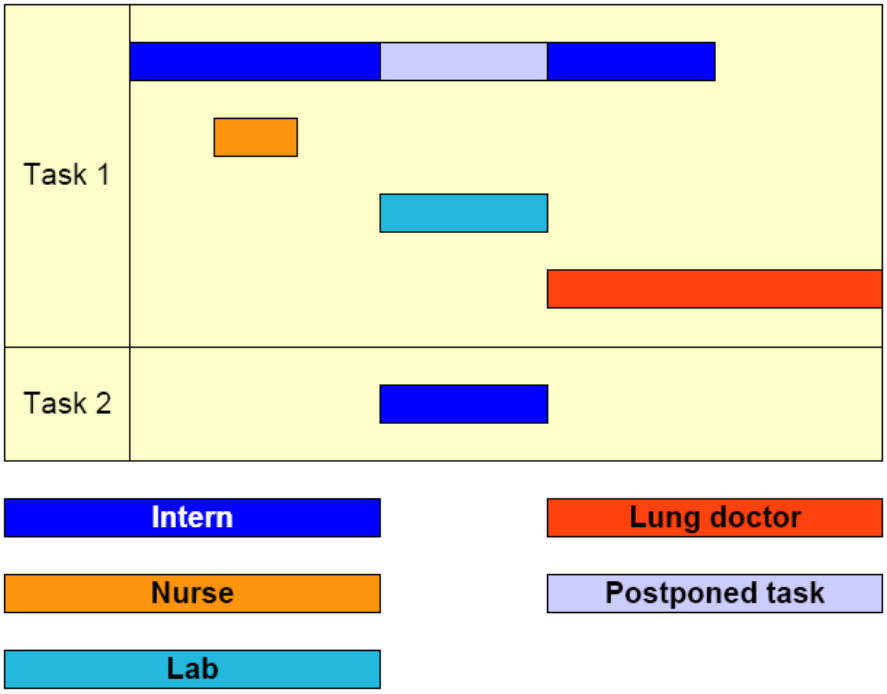


Figure 5.6: Gantt diagram of scenario III

The third scenario contained the following principles:

Mobility, again by the aid of mobile devices, and by the use of viewing the same information on both a stationary and a hand-held devices. The intern is constantly mobile by being able to access his account on his portable device and on his desktop.

Interruption, when the intern calls the surgeon in the middle of surgery, and when the intern receives a notification about the test results he had ordered.

Collaboration, between the nurse in the operating room and the intern, and between the lung doctor and the intern.

Multiple tasks, when the doctor toggles between his various patients and test results.

Handover, when the patient is transferred to a different ward.

After acting out the scenarios the actors participated in a discussion about their scenarios. All of them responded that their scenarios were realistic and could easily

Figure 5.7: Scenario 3

have happened on a daily basis. Table 5.2 shows an overview of the different principles found in the three scenarios.

Principle	Scenario I	Scenario II	Scenario III
Multiple tasks	X	X	X
Multiple patients		X	
Collaboration	X	X	X
Interruption	X	X	X
Mobility		X	X
Handover			X

Table 5.2: Overview of the principles found in the three scenarios.

5.3 Focus group (with Card Ranking)

The workshops ended with a focus group. The goal of the focus group was to start a discussion about the ABC-principles, and their usefulness.

5.3.1 Card Ranking

To get the participants started they were asked to perform a ranking of the six principles, first individually and then plenary.

The participants found this difficult in both workshops. In the first workshop the participants gave up the task (partly due to group think). One of the participants said:

> D2: I don't think you can make one without the other. It's the same thing, but a different approach.

In the second workshop the participants were asked to rank the principles individually before ranking them in a group. This "forced" the participants to make their own decisions before listening to the rest of the group. The results are depicted below.

Because there were difficulties ranking the principles in the first workshop, an additional individual ranking was added before the group ranking. Although finding it difficult, the second workshop made the ranking depicted in figure 5.8. We can see from this image that the interruption principle is behind the top three principles. One of the participants commented on it in this way:

> N4: I don't know, I think it is difficult. I think that this (interruption) is automatic, because in this (mobility) you've had an interruption, and between these (multiple patients, and multiple tasks) there are interruptions.

The group discussed the different aspects of the principles until they reached a decision. The most interesting discovery was that the group (in the second workshop) considered “interruptions” as a part of most of the principles, as a “background”-principle, “Handover” was ranked as the least desirable principle, but the reason for this was that the participants meant that implementing this feature had the largest potential for error. But that being said, the participants also appreciated the feature if it could be implemented in a satisfactory way. One of the nurses said that it is a nice feature, but that they had to get used to collaboration before handover, as a type of transition.

Figure 5.8: The interruption principle was seen as incorporated in the other principles.

To further examine the participants thoughts the different principles were discussed.

5.3.2 Focus group

Multiple patients and Multiple tasks

When asked about the possibility for multiple tasks and multiple patients one of the nurses replied that both features are desirable, and what is “best” is dependent on the nature of the profession:

> N2: I think it’s very useful to have the possibility for multiple tasks, if you organize it like this. Multiple views for the same patient, for my work day this would be more useful than that (the possibility for multiple patients).
>
> Facilitator: Why do you think that is?
>
> N2: Because of the nature of the profession.
>
> (...)
>
> Multiple patients is a principle that also is useful, but for me it would be more useful with multiple tasks.

This was confirmed by another nurse. Because a doctor on the average has more patients than a nurse, the doctor would typically have a greater need for the multiple patients-view, and a nurse the multiple tasks-view:

> N1: That's natural, a doctor would have responsibility for 40, or even 100 patients. But a nurse might only have 15, or 6, or 2, or even just 1 patient. So there's more need for going into detail than having an overview over all the patients.
>
> N2: I agree.

But, as one of the doctors said, both principles are desirable:

> D2: Yes, and at the same time both (principles, multiple patients and tasks). Some times I also have the need to look at the patients in detail.

Interruption

The facilitator asked the question "What is important if a system should support interruption?". He got this reply:

> D2: To be able to resume where I was. To go back to what I was interrupted from.

