



eNursing in an elderly home.

Analysis, design and prototyping of an ICT solution supporting the assistant nurse and her team in the care process.

Master's thesis in Biomedical Engineering

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CHALMERS
UNIVERSITY OF TECHNOLOGY

Department of Signals & Systems
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Gothenburg, Sweden 2016

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Cover: Low-fidelity prototype of the suggested phone interface.

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Abstract

The cost of high-quality elderly care increases rapidly, with the aging population in Sweden. The continuously expanding field of modern technology can provide solutions that meet the growing needs. eNursing is a concept that should connect devices, such as phone, computers and tablets, with ICT-systems, to support nursing staff in the care process. eNursing should handle interoperability in-between ICT-systems and enhance the work process. This project was carried out in cooperation with an elderly home, where their current use of ICT-systems were reviewed and mapped. The investigation resulted in a eNursing concept demonstrated through paper made low-fidelity prototypes and a Xamarin developed high-fidelity prototyped android application. eNursing concepts must be adapted to healthcare sector and connect the ICT-systems used within. The concept should enable interoperability and communication between systems that lack the ability. The future use of eNursing solutions may decrease the cost within the healthcare sector.

Keywords: eNursing, eHealth, elderly home, healthcare, field study, ICT, prototyping.

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Bea Bengtsdotter, Gothenburg, August 2016

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1

Introduction

This thesis have been carried out in cooperation with an elderly home, with the goal to propose an eNursing concept intended for assistant nurses. This section introduce the reader to Swedish elderly care, the investigated elderly home and the concept of eNursing, as well as the thesis purpose and scope.

1.1 Background

Health- and social care for elderly citizens is an important part of the Swedish welfare policy. Today, 20 percent of Sweden's 9.8 million inhabitants have passed the standard retirement age of 65 and the number is predicted to rise to 23 percent by 2040. [1] The ageing population rapidly increase the need for well-functioning elderly care [2], both the quality and the efficiency must be enhanced to meet future needs.[3] Today's fast growing market of ICT¹-solutions provide a continuously expanding field of applications, to meet the needs and the growing cost within the sector. [5]

The thesis is carried out in cooperation with the foundation Tre Stiftelser, which operates three elderly homes at different locations in Gothenburg. Each facility divide the residents into different wards, or floors, as it is called in the organisation. Tre Stiftelser is a private organisation and can therefore influence their activities and the provided care in a larger extent than municipality govern elderly homes. The basic values of the organisation is to create meaningfulness, intelligibility and manipulability, since they together create a feeling of belonging. Through an interested staff with a desire to listen, understand and act, the foundation strives to give as individualized care as possible. [6] The organisation have an openness to new technology and consider themselves to be one of the elderly homes in Sweden with the largest use of ICT-technology and is therefore well-suited for this study.

eHealth, defined by WHO² as "The use of ICT for health. Examples includes treating patients, conducting research, educating the health workforce, tracking diseases and monitoring public health.[7] ", is a growing field within Swedish healthcare [8]. There is a national eHealth strategy called "Nationell eHälsa", that focus on how future health and social care should be designed and improved with different e-services. eHealth solutions should mainly support three target groups, the individual, the healthcare personnel and the decision makers. The national strategy states that the individual,

¹Information and communications technology [4]

²World Health Organisation

1. Introduction

as an inhabitant, patient and relative, should have access to quality assured health information and documentation of earlier actions and treatments. The services given should be personalized and self-determination should be encouraged, in accordance with the individuals own conditions. Healthcare personnel should have access to well-functioning and co-current electronic decision support systems, to get help to ensure a high quality and secure electronic environment. The strategy also state that eHealth should provide decision makers with tools to ensure that high-quality care have been provided and to get decision support in performance management, planning and resource allocation. eHealth should give both public and private research projects, easy access to high quality data, with the full respect to the individual's integrity. [8]

eNursing technology is basically eHealth solutions that support the nurse and her them in the care process. The solution should enhance and simplify the work situation at the care unit, by connecting different ICT-solutions. eNursing should provide a solution to interoperability problems in between systems and provide the nurses with updated information in easy-maneuverable interfaces in team screens, tablets and phones. The usage of an eNursing concept should support the nurse in delivering higher quality care, enhanced teamwork and improved health outcomes. The system should ensure that correct and relevant information is provided to the responsible nurse, at the right time. eNursing should in-direct be a tool to ameliorate the patient experience, free time for care work and enable a more patient centered care. Apart from connecting IT-systems, the eNursing concept should enable communication with sensors, such as smart wearables, textiles (e.g. intelligent diapers), and smart home solutions. This gives an extra opportunity to collect important information regarding patients that could simplify the care process. By enabling interoperability between systems that not have the ability on their own, eNursing could send information in between systems and merge information from different vendors. Figure 1.1 shows an example of ICT-solutions that could be included in an eNursing concept and important aspects to consider in the concept. [9] [10]



Figure 1.1: Example of an eNursing concept, with both different devices and information sources included. The concept combine different ICT-systems with data collection technology and information regarding patients and personnel.