Collaboration

A concern for the participants in both workshop was losing the physical act of talking together. Although technology has come a long way, doctors and nurses have to talk together. Physically talking to a person is much more than just exchanging a piece of information. One of the nurses put it this way:

> N1: There's nothing wrong with cooperating in today's system. I mentioned earlier that there's something about talking together, because, we have to talk together! The information you receive on your screen and the one you get orally are two different things and they always will be.

The same nurse also pointed out that the activities have to be mutable. Not being able to add, remove or edit information in an activity is futile.

> N1: The difference now is more that you present a presentable package, a section of a patients journal. What I'm afraid of is that, and we briefly discussed this earlier, if I go to a doctor and say: "We have to adjust the medication for this patient", and the doctor then replies: "Yes, but I have to look at the test results that have returned before I can change it." Because I didn't put it in the package, we're just as far, if I can't attach it to the package later on.

Another participant expressed concerns that this type of collaboration could lead to the poor examinations because the information is served to you. If some vital piece of information is missing, the receiver of the information might think that this information is not available, or worse, not even consider it.

In the first workshop, when asked about the second scenario, the actors said that collaboration is a nice feature to have in those types of situations, and, in the scenario, there could easily have been an additional call to another doctor.

Mobility

While discussing mobility the two nurses from the first workshop mentioned the possibility for viewing information on the patient terminal (by the patients bed). The nurse that had experience by using it expressed himself positive towards the principle, but negative towards the implementation. Logging on to the patient terminal is similar to other computers at the hospital and takes "too long time". When asked if he would use the system if implemented like in the ABC-framework, where logging on takes approximately 2 seconds, and resumes where the user left off, he replied:

> N2: Yes. The problem isn't that you don't get up the same information, it's the time it takes. I tried it once. Never again!

The other nurse mentioned that using the patient terminal to show the patient's information not necessarily is the best solution.

> N1: Not all work should be presented to the patients, or be done with the patients close by.

He argued that not all information should be presented "as is", and that both nurse and doctor should discuss the information privately before going to the patient.

He also mentioned that in today's hospital there are few places where the information is accessible, and expressed a wish to have mobile information:

> N1: Now it's like we have information either at the office or in a computer room. This creates "oases" where the information resides. We should have the information with us at all times.

Handover

In both workshops the Handover principle was welcomed. Concretizing an activity, and being able to transfer the ownership was a welcomed thought:

> N2: Well, that's really smart. It would require some kind of identification or login in, or some kind of mapping between patient and personnel, but I think that would be really smart.

In the discussion one of the doctors suggested that the handover principle could be divided into two sub-principles, handover of one activity, and handover of patient responsibility. Handover of patient responsibility would be applied in the change of personnel (when a shift is over), and handover of an activity would be when a health worker gets the responsibility of a single task.

> N1: (...) when a shift is over, one could say "Here you go, now I'm going home". Creating something physical.

5.4 Observation

As a follow-up, three of the participants were observed at their workplace through two observations. The first observation was of a male nurse working at St. Olavs Hospital in Trondheim. The observer followed him throughout the workday and documented the most significant happenings in a schema shown in B.

Following him around in his work environment produced two scenarios worth mentioning in this thesis. The first situation came when the nurse was on his morning round. After giving medication to a patient, the patient started to ask questions. Although knowing the answer to many questions the nurse did not know the answer to them all, and had to reply "I'll have to come back to you with that.". The nurse is then required to check the answer to the questions in the medical database before returning to the patient.

The second case was a desire to have the patient's medical journal accessible, in the patients room to check the medical history. Despite patients at his ward being

"frequent" visitors, the health workers (nurses and doctors) can not take the patients word for it when they say that they have been there before. In this particular case the patient was an elderly lady who claimed she had been there some months earlier. The nurse, that not necessarily was "in charge" of her, had to check this on a stationary computer in the computer room to verify her claim.

The second observation, also in St. Olavs Hospital in Trondheim, was of the two nurses from the second workshop. Also this observation contains two situations worth mentioning.

The first situation was provoked by the daily routines of the ward. Every day the nurse in charge would, in a notebook, write down a list of tasks that need to be performed on each patient. This notebook would typically be stored in the meeting room or on the nurse herself. After performing a task the person that performed the task had to update the patient's list by marking the task as performed. A loss of the notebook could lead to frustration and potential mistreatment of the patients.

This situation appeals to the mobility principle. Having a personal mobile device with the possibility to access and update such a list would make the task easier to perform, and would (if implemented correctly) avoid multiple copies and loss of data. In addition it would be easy to keep a log over who has done what and when. Giving all the nurses access to the list would also trigger the collaboration principle.

The second situation is similar to the two situations from the first observation. The observed nurse often needed information from the patient journal when performing a task. The information needed is not always accessible, either because it has not yet been produced, it is non-existing, or there are no available computers at hand. This causes the nurse to start another task or abort the started task, until the information is accessible.

These two scenarios contain similar elements. Both of them appeals to the mobility of information. A mobile device e.g. 10 by 10 cm, connected to the internet or intranet, would suffice for these situations.

Chapter 6

Analysis

Analysis

This section will analyse the results captured in chapter 5. Although the first workshop served as a pilot, it also produced usable information, and the results from the workshops conclude that the evaluated principles are a step in the right direction. Although some individuals are more experienced with computers than others, the overall response of the workshop participants was that they were open for change.

6.1 Multiple patients and Multiple tasks

Even though the participants had some adjustment problems regarding multiple patients and tasks in the ABC-approach, having the possibility to work on multiple tasks or patients in parallel was appreciated. Jaatun also captured this in [7]. However, the participants did not seem to notice the difference between the two in the ABC-approach, but this did not prevent them from completing their tasks.

The main reason for this, as expressed from the participants themselves, is that they don't have the possibility to do this in their current computer system at work, but that other computer systems they use have the possibility.

In today's computer system, changing patient means having to close all programs related to the current patient, before opening all the same programs again, but with a new patient. The programs often use several minutes to open, and for a quick look at a similar incident with another patient, it takes too long.

6.2 Collaboration

As with the above principle, collaboration is a desired feature, and although the response to the lack of feedback was poor during the usability evaluations, the principle behind the implementation in the ABC-approach received positive response.

From the role play exercise (see table 5.2) we could see that the collaboration principle was utilized in all the scenarios. In today's computer systems collaboration, as seen in the ABC-approach and in the scenarios created by the participants, is not possible. This shows that collaboration is an exciting and desired feature for the participants.

In addition to saving time with regard to receiving information rather than gathering information, one should also consider the aspect of time saved when health workers can educate each other through collaboration. When accessing the same information

synchronous, the collaborators can communicate and show each other the problems.

For collaboration to be efficient the users have to be notified about changes in collaborations and the arrival of new collaborations. Some of the participants also mentioned that the information received orally also is important, and seeing the size of a journal could say something about a patient. Therefore presenting information as a packet could "blind" the receiver to either not consider additional information (not presented), or to fail to see details that normally would have been noticed.

6.3 Mobility

Due to the nomadic behaviour in a health worker's work day, mobility is a wanted feature. In Trondheim's new hospital, this feature is implemented, but because of the time it takes to log in, it is rarely used.

For mobility to be usable, the time to log in to the system has to be short. Waiting three minutes when logging on a profile may not sound much, but in reality it is too long. Multiply these three minutes with the number of patients to whom you wish present something, and the time spent at the patients' beds balloons.

In addition, as one of the nurses mentioned "not everything should be done in front of the patients". One of the doctors expressed a desire to start using portable computers as a visualizing tool. Giving the health workers personal computers would help the staff being mobile and remove the issue of presenting unnecessary information to the patients.

During the observations, the three situations captured were all related to the mobility principle. This has to do with the nature of the profession. Nurses are mobile (within their ward), and seldom stationary. This might have to do with the time of day the observations were taken (normal working hours between 0700 AM and 0300 PM), but in all cases being mobile and having the possibility to access information everywhere, is a wanted feature for both doctors and nurses.

Although accssibility is easily solved by the nurse going to a room with a computer, logging on, opening the specific application and retrieving the information, the number of requests can often be a lot higher, and hence the time spent to find the requisite information will also escalate.

6.4 Handover

Of all the principles, handover was the principle that received the most negative feedback. However, this feedback focused on the pitfalls of a faulty implementation. The principle itself was welcomed, especially by the nurses. Creating something concrete and almost physical helps visualize the responsibilities of an activity or patient, but as with collaboration, handover has to have sufficient feedback to be efficient. Not knowing that an activity has been handed over can potentially create a disastrous situation.

The participants also identified two different types of handover. Handover of a task and handover of a patient. Handing over a task will give the receiver responsibility for that one specific task, but handing over a patient gives the receiver responsibility for the patient and all his tasks.

6.5 Interruption

When changing from one device to another (mobility), the user suspends the work on the first computer, and resumes it on another, this can be seen as an interruption. As can changing between patients and tasks. The user suspends one activity and resumes another, previously suspended activity.

In the usability evaluation the interruptions went “unnoticed”, indicating that the participants did not experience the feature as negative, and continued the tasks as normal.

From table 5.2, showing an overview of the principles found in the three scenarios performed by the participants, the interruption principle is found in all. This may indicate that the interruption principle is in many cases present without being the main principle.

While discussing, in both workshops the participants agreed that the interruption principle is a “background”-principle, and incorporated in the other principles (mobility, multiple patients and multiple tasks). This does not coincides with the findings in [5], [15] and [17].

6.6 Implications for design

The participants were of the opinion that the main objective for a new system is creating a good and understandable user interface, having sufficient feedback and increasing the efficiency. Table 6.1 sums up the requirements for the different features.

Principle	Requirement
Multiple Patients	Time
Multiple Tasks	Time
Collaboration	Feedback
Mobility	Time
Handover	Feedback

Table 6.1: Requirements for the different principles.

Having multiple patients and multiple tasks does not add any value if the time it takes to change between them is too long. This also applies to the mobility principle, if logging on takes too long the users will not use the system except when they have to.

What is an activity?

In addition to commenting the different principles, the participants both directly and indirectly had suggestions for further improvement in an ABC-system.

The term Activity Based Computing is a computing system where an activity is a first class object. However, using the term "activity" might create some ambiguity for health workers. When asked, the participants said that an activity can be one situation for some, but many for someone else. An example from one of the participating doctors:

> When you're in the ward, and a patient is being prepared for surgery, that's one activity, seen from the ward's side. But for the operating personnel that's multiple activities.

In order not to influence the participants, the term "activity" was used only when necessary by the facilitators. By not using the term, the participants were forced to create their own term for an activity, and during the focus group the participants were asked what they preferred calling it.

Most of the participants had subconsciously called an activity several things during the workshop, without noticing it.

General
Screen shot
Showing
Packet
Information
Desktop
Demonstration
Specific
Journal
X-ray
medicine chart
Indirect reference
I'll send you what I've prepared
I'll show you how I've been thinking

Table 6.2: Different names for activity.

From the workshops the term for activity was used in three different ways. The first describing a general term for activity, the second a more describing term for an activity, and the third an indirect reference of the term in a sentence. Table 6.2 shows examples of the three different types.

What the participants called an activity is therefore dependent on the activity being done. An interesting fact is that the participants themselves did not mention the term activity (unless directly influenced by the facilitators). This shows that the term activity, although logic for system architects and developers, was not a preferred term among the participants of the workshops. If the term activity is to be used, a standardizing of the term has to be introduced.

Conceptual model

In [7], Jaatuns recommendation for a future system is a restructuring of the conceptual model of the ABC-framework to better match the way that health workers work– a mapping between patients and an activity. This was also noticed in the workshops that were performed. Although being shown how to switch between activities in the introduction to the usability evaluation, the users chose to remain in the current activity, loosely related to patient A, to find information about patient B (by selecting patient B in a patient selector), instead of changing to the already created activity for patient B.