1.2 Purpose

The thesis should review the work situation of assistant nurses in an elderly home, including both used ICT-technology as well as daily tasks and improvement areas. Based on the findings, an eNursing concept well-suited for an elderly home should be proposed, with the goal to support the assistant nurse in her daily work and in interactions with residents and colleagues. Some part of the concept should be visualized in prototypes, as well as thoroughly explained in figures and text. It should also be stated, if there is a difference between eNursing in elderly homes and in healthcare as whole. The purpose is rationalized to the following research questions,

1. How could an eNursing concept enhance the work situation for assistant nurses at an elderly home?
2. Which features is important to include in an eNursing concept?

1.3 Scope

The investigated ward home inhabits residents suffering from somatic disorders³, but the organisation as whole have residents in four different categories. Even though the work situation might differ between the wards, the used ICT-systems and the care work remains the same. Other organisations may have different work flows and ICT-systems usage, which must be considered when analyzing the result of this study.

The high-fidelity prototype presented in the results is a front-end device with limited back-end functionality. It should be used to visualise the concept, and is not prepared for any commercial use. However, the overall eNursing concept is not visualised in a prototype, instead explained in figures and text. The need of interoperability between existing and future ICT-systems will be discussed, but no technical solutions will be provided.

³Disorders that involves movement disabilities. [11]

2

Theory

This chapter explains the Swedish elderly care system and its requirements in terms of laws, documentation and quality registers, also theory behind ICT-development with data collection, prototyping and interoperability are presented.

2.1 Swedish elderly care

Health and social care for elderly citizens is an important part of the Swedish welfare policy [1]. However, Swedish elderly homes have limited capacity and only 5.2 percent of the elderly aged 65 and over, can live there on a permanent basis. Consequently, the most frail and those with the greatest need for care become residents. [2] The elderly care system aims to help elderly people and people with disabilities to live as normal and independent as possible, which includes getting help to live in their own homes for as long as possible. [1] Sweden funds most elderly care with taxes and government grants, and in 2014, only 4 percent of the SEK 109.2 billion spend on elderly care was financed by patient charges. Even though an increasing number of municipalities allows private care providers run their elderly care, the municipalities still have a main responsibility for funding, allocating support in the home and positioning elderly in nursing homes. [1]

2.1.1 Laws

There is mainly two laws that governs elderly care in Sweden, the SoL- and the HSL law [12]. Tre Stiftelser also has a division with younger patients that fall under the jurisdiction of the LSS law.

The SoL law, Socialtjänstlagen (2001:453), regulates the social services and covers topics concerning economic- and social security for people and it also includes equality in living conditions. The law states that the social services should liberate and develop the individuals own resources and respect their autonomy and integrity. [13] HSL, Hälso- och sjukvårdslagen (1982:763), is a central law that states obligations within the health care sector for county councils and municipalities. One of the goals of the law is to make sure that each citizen is provided with high quality care on equals terms regardless their health care provider. It includes, amongst others, a high hygienic standard, meet the patients' need of security, being easy-accessible and respect the patients' autonomy and safety. The law also states that the patient, with relatives, should be updated on her state of health and methods that can be used to prevent illness or injuries.

The quality of care must be systematic and continuously developed and ensured. [14] LSS, Lag (1993:387) om stöd och service till vissa funktionshindrade, concern people with certain disabilities and ensure that they are provided with the support they need to live as independently as possible. The law states that the patient should be provided with a way of life that corresponds to the life of a healthy person, including equality in living conditions and full participation in the community. The care given should be of high quality and with respect to the patients' autonomy and integrity. Hence, the quality must systematically and continuously be developed and ensured. [15]

Another important law within the healthcare sectors, is Patientdatalag (2008:355), which concerns the handling of patient information and covers organised information structuring, secure data storage and protection against unauthorized access. The law also include parts to assure patient integrity, ensure patient safety and high-quality care. [16]

2.1.2 Documentation

According to the law, every resident within an elderly home must have a social act that collects all important documentation. The act should include an aid investigation, aid decision, eventual life history, implementation plan, continuously notes and individual signing list for aids not delivered. Figure 2.1 shows the documentation required according to the SoL respective HSL law. [17]



Figure 2.1: Documentation required according to the HSL- and SoL-law respectively.