Utility

Based on utility, the ranking of the principles would be quite similar to the ranking the participants found during the second workshop.

Looking closer at the results from the focus groups and the observations, the most utilized concept is the mobility principle. Although ranked as the second most desirable principle (together with multiple tasks), the observations showed that it is the most frequently used principle. Health workers are mobile, and a large part of their work day is spent among, by or in-between patients, therefore having information mobile (through mobile devices or by having several devices available) could help the health workers become more efficient.

When discussing the principles, multiple patients and multiple tasks were found especially useful. This also became apparent in the role play section of the workshops, where all the scenarios created contained “Multiple tasks”.

Also collaboration and handover received much attention during the scenarios and in the focus group, and were considered to be important principles by the participants. However, collaboration and handover happens less frequently than utilizing multiple activities or mobility.

The interruption principle is considered being a part of the multiple patients, multiple tasks and mobility principles because each of them requires an interruption to take place or to have taken place. This leaves the interruption principle redundant.

A ranking of the principles in light of their utility is depicted in figure 6.1.

Principles

When designing new computer systems for use in hospitals, the designers should take into consideration the principles of ABC. In this thesis the principles considered were Bardram’s ABC-principles and the Attributes of a session aware system. By comparing and extracting a subset of these, the principles that we have evaluated were derived (chapter 3).

As seen in the analysis the interruption principle is viewed as a part of the mobility, multiple patients and multiple tasks principles, and should not be considered as it’s own principle.

Also the conceptual model of the way the health workers work differs from the one implemented in the ABC-framework, suggesting that the multiple patients and

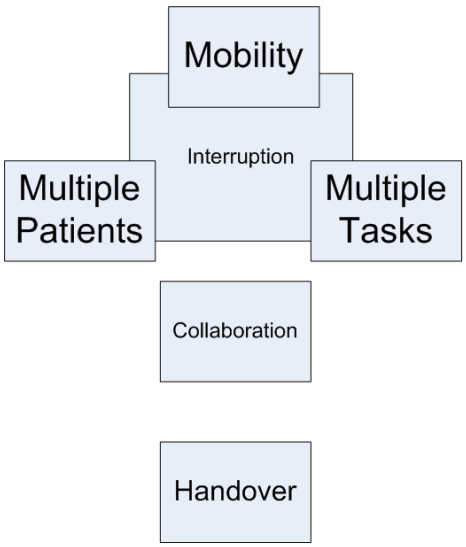


Figure 6.1: The ranking based on utility.

multiple tasks are overlapping. However, the discussion in the focus group provided additional information suggesting that the principles are not an either\or choice, but rather a preference choice.

The Collaboration and Handover principles are closely related. Because a collaboration can lead to a handover it should be viewed as a sub-principle of collaboration. Although arguments stating that the handover should be divided into two subgroups, one for handing over the patient and one for the task, this also applies to the collaboration principle.

From the comparison of the concepts in section 3.1.2, the cross-section between “Plan Instantiation”, “Abstract Parametrization” and “Activity Discovery” constitutes a concept related to “awareness”. Future systems should not only provide creation of activities manually, but also automatically through a “smart” system.

When designing the next generation computer systems for health workers, the four main principles should be considered.

- Multiple Activities, contains the two sub-principles multiple patients and multiple tasks.
- Collaboration, including handover (both of task and patient) and all types of collaboration, both synchronous, asynchronous, and collaboration of patients and tasks.
- Mobility, supporting the previous interruption principles and giving the health workers more freedom.

- Awareness, providing the feature of a “smart” computer system.

Chapter 7

Discussion

Discussion

In this chapter the possible sources for errors, and counter measures will be discussed.

7.1 Usability evaluation

The first interactive item in the workshop was the usability evaluation. The usability evaluations in both workshops were performed with only minor technical errors, and the results from them were very usable despite the poor graphical user interface of the ABC-approach.

One potential pitfall of a usability evaluation can be not having realistic tasks for the participants [16]. The facilitators, being aware of the poor usability of the ABC-framework through previous tests and Jaatuns master thesis [7], made the exercises accordingly, not focusing on the contents of the application, but on showing the principles in a best possible way.

A lot of information was extracted by studying the behaviour of the participants and their choices during the usability evaluation. This helped the facilitators in evaluating the conceptual model. The post usability debrief gave the facilitators the change to further prod the participants. However, the requirement for having a usability evaluation is, among others, having a flawless prototype. Creating a prototype from scratch with the implemented features equivalent to the ABC-framework can take time, and therefore this type of evaluation does not suit all situations. Because our prototype already was implemented, this form for evaluation was possible, and also provided a good result.

7.2 Role play

Having a role play exercise in the workshop let the participants use their creativity to express their thoughts through acting. A problem for some might be that not all people are fond of acting, and might feel discomfort during such an exercise, and the results would then be accordingly. However, this did not cause any problems during the workshops.

7.3 Focus group

After the introduction to the ABC-principles, the users had experienced an instance of ABC through the ABC-approach and experimented with the concepts in the role play. This aided the participants in the discussion of the focus group and in the card ranking.

A potential source for error is group think, but by having two small rather than one large workshop this was prevented. The facilitators in the two workshops also tried to prevent the most extrovert participants from forcing their opinions, by letting the less talkative participants answer questions as well.

In the first workshop the participants did not manage to sort the principles in the card ranking. This may have been due to group think. For the second workshop the participants were asked to rank the principles individually before doing so as a group. The participants managed to rank both individually and plenary, which again produced a more productive discussion.

Using a focus group as a method for retrieval of information gave the facilitators a better understanding of the users and their opinions of the principles. By discussing the principles one by one, all the principles were affected and all the participants' opinions were uncovered. The focus group was especially useful for ranking the different principles and uncovering potential pitfalls for future systems.

7.4 Observation

From the three observations, three similar cases were noticed, all linked to the mobility principle. However, in the workshop, the other principles also received just as much attention, and the participants made many different cases from all the principles. The fact that the three cases observed were linked to the mobility principle may have to do with the type of ward and time of day (seeing as the observations were taken on the morning shift (0700 AM to 0300 PM). It could also be that mobility is the most used principle, and therefore the one most observed.

The negative aspect of the workshops was the non-realistic setting. Having observations removed this aspect and the participants had to behave as they would any other day at work. This sheds more light on the activities the health workers do on a day to day basis, and therefore also on the utility of the principles.

7.5 Additional sources for error

The participants

A potential source of error in all evaluations and tests, are the participants. Choosing a selection of participants exclusively from one place or one group of people, may give a wrong impression when analysing the data.

For the workshops we selected participants working at St.Olavs hospital, in Trondheim. All but two of the participants came from different wards and consisted of doctors and nurses. The participants were at different levels of understanding computers, and this also represents the users of the computers at St. Olavs hospital.

7.6 Gained experience

An analysis of the information gathered shows what the results from the different methods have contributed to. This has been inserted into table 7.1. The findings have been divided into four groups: Utility, Rationale, Conceptual model and Principles. The utility is how the principles are used and rationale how they are used. The conceptual model is how the system should built, and the principles are what principles should be considered in a next generation system.

As we can see, most of the methods helped uncover the utility of the current principles and principles of a next generation system. The focus group contributed to all the groups, as it is easier to retrieve information from a discussion than actions (e.g. the usability evaluation).

Method	Utility	Rationale	Conceptual model	Principles
Usability eval.			X	
Role play	X			X
Card ranking	X			X
Focus group	X	X	X	X
Observation	X			X

Table 7.1: A mapping between the methods used and the results.

Chapter 8

Conclusion

Conclusion

This thesis presents an evaluation of the work done before, during and after the two workshops that were held. This chapter will summarize the work before answering the research questions and presenting suggestions for further work.

8.1 ABC-principles

Research question 1: What principles of Activity Based Computing do health workers find most useful in their everyday work?

Based on the analysis of the results from the workshops, the health workers consider all the ABC-principles valuable. The negative feedback received from the usability evaluations all had to do with the poor implementation of the user interface and lack of proper feedback, and not with the principles.

The principles that the participants appreciated the most were the principles multiple patients and multiple tasks along with mobility. At St.Olavs Hospital, where all but one of the participants work, there are no applications providing the functionality of multiple activities active in parallel, and no possibility for viewing two patients simultaneously (due to the risk of mix-ups).

As we saw in the observations, the three observed cases were all connected to the mobility principle. Patients asking questions and medicine charts to remember are among the things that health workers easily can organize and find answers to by keeping the information mobile.

The collaboration and handover principles are principles that are closely related, and the participants of the workshops argued strongly for them during the focus groups. As seen through the role play exercises where collaboration was incorporated in all the three scenarios, collaboration is an important part of the work of a health worker.

The principles introduce the possibility for features the health workers want, giving them more freedom and saving time. The participants largest concern for a new system was the efficiency. Logging on in today's system can take several minutes, and therefore simple transactions like checking the medicine stock is not done on the users own profile, but rather when passing a co-worker that already is logged on and using his profile.

For the health workers, being mobile is an important part of their everyday work. A large portion of their day revolves around the patients and their well-being. Therefore

the mobility principle would be the most useful because it would be the most used concept. Combining this with the multiple patients and multiple tasks principles would relieve the health workers of time consuming and unnecessary tasks.

As we can see, the all principles are useful in a health worker's everyday work. The principles behind the features presented in the ABC-approach were all welcomed, despite the poor usability. When discussing the principles, both in the post usability debrief and the focus group, all of the principles received overwhelming amounts of positive feedback.

The reasons for this is the utility of the principles. All the principles can, if implemented correctly, help the health workers in their everyday work. Helping the health workers by making them more efficient, gives them more freedom time to do their actual work, saving lifes.

8.2 Implications for design

What should be taken into consideration when designing the next generation ABC-system?

Designers should take into consideration the ABC-principles when designing a new system. The principles considered in this thesis are the cross-section between Bardram's ABC-principles and the Attributes of a session aware system [17].

An interesting fact is that in both workshops the participants viewed interruption as a "background"-principle, not being a principle on it's own, but incorporated in the mobility, multiple patients and multiple tasks principles.

However, the conceptual model that the ABC-framework is built on does not agree with the conceptual model the health workers use. Although having the opportunity to use multiple patients and multiple tasks, the participants of the usability evaluations chose to utilize the current activity rather than creating a new, or changing to another previously created task. This is also backed up by Jaatun [7], stating that the technical level of the activities were too high.

In addition "Awareness" should also be considered a separate principle.

Through the analysis in chapter 6 a suggestion for principles to consider when designing a new system for health workers has been composed:

- Multiple Activities

- Collaboration
- Mobility
- Awareness

For a more detailed description of the principles see the analysis in section 6.6.

Bibliography

[1] Poole Debra A. and Lindsay D. Stephen. Interviewing preschoolers: Effects of nonsuggestive techniques, parental coaching, and leading questions on reports of nonexperienced events. *Journal of Experimental Child Psychology*, 60(1):129–154, 1995.

[2] Ole Andreas Alsos and Yngve Dahl. The card ranking technique: Application and added value in comparative usability testing, 2009. http://folk.ntnu.no/oleanda/cardranking/cardranking.pdf (last accessed June 8, 2009).

[3] Jakob E. Bardram. Activity-based computing: support for mobility and collaboration in ubiquitous computing. *Personal and Ubiquitous Computing*, 9:312 – 322, September 2005.

[4] Jakob E. Bardram and Henrik B. Christensen. Real-time Collaboration in Activity-based Architectures. In *Proceedings of Fourth Working IEEE/IFIP Conference on Software Architecture (WICSA'04)*, pages 325–329. IEEE Press, 2004.

[5] Jakob E. Bardram and Henrik B. Christensen. Pervasive computing support for hospitals: An overview of the activity-based computing project. *IEEE Pervasive Computing*, 6(1):44–51, 2007.