The aid investigation give the basis for the aid decision, which in turn give the basis for the implementation plan. The decision tells which aids the individual are granted with and states his or her needs. The life history help the personnel to see the person behind a disorder and covers topics as earlier living conditions, relatives and friends, earlier work situation, culture, language, habits and interests. The implementation plan embodies the aid decision and is an agreement between the resident and the organisation, it is a tool to help the personnel to provide better care work. Both information such as the individuals' relatives, contact person, nurse, doctor, as well as activities the individual needs help with and thoughts the individual have about the future should

be included. The implementation plan also contains a plan on how the staff should handle and execute activities decided in the aid decision, e.g. what the resident wants for breakfast. To always have an updated idea of the residents' situation and progress, continuous entries should be added in the residents chart. It can also be used to improve the provided care. Entries could include actions the individual denies, deviations from the care plan, hospital admissions and visits of family and friends. [17]

If the staff have notes regarding activities the resident wants to do, needed purchases or updates needed in the implementation plan, the notes must be kept in accordance with the secrecy law and with respect to the residents' integrity. All documentation concerning a residents' personal situation should be kept in a secure manner, away from unauthorized access and protected from fire, vandalism, water and theft. To ensure the security of the documentation, every entry should be traceable and documentation concerning different laws should be kept separately. [17]

2.2 ICT-solutions within elderly homes

The usage of ICT-solutions in elderly homes varies between different organisations, regions and municipalities. Tre Stiftelser see themselves as one of the elderly homes in Sweden with the largest use of ICT-solutions and this section presents and explain their usage of ICT-systems, as well as solutions available at the market.

2.2.1 Tre Stiftelser's usage of ICT-solutions

Tre Stiftelser's assistant nurse Therese Vouri, has provided information regarding Tre Stiftelser use of different ICT-solutions, the frequency of the usage and the user, which are summarised in Table 2.1. Apart from the assistant nurses and the nurses, staff as management may also use the solutions, but they are not the subject of this thesis.

Depending on the profession, assistant- or regular nurses usage of the ICT-solutions differs. The assistant nurses do not use the quality registers, whereas the nurses do not use the alarm function and the food ordering. However, many of the systems are used by both professions, but depending on the system they perform different tasks. MCSS can be used as an example, where the assistant nurses use it for signing medication dispensing, and the regular nurses manage delegation to the assistant nurses, deviation follow-up and statistics. Another example is the documentation system Omsorg 2000, where the professions operates according to different laws and document different type of information. The assistant nurses documents implementation plan and daily deviations, whereas the nurses documents medication and health related issues.

Nurse	Assistant Nurse	ICT system	Usage
	X	Alarm	Daily
X	X	Phone	Daily
X	X	MCSS	Daily
X	X	Omsorg 2000	Daily
X	X	Scheduling	Daily
X	X	Intranet	Daily
	X	FoodIt – Matilda	Weekly
X		QR: SeniorAlert	Monthly
X		QR: BPSD	Monthly
X		QR: Palliativregistret	Occasionally
X	X	Fire Control	Occasionally
X	X	Fault report	Occasionally
X	X	Tena Identifi	Occasionally

Table 2.1: Tre Stiftelser’s usage of ICT solutions, together with the frequency of the usage and the user, nurse or assistant nurse.

A more detailed presentation than presented in the table above, including used interface, storage, login and communication is shown in Table 2.2. Most of the systems are accessed through a computer IE11¹ interface and stored externally. There is systems where the assistant- and regular nurse use the them in different interfaces, for example MCSS, where the regular nurses use the computer IE11 interface and the assistant nurses, the tablet interface. Some of the systems are not used in all possible interfaces, e.g. MCSS which could be used in smart phone, because of the DECT phones poor interoperability with the other ICT-systems. [18]–[28]

According to Tre Stiftelser’s administrative manager Johan Rindeborg, every staff members have own credentials or SITHS card to enter the ICT-systems. The credentials differ between system and due to the administrative burden only regular nurses use the SITHS card, even though its a safer method.

¹Internet Explorer 11

ICT-system	Interface	Storage	Login	Communication
Alarm – Ascom	d62-terminal/alarm devices	-	No login required	DECT
Phone – Ascom	d62-terminal	Local	No login required	DECT
MCSS – Appva	IE11 iOS/Android-phone or tablet	Secure database	Personal login SITHS	Encrypted data through HTTPS Requirement of certificate
Omsorg 2000 – Alfa KL	Windows computer	-	Personal login SITHS	-
Scheduling – Quinyx	IE11 iOS/Android-phone	No local storage	Personal login	-
Intranet	IE11	No local storage	Personal login	-
Matilda – FoodIt	IE11 iOS/Android-phone or tablet	No local storage	Personal login	-
SeniorAlert	IE11	No local storage	Personal login SITHS	-
BPSD	IE11	No local storage	Personal login SITHS	-
Palliativregistret	IE11	No local storage	SITHS	-
Fire control	IE11	Secure cloud database	Personal login	Encrypted data through HTTPS
Fault report	IE11 iOS/Android-phone or tablet	Secure external server	Personal login	SSL-encryption
Tena Identifi – SCA	IE11	Secure external server	Personal login	3G (Device to server)

Table 2.2: Technical specification of the used ICT-solutions, including interface, storage, login and communication.

2.2.2 Detailed information regarding used ICT-systems

As many other industries, Tre Stiftelser use several different ICT-solutions to support their operations. To get access to the different solutions, the personnel have access to computers, tablets and phones. During a shift, each of the staff members carries a phone and apart from that, have access to tablets placed in the common kitchen and in the apartment of every resident and computers placed in the office at each floor. However, the ICT-solutions used are not adapted for every device and the personnel must choose device according to work task.

To alert the personnel when a resident is in need of assistance, there is an alarm link between each resident and the personnel's work phones. Different type of alarms, e.g. assistance alarms, door alarms and bed alarms, are used depending on each residents needs. The alarms are received in the personnel's Ascom d62 DECT² phone, where they can either choose to answer and talk directly to the resident, or redirect the alarm to another staff member. Apart from the alarm handling, both assistant- and regular nurses use the DECT phone to make and receive calls. [18]

²DECT, or Digital Enhanced Cordless Telecommunications, is a standard used within wireless telecommunication and is a general radio access technology. It is not a network like GSM, 3G or 4G, but can still provide access to almost any public or local network. [29]

2. Theory

The company Appva, provide the organisation with MCSS (Medication and Care Support System), a system used for signing and follow-up on SoL- and HSL-interventions. Tre Stifelser only use it for HSL-interventions performed by assistant nurses, e.g. giving medication, eye drops and put on compression socks. The system ensure that correct interventions are given within a scheduled time, and if the time slot is missed, an alarm is sent off to the responsible staff member. If the intervention still is not signed, the alarm is sent to the other staff members on the same floor and if they do not answer either, the responsible nurse will be given a fault report. In addition, MCSS provide the regular nurses with tools to regulate the delegation a specific staff member has and an overview of the performed- and missed interventions. [19]

When a scheduled intervention is missed, according to the law, a deviation report must be documented, which the organisation use Omsorg 2000, provided by the company Alfa KL, for. Omsorg 2000 contains features such as implementation plan, statistics, tools for follow-up, incident reporting and intervention refusal. The systems allows the nurses and the assistant nurses to read each other entries, even though they are documented according to different laws. [20] According to the law, the organisation use three different quality registers, how often they are used, depend on the residents and the care they are given. Palliativregistret concerns residents that have died within the organisation and addresses how staff and the relatives have experienced the care prior to the death [24]. SeniorAlert focus on pressure ulcers, malnutrition and similar problems. It is used to risk assess, make an action plan, follow-up and document the actions [23]. BPSD is used to assess if a residents suffering from dementia, also suffers from behavioral and psychological symptoms. The result of the assessment is analysed using a BPSD checklist and possible interventions are reported to the system. [27]

For scheduling, the organisation use a system provided by the company Quinyx. The system provides features to handle and add new schedules, keep track of worked hours, see other staff members shifts, send requests for a shift switch and to submit leave requests. [21] Johan Rindeborg, administrative manager, have explained that the staff have somewhat flexible work hours and therefore the organisation have a time-clock directly linked to the scheduling system.

The staff members also have access to the organisation's intranet. According to Therese Vouri, assistant nurse, it includes most of the information the staff needs, e.g. policies, graphic templates, food blog, continuous information, YH-thesis and links to fault report and food ordering. The food ordering and the food distribution is managed through an ICT-tool, called Matilda, provided by the company Foodit. Each floor have a responsible assistant nurse, which every week both orders the whole canteens of food and the consumables, such as breakfast. There always several alternatives to choose from and the residents are asked which they prefer. If a resident is in need of special diet, it is also handled through the system. The food canteens are distributed to each floor, but the consumables must be collected by the staff. [22]

The fault report system is used to ensure a safe environment both for the staff and the residents. The system is provided by a company called Summera Support and allows

the personnel to report material error within the organisation. The reporting is done in predefined forms which are sent to the responsible staff. [25] Brandkontroll is a tool for protection from fire in a systematic and preventing way. Some of the assistant nurses are assigned controllers and take part in safety inspections and control of fire preventing equipment on their own floor. The system send alerts to responsible controller when some equipment must be assessed. [28]

When a new resident with incontinence problems move to some of the organisations addresses, an ICT-tool called Tena Identifi is used. It assess the resident's need of incontinence aid and by a sensor bases technique, track the residents voiding pattern during 72 hours. The data are then provided to the staff and help them choose a suitable incontinence aid. [26]

2.2.3 eNursing technology available for commercial use

There are devices and software's available in Sweden that makes use of parts of the eNursing concept. Three of these will be presented to get an understanding of the market and features available in commercial products.