[6] Andreas Holzinger. Usability engineering methods for software developers. *Commun. ACM*, 48(1):71–74, 2005.

[7] Jon Jaatun. *Evaluering av et aktivitetsbasert konsept for helserettede informasjonssystemer*. NTNU, 2008.

[8] J. Nielsen. The use and misuse of focus groups. *Software, IEEE*, 14(1):94–95, Jan/Feb 1997.

[9] Jakob Nielsen. Card sorting to discover the users' model of the information space, 1995. http://www.useit.com/papers/sun/cardsort.html (last accessed June 8, 2009).

[10] Jakob Nielsen. Card sorting to discover the users' model of the information space, 2004. http://www.useit.com/alertbox/20040719.html (last accessed June 8, 2009).

[11] Hans Kristian Ormberg. *Improving the usability of the ABC-framework*. NTNU, 2008.

[12] Stephanie Rosenbaum, Gilbert Cockton, Kara Coyne, Michael Muller, and Thyra Rauch. Focus groups in hci: wealth of information or waste of resources? In *CHI '02: CHI '02 extended abstracts on Human factors in computing systems*, pages 702–703, New York, NY, USA, 2002. ACM.

[13] Gry Seland. System designer assessments of role play as a design method: a qualitative study. In *NordiCHI '06: Proceedings of the 4th Nordic conference on Human-computer interaction*, pages 222–231, New York, NY, USA, 2006. ACM.

[14] Dag Svanaes and Gry Seland. Putting the users center stage: role playing and low-fi prototyping enable end users to design mobile systems. In *CHI '04: Proceedings of the SIGCHI conference on Human factors in computing systems*, pages 479–486, New York, NY, USA, 2004. ACM.

[15] ABC Research Team. http://www.activitybasedcomputing.com/whatisabc/homepage.

[16] Willie Wheeler. Usability testing pitfalls, 2008. http://wheelersoftware.com/articles/usability-testing-pitfalls-3.html (last accessed June 8, 2009).

[17] Øystein Nytrø, Inger Dybdahl Sørby, Ole A. Alsos, and Arild Faxvaag. Session-aware clinical information systems. 2008.

Appendix A

Workshop

Workshop

This chapter contains the contens of the workshops. An overview of the exercies the participants have been through and notes taken from the workshops are also included in this chapter.

A.1 Instruksjon til ledere av brukbarhetstest

Formål med testen: Viktigst: Tilbakemeldinger på selve "ideen" bak systemet. Er den nyttig? Tilbakemeldinger på selve skjermdesignet, dvs. hvordan ting ser ut

Systemet: Kan brukes for å finne og organisere informasjon om pasienter og for å samarbeide med andre på om en eller flere pasienter. Systemprototyp: laget for å vise at det er teknisk mulig å lage et slikt system (det er ikke noe ferdig system vi viser fram) Pasientdataene i systemet er begrenset, inneholder for det meste røntgenbilder og medisiner.

Gangen i testen: Hver person for utdelt et ark med oppgaver To og to personer jobber sammen Når dere gjennomfører testen skal dere så langt det går "tenke høyt", dvs. rett og slett fortelle hva dere tenker og diskutere det dere ser.

Rammen rundt testen: Det er ettermiddag og det nærmer seg slutten av arbeidsdagen Både leger og sykepleiere har litt kontorarbeid å gjøre før de skal gå hjem.

A.2 Introduction to the workshop

Workshop

Diskusjoner rundt fremtidens elektroniske pasientjournal

12. mars 2009

Ole Andreas Alsos
Doktorgradsstipendiat

Terje Røsand
Labingeniør

Gry Seland
Forsker

Hans Kristian Ormberg
Mastergradsstudent

POCMAP-prosjektet

Kontorarbeid

Fysisk i ro
En oppgave av gangen
Få avbrudd
Individuelle oppgaver

Klinisk arbeid

Fysisk i bevegelse
Mange oppgaver
Mange avbrudd
Kollektive oppgaver

Hensikten med arbeidsmøtet

- Evaluere et tenk system som bedre støtter klinisk arbeid
- Finne situasjoner der et slikt system er nyttig
- Vise situasjonene for oss
- Diskutere nytteverdien av det tenkte systemet

Tidsplan

Introduksjon til konseptet	1200
Brukbarhetstest	1230
Scenariebygging	1300
Framvisning	1400
Fokusgruppe	1430
Ferdig	1530