Myco, from the company Ascom, is practically a smartphone fitted for the healthcare sector. It is particularly designed for nurses in hospitals with its extra top screen for visualizing alarms and it has a fast way to accept, dismiss, redirect and prioritise alarms. Apart from that, it is persistent to disinfecting agents, survives excessive drops, has a carrying clip, high battery capacity and an easy battery exchange. The staff can send alerts to each other when they are in need of assistance and use a built-in bar code reader to scan consumables, such as medicine packages. To allow usage of IT-systems not included in the solution, Myco support third-party android applications. Myco can communicate through Wi-Fi, PBX³ and 3G/GSM to hospital information systems, medical devices and systems, device management systems and other features. [18]

COSMIC Nova provided by Cambio is a concept with several different products tailored to enhance the daily work for healthcare personnel by pliable and easy used features. The products can be used on any device and regardless, COSMIC Nova provide the correct information where needed. One of the products included in the concept is COSMIC Nova ward, which provides a digital overview of the ward on a large touch screen, like the whiteboards used in many hospital wards today. The digital overview include all patients in the ward and provide a way to allocate them between personnel. The solution shows private information, such as diagnosis and allergies, hidden in plain sight, only understandable by the personnel. In addition to COSMIC Nova ward, the concept also include a tablet application designed for collecting detailed patient information and to have a personal checklist. The checklist enables documentation, planning and follow-up on the patient, and if desired activities regarding the care of the patient could be added and allocated within the staff. The system is interoperable with other COSMIC features as COSMIC Medication and COSMIC Care Documenta-

³Private branch exchange, non-public telephone exchange [30]

tion. [31]

The last eNursing technology presented is Phoniro Care, designed to facilitate the daily work for nursing personnel within the elderly sector. It tracks visits, visit time, type of visits and also which personnel providing the care, all to assure the quality of the care. The system enables administrating and real time monitoring of alarms, documentation through a digital pen or mobile phone and a feature for unlocking doors. All the information gathered by the system is easily filtered and analysed to get key ratios, qualified decision basis and to perform follow-ups. To allow an organisation to create well-functioning platforms, the system is interoperable with many different systems. [32]

2.3 Technical aspects

To create a successful eNursing concept, that enables communication between different IT-systems and security for the stored data, there are some technical features to be considered. This section both explains interoperability and the secure login service, SITHS, used and developed by the national eHealth programme in Sweden.

2.3.1 Interoperability

Interoperability is the shared understanding of data representation and concepts between systems, IEEE ⁴ defines it as the “ability of a system or a product to work with other systems or products without special effort on the part of the customer. Interoperability is made possible by the implementation of standards”. [33] With growing knowledge and understanding of interoperability, it have been divided into legal, organisational, semantic and technical interoperability, see Figure 2.2. [34]



Figure 2.2: Interoperability divided into its four classes, semantic, technical, legal and organisational.

Legal interoperability refers to the legal EU-framework that support and enable exchange of data within and between countries, it covers legislation's, regulations and civil contracts. Organisational interoperability covers the coordinated processes between different parties, that is needed to fulfill agreed results and it also includes the own ability for optimisation for external collaboration. Semantic interoperability is the

⁴Institute of Electrical and Electronics Engineers

ability to correctly interpret, understand and use exchanged information to get a common understanding, in terms of concepts and information, regardless the IT-system used. Whereas, technical interoperability enables communication to exchange the information between IT-system, in a secure way with respect to the individuals integrity. Figure 2.3 explains the semantic and technical interoperability between two systems. [34]

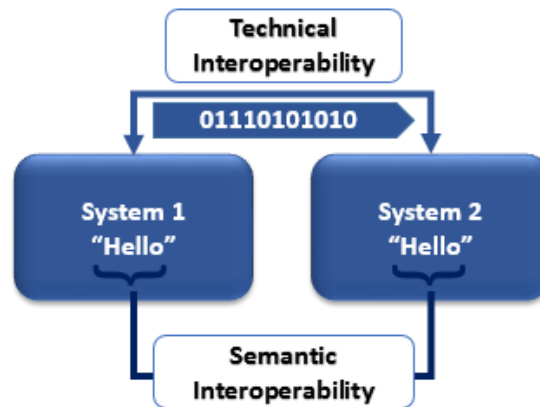


Figure 2.3: Example of technical and semantic interoperability between two systems. Where the technical interoperability enables the communication between the systems and the semantic interoperability enables the common understanding of the word "Hello".

The IT-infrastructure needed to achieve internal and external interoperability must involve both software and hardware solutions. The hardware is needed to perform services and data exchange, whereas, the software covers standards, technical platforms and features such as identification. Interoperability is particular important in areas such as healthcare, where large amount of data is handled and transferred between facilities. The data exchange must be performed in an effective and secure way and it must be easy to handle, support the organisation, exchange data correctly, protect individuals' autonomy and facilitate- and develop quality. Apart from keeping away unauthorized persons, secure information handling is also about making the information easy-accessible and trustworthy, and it must be possible to track when and by whom information have been handled. [35]