Grupper

Deltakere
- Lege: Børge
- Sykepleier: Tone
- Fasilitator: Ole, Yngve

Del 1: Kontrollrommet
Del 2: Kontoret

- *Samarbeid, mobiltet, flere pasienter*

Deltakere
- Lege: Alvilde
- Sykepleier: Heidi
- Fasilitator: Gry, HK

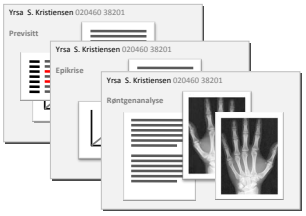
Del 1: Laboratoriet
Del 2: Laboratoriet

- *Handover, avbrudd, flere oppgaver*

Flere pasienter

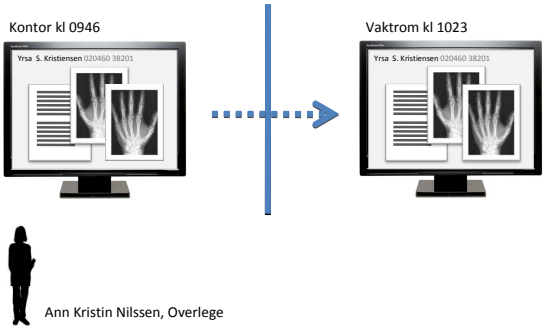
Ann Kristin Nilssen, Overlege

Flere oppgaver

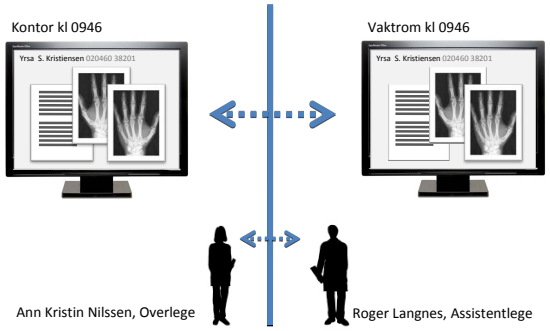


Ann Kristin Nilssen, Overlege

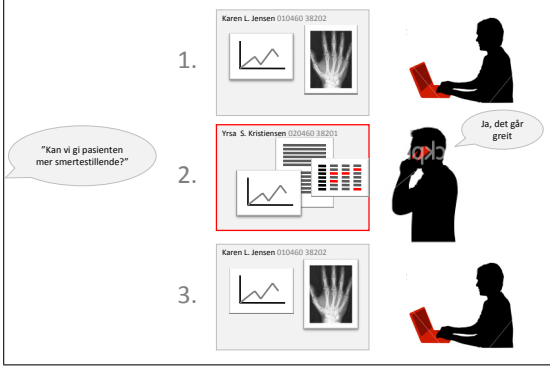
Mobilitet



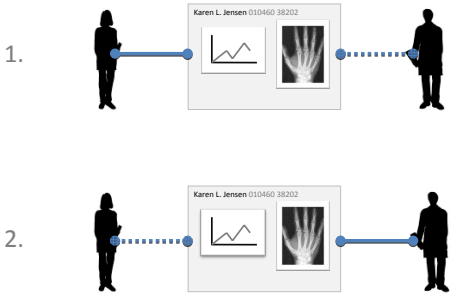
Samarbeid



Avbrudd



Handover



A.3 Usabilitytest exercises

Gruppe 1 (Lab)

Oppgave 1

- Logg på som lege Simon Bo Larsen.
- Få opp en oversikt over det du jobber med ved å trykke <alt> (sortert på pasient) eller <ctrl + alt> (sortert på oppgave). For å endre arbeidsoppgave bruk piltastene . Slipp opp <alt>/<ctrl + alt> for å velge.
- Diskuter røntgensvaret for pasient Karen L. Jensen.

Oppgave 2

- Pasient Inger E. Pedersen har opplyst at hun er allergisk mot Sulfa. Legg til denne informasjonen (i programmet “ERP Notes”).
- Vurder medikasjonslisten til pasient Pedersen.

Oppgave 3

- Du ønsker hjelp fra lege Henrik B. Kristensen til å vurdere nedtrapping av ZeloSok for pasient Inger E. Pedersen.
- Del opplysningene med lege Henrik B. Kristensen
- Ring han på tlf 51535 be han om råd.

Oppgave 4

- Gi lege Henrik B. Kristensen ansvaret for videre oppfølging av pasient Inger E. Pedersen.

Oppgave 5

- Fortsett å studere pasient Karen L. Jensen røntgenbilder.
- Logg ut.

Oppgave 6

- Logg inn som sykepleier Thomas Urban
- Få oversikt over dine pasienter.

Oppgave 7

- Gå til dine kolleger i konferanserommet (kontrollrommet).

Gruppe 2 (Kontrollrom)

Oppgave 1

- Logg på som lege Henrik B. Kristensen
- Få opp en oversikt over det du jobber med ved å trykke <alt> (sortert på pasient) eller <ctrl + alt> (sortert på oppgave). For å endre arbeidsoppgave bruk piltastene . Slipp opp <alt>/<ctrl + alt> for å velge.
- Vurder medikasjonen til pasient Kurt E. Jensen

Oppgave 2

- Finn frem pasient Yrsa S. Kristensen og studer røntgenbildene.

Oppgave 3

- Del opplysningene med lege Simon Bo Larsen.
- Ring 51536 og be ham finne frem opplysningene.
- Diskuter funnene med ham.

Oppgave 4

- Finn frem pasient Kurt E. Jensen og vurder medikasjonen hans

Oppgave 5

- Fortsett vurderingen av pasient Kurt E. Jensen
- Gi ansvaret for pasienten til lege Simon Bo Larsen.
- Logg ut

Oppgave 6

- Logg inn som sykepleier Diana Rogerigeus.
- Få oversikt over dine pasienter.
- Del prøvesvarene til Hans E Dupont med Thomas Urban.
- Ring sykepleier Thomas Urban på, telefon 51536, og diskuter pasient Hans E Dupont.

Oppgave 7

- Møt Simon Bo Larsen i konferanserommet.
- Logg inn som Henrik B. Kristensen og finn frem pasient Yrsa S. Kristensen og vurder røntgenbildene sammen.

A.4 Role play exercises

Rekvisitter: Skummodeller, papplater, tusjer, post-it-lapper, sykepleieklær, teknologiske dingser?

1. Forklaring av arbeidsmåte, litt om teknologiske forutsetninger, en liten oppvarmingsøvelse Plenum i møterommet (Gry)

   Teknologiske forutsetninger:

   - Laptoper, både store (15 tommers) og små (8 tommer?)
   - Storskjermer (som på kontrollrommet på laben)
   - Fastmonterte skjermer ved pasientsengen
   - Mobiltelefoner med stor skjerm (iPhone ++), tastatur Interaktive tavler, -smartboards (alle "dingser" kan brukes til opptak, avspilling, bilder, video m.m.)
   - Systemer som vet hvor du er til en hver tid (utnytter gps og gsm-signaler).
   - Enheter som kan gjøre flere ting samtidig (som feks være en mp3-spiller og en mobiltelefon samtidig), typisk smartphones.
   - Alle enheter får etter hvert (trådløst)nett.