2.3.2 Service identification for security in the healthcare sector

As a part of the development of IT in healthcare, Sweden have introduced SITHS⁵ cards, as a national security service for IT communication. [36] The cards are a service ID, used by county councils, municipalities and private healthcare providers to meet the requirements for strong authentication. The system uses a two-factor authentication, which means both the staffs' identity are confirmed, as well as their work

⁵Secure IT in Health Services [36]

profession. The identity is confirmed using Telia's electronic ID and the profession is confirmed using the SITHS certificate that are incorporated into the cards. SITHS is considered a secure identification method because of the quality assured process for card issuers, and all of the issuers go through regular internal and external audits. The field of application is quite large and its' especially used within healthcare, but also in agencies. Among other applications SITHS cards can be used for entering computer systems and e-services, such as physical and electronical ID both in service and private, for electronic signing of medical records, invoices and agreements etc., signing and encryption of e-mails, door entries and print outs. [37]

2.4 Data gathering techniques

This section explains the theory behind methods used in the data gathering phase of the thesis work. It includes information on interview techniques, observational studies and process mapping, to provide the reader with an understanding of the methods used throughout the thesis.

2.4.1 Interviews

An interview is seen as a conversation where someone is questioned about their background, lifestyle or experience. There is three basic types of interviews, unstructured, structured and semi-structured, where semi-structured interviews is a combination of the two others. Unstructured interviews are exploratory and can be thought of as a conversation about a specific topic and does not include predefined questions. When structured interviews contains already stated questions that should be asked in a specific order, this is used to make the interview standardized and resembles a questionnaire. However, a semi-structured interview is a combination of both and contains predetermined questions, but opens the possibility to probe the participant until no new or relevant information is forthcoming. [38], [39] This way of interviewing can be used to gather fact, attitudes and opinions, also to get knowledge about behavior which cannot be observed cause of e.g. timing, hazards or privacy [40].

2.4.2 Observational study

Observations is the most commonly used method for gathering information in the daily life. Every awake minute, the brain collects and process information gained from the surroundings without any active thought. However, observational studies for a scientific purpose requires planning and systematic registration of the observed data. The purpose to perform an observational study varies, but it is mainly used in exploratory settings. It enables the researcher to investigate events and behaviors in its' natural settings, and its therefore important to carefully plan and decide what to investigate, how to register observations and whether the observer should be participating or not, prior to the study. The study can either be done in the field, or in a controlled environment, as a laboratory. An observational study can be used as a complement to questionnaire and interviews, since people have a tendency to have problems to explain what they do

and accurately describe how they achieve a task. Figure 2.4 shows how observational studies can be divided into different categories.[39], [40]



Figure 2.4: Observational studies divided into different categories.

During an observational study, the observer can either do direct observations by being present in the field, or indirect observation from a distance, e.g. recordings, diaries or interaction logs. The chosen observer could be known or unknown to the observed people, depending on the results to achieve, and also choose to either be a passive or an active observer. However, a passive observer has a hard time to truly be passive, since it is hard to not interact with the activities happening around you. Whereas an active observer interact with the ones being observed and can help with performing the tasks if needed. [39], [40] If the objects of the observational study know they are being a part of an experiment, they might change their behavior and respond different than normal, a behavior known as the Hawthorne effect. [41]

When present in the field, the observer must actively search for important information, which includes, ask people to describe their doings, note interactions, collaborations and follow the result of different actions. The observer must note or record as much information as possible, without reflecting of the data's importance. It is not certain that the observer understand all work that is performed, and its therefore important that the happenings is described when the staff performs it. Every work place have problems that occur once in a while, without making anyone surprised. How the work force handles these problems gives an understanding on how the work is organised, and may be important to note during an observational study. [42] When performing an observational study in the development of human-computer interaction design, the observer must focus on the context and how the objects interact with each other, the technology and their environment [40].

2.4.3 Process mapping

All sectors use processes to explain and achieve their intentions, the international organization for standardisation have the following description of a process in ISO 9001:2015, "set of interrelated or interacting activities that use inputs to deliver an intended result" [43]. A process can be divided into the three subgroups, main process, management processes and support processes. The main process have the objective to fulfill the

customers needs and deliver intended product or service to external customers. In the context of the elderly home, this means giving the residents the care and supervised living conditions they expect and need. Management processes have the task to direct and support the main- and support processes with their expertise and strategic planning, whereas support processes should support and provide resources to the different functions in the main processes, e.g. recruitment, maintenance and information processes. [44] Figure 2.5 shows a process map of the operations needed within an elderly home to provide the residents with salutogenic⁶ living conditions.

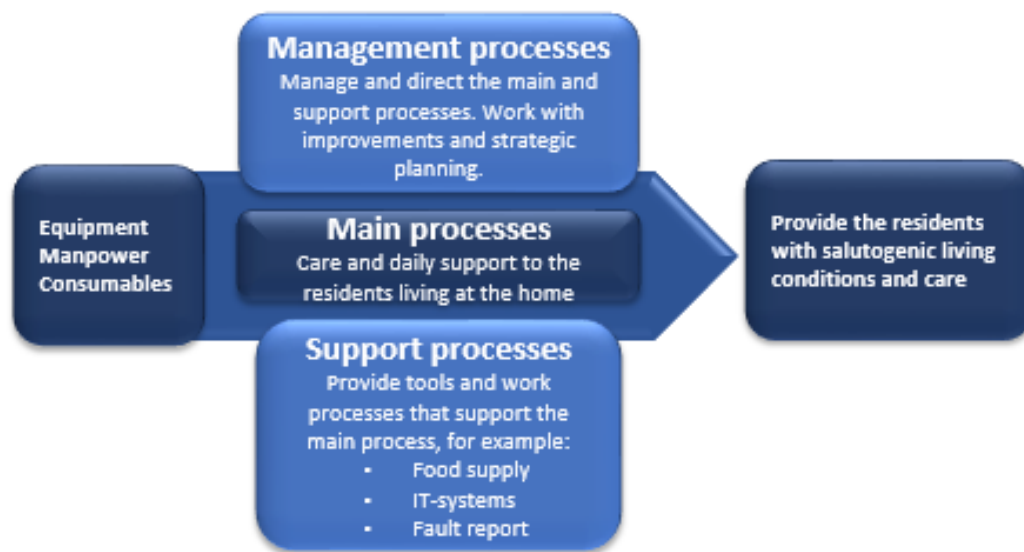


Figure 2.5: Process map of the operations needed within an elderly home to provide residents with salutogenic living conditions, including main processes, input, output, management- and support processes.

Process mapping is used to visualise work processes, and through that identify problem areas and improvement opportunities. A process map should give a common understanding of a process, with roles and contributions of different participants. Successful processes combine several tasks into one and let workers monitor their own process and make decision at the lowest possible level. Different steps of the process should be aligned in a natural order, where the work steps are performed when and where they make sense. A successful process have as few interfaces, handling points, activities and backward movements as possible, to achieve a effective work situation. [44], [46]

A process map should identify all steps and decisions made in a process in a diagrammatic form, where different types of charts are used to capture particular aspect of a work situation. The most common techniques for process mapping are flowchart

⁶Salutogenic care focus on factors that support human health and well-being, which includes achieving meaningfulness, intelligibility and manipulability.[45]

process maps and deployment charts. A flowchart provide a basic overview of all performed actions during a particular work process, where a deployment chart besides that, also indicate the place and person that perform specific actions. Its important that process maps are represented in a clear way, where almost anyone can review, understand and identify possible improvements areas. [44], [46]

The technique of process mapping is important, since changes made without properly understanding how and why a process works, may lead to costly mistakes. It enables organisations' to present their processes in a easy-understandable way, where the identification of problem areas such as bottle necks, delays and waste, is easily done. Results achieved from the process mapping can then be used to develop existing and future solutions, and to get improved processes. [46]

2.5 Prototyping

Users often have a hard time to imagine their needs, but when they see a product and start to use it, they soon realize which features they appreciate and not. Data collected from field studies, interviews and questionnaires may give rise to new thoughts and ideas and can be used to create and improve products. Before a product is ready for the market, the developer must go through several versions of prototypes. Using prototypes is a more cost efficient way of developing products and give a better final product, than if the end-product is the target from the start. A prototype can be everything in between a scaled version of a bridge, a software that crashes every few minutes and a piece of paper that illustrate a concept. Prototypes can be further divided into low-fidelity, a sketch or storyboarding, and high-fidelity, which reminds more of the final product and may be built in the same hardware or material. [40]

2.5.1 Low-fidelity prototyping

A low fidelity prototype is an useful tool to visualize the indented product in a quick, simple and easy way. The used materials are very different from those in the final product, paper sketching is used rather than electronic screens. Low-fidelity prototyping is particular important in early development phases and may be used to explore thoughts and encourage new ideas. [40] Low-fidelity prototypes in paper is widely used in early user interface development, but can be used for all types of products and as a method for brainstorming, designing, creating, testing and communicating the product [47]. It has a low development cost and can evaluate multiple design concepts, it is useful for identifying market requirements and as a proof-of-concept [40]. However, low-fidelity prototypes are constructed to visualize concepts, design alternatives and screen layouts, rather than mapping the interaction between the user and prototype. User interactions most often requires a facilitator familiar with the prototype, and respond to the user's command by turning cards or flipping interfaces, to generate a flow in the application. [48]

2.5.2 High-fidelity prototyping

In comparison to low-fidelity prototypes, high-fidelity prototype development is much more time consuming. A high-fidelity prototype is built using the material that is expected in the final product, e.g. with a software as a final product, a computer based prototype is considered of higher fidelity than a paper prototype. [40] High fidelity prototypes should be interactive and allow the user should to use test the interface as it was a real product. This makes the prototype ideal when targeting navigational issues and system flow, whereas low-fidelity prototypes are better suiting when addressing layout and surface representation. [48] High-fidelity prototype reviewers often comment on detailed interface aspects rather than content, which makes it useful when marketing and selling an idea and testing technical features. [40] Figure 2.6 summarise the advantages and disadvantage with low- respectively high-fidelity prototyping.