2. Jobbing i grupper, identifisering og utvikling av scenarier (Brukbarhetslab og pocmapkontor, Gry og Dag leder hver sin gruppe, Ole og Hans Kristian har ansvaret for det tekniske)

   a. På med legefrakken!
   b. Brainstorming
   c. Utvelgelse av noen ideer som kan brukes i scenario
   d. Konkretisering av scenario: Hvem? Hva? Når? Hovedhandling?
   e. Improvisering av handlinger og teknologi

3. Fremføring i plenum (brukbarhetslab)

   a. Hver gruppe viser sin løsning, mens de som ser på skriver ned uventede ting som kan skje
   b. Ny fremføring der gruppene må improvisere fram hvordan “løsningene” fungerer når det er uventede hendelser

4. Diskusjon (brukbarhetslab? Møterom? Hvem leder?) Etter å ha vært igjennom denne workshopen:

   a. Kan dere se for dere at det skal være mulig å organisere kliniske IT-systemer på denne måten?
   b. Finnes det et godt norsk ord for det å velge ut noen data for å dele den med en annen, vise det på ulike tekniske enheter og enkelt opprette og legge til side. Hva ville dere kalle noe slikt?
   c. Vil en slik organisering av datasystemene være nyttig i klinisk arbeid?
   d. Hvilke forutsetninger må være på plass for at den skal bli nyttig?
   e. På hvilken måte vil dere ønske å organisere slike systemer i bruk?

A.5 Interview guide

Kort debrief etter test av ABC-rammeverket

Hva vil du kalle disse aktivitetene/sesjonene/skjermbildene?

Hvordan oppleves skiftingen mellom pasienter og oppgaver?

Hvordan oppleves samarbeidet gjennom systemet?

Hvordan oppleves det å kunne "ta med seg" systemet til andre enheter (som storskjerm)?

Er det relevant for din arbeidshverdag?

Hvilke elementer savner du i systemet du nettopp har prøvd?

Tror dere at det er behov for et system med slik funsksjonalitet?

Debrief etter rollespillet

Gruppe 1

Var historiene dere lagde realistiske?

Var systemet dere lagde nyttig?

Hvordan ville fremtidsscenariet sett ut med dagens teknologi?

Gruppe 2

Var historiene dere lagde realistiske?

Var systemet dere lagde nyttig?

Hvordan ville fremtidsscenariet sett ut med dagens teknologi?

Felles

Kan dere se for dere at det skal være mulig å organisere kliniske IT-systemer på denne måten i fremtiden

Hvordan støtter dagens systemer denne måten å arbeide på?

Finnes det et godt norsk ord for det å velge ut noen data for å dele den med en annen, vise det på ulike tekniske enheter og enkelt opprette og legge til side. Hva ville dere kalle noe slikt?

Vil en slik organisering av datasystemene være nyttig i klinisk arbeid?

Hvilke forutsetninger må være på plass for at den skal bli nyttig?

På hvilken måte vil dere ønske å organisere slike systemer i bruk?

Individuell rangering

Kort oppfriskning av konseptene

Rangering individuelt i ca 1 min.

Kort gjennomgang av sorteringsrekkefølgen

For hvert deltaker; forklaring av beste/mest nyttige og dårligste/minst nyttige konsept

Grupperangering

Rangering i gruppe, med diskusjon.

Av alle de 6 forskjellige konseptene hvilke er mest aktuell på arbeidsplassen i dag? Hvorfor Hvilke skjer ikke? Hvorfor ikke?

Ville disse funksjonene blitt tatt i bruk hvis de fantes? Hva er kriteriene (feks kjapp pålogging) for at de skal bli tatt i bruk?

Flere pasienter Flere aktiviteter Avbrudd Sammarbeid Mobilitet Handover

Videre diskusjon

(Fritt ord)

A.6 Permissionslip

Tillatelse til bruk av stillbilder og videoklipp fra workshop 12. februar 2009

Navn: _____

Kontaktadresse (telefon, e-mail, internadresse el. privatadresse, dvs. foretrukket kontaktform):

_____

_____

Orientering om presentasjoner og publikasjoner

Jeg ønsker å bli orientert om presentasjoner og publikasjoner av workshopen ☐

Bruk av stillbilder fra workshopen i muntlige presentasjoner

Jeg godtar at stillbilder fra workshopen blir brukt i presentasjoner av POCMAP ☐
Jeg godtar ikke at stillbilder fra workshopen blir brukt i presentasjoner av POCMAP ☐
Jeg ønsker å bli forespurt og forevist bildene før hver presentasjon ☐

Bruk av stillbilder fra workshopen i skriftlige arbeider

Jeg godtar at stillbilder fra workshopen kan bli brukt i Hans Ormbergs masteroppgave ☐
Jeg godtar ikke at stillbilder fra workshopen kan bli brukt i Hans Ormbergs masteroppgave ☐

Bruk av videoklipp fra workshopen

Jeg godtar at videoklipp fra workshopen kan bli brukt i presentasjoner av POCMAP ☐
Jeg godtar ikke at videoklipp fra workshopen kan bli brukt i presentasjoner av POCMAP ☐
Jeg ønsker å bli forespurt og forevist videoklippene før hver presentasjon ☐

Appendix B

Observation

Observation

This chapter contains all the information surrounding the observations. In all there were two observations. For the purpose these observations a form was made, and during the observations they were filled out by the observer.

The form, depicted below, made it easier to concentrate on the situation while at the same time documenting the actions of the observed actors.

Teknologisk ide og **Situasjon**	☐ Flere pasienter ☐ Flere aktiviteter ☐ Samarbeid ☐ Avbrudd ☐ Mobilitet ☐ Handover	☐ Sykepleierapport ☐ Administrering av medisiner ☐ Previsitt ☐ Visitt ☐ Etterarbeid ☐ Annet:
Hvor og **Når**	☐ Legekontor ☐ Pasientrom ☐ Korridor ☐ Lab eller undersøkelsesrom ☐ Vaktrom ☐ Medisinrom ☐ Annet:	
Hvem er til stede? (Leger, sykepleiere, pasienter og pårørende?) og **Bemerkninger**		
Hva (Hva skjer, aktvitet)		
Kilde (Hva trigget denne situasjonen, eks: PJ)		