	Low-Fidelity Prototype	High-Fidelity Prototype
Advantages	Fast & simple to build Low cost Evaluate multiple design concepts Proof-of-concept	Interactive User-driven High functionality Look & feel of final product
Disadvantages	Limited functionality Requires facilitator	Expense development Time-consuming

Figure 2.6: Advantages and disadvantages with low- and high-fidelity prototypes.

3

Methods

The goal of the thesis is to investigate and design an eNursing concept fitted for a specific elderly home. This requires an understanding of the organisation and their work situation, which is achieved by a field study where the work situation of the assistant nurses was mapped. The results of the field study and the process mapping was then used to develop a concept consisting of several low-fidelity prototypes, which later was scaled down to a high-fidelity prototype. Thereafter, a technical description of an eNursing concept was proposed. Figure 3.1 shows a time line of the main work tasks during the thesis.

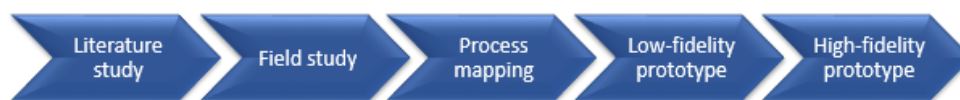


Figure 3.1: The main tasks during the thesis work, in a time line representation.

3.1 Literature study

As figure 3.1 shows, the work begun with a literature study, with the goal to investigate important areas used throughout the thesis work. Which among other areas, included Swedish elderly care, eHealth, eNursing, commercial eNursing technology, field studies and prototyping. The literature was mainly found in books, journals and at the Internet, where the Chalmers library webpage was used to locate useful books and journals. Search words as "Elderly care", "Elderly care Sweden", "Prototyping", "Laws elderly care", "eHealth Sweden" and "ICT elderly care Sweden", was used to find interesting information sources. Useful information was found though reading abstracts and check-out references of important information. Internet was mainly used to find commercial eNursing technology and technology used at elderly homes today.

3.2 Field study

The field study was performed at one of Tre Stiftelser's three facilities, Göteborgs sjukhem, in a floor with 17 residents in varying age and with different disabilities, all suffering from somatic disorders. The study was performed during two, four hours sessions,

with a focus on problem areas and possible improvements. Together with observations of the work situation, a semi-structured interview technique was used to collect additional information during the field study. The interview template used is found in appendix A. The field instructor was an assistant nurse, specialized in elderly care, employed by the organisation.

A direct observation method was used, with the observer present in the field. The observer did not participate in any activities, but talked and interacted with the observed people. Hence, the observation was of passive character, but not truly passive. Answers to the predetermine questions and notes on the observed happenings, were written down during and directly after the study. Comments on the observations, explanations on how things works and own reflections and ideas were noted. The binder collecting information about the residents and the information board in the office was photographed to remember important ideas. To get a feeling of the used IT-systems, some systems were shown during one of the field sessions.

3.3 Process mapping

With the field study and own experiences from working within elderly care as a benchmark, the work situation of the assistant nurses was mapped. The assignments within an elderly home covers every hour of the day and differ according to residents and the weekday. The 24 hour mapping of the work processes, therefore divided the day into seven time slots, with a general description of the occurring every day tasks. To get an understanding of the personnel numbers throughout the day, the assistant nurses schedule was investigated and added to the map. Apart from the daily tasks, other recurrent tasks, such as the process every resident goes through from move-in until death or move out and different professions responsibilities was mapped. Since they are important to get an understanding of the elderly home as whole.

The assistant nurses pointed out the morning as the most critical time during the day. The morning routine was therefore visualized in a flow chart, to illustrate and identify situations where the assistant nurses is in an enlarged need of support. The process mapping included the number of residents every assistant nurse is responsible for, how colleagues collaborate and how alarms are handled. However, the mapping was only an example of the real work situation and not a complete replica of a morning schedule used by the elderly home.

Apart from the work processes, a mapping of the elderly homes usage of different ICT-systems was performed. The result was summarised in two tables, where one describes which group, regular- or assistant nurses, that use each systems and how often they are used, and the other describes technical details regarding the systems collected from each company's webpage.

Before completing the process maps and technical information regarding ICT-systems, a draft were discussed in a meeting with the field study instructor. A document con-

taining questions and early drafts of the process maps is found in appendix B. The questions asked were about features in used IT-systems, report sessions and personnel density. The meetings were held as a semi-structured interview, where the asked questions were followed-up and developed to collect as much information as possible. The process maps and the gathered information, were then adjusted according to the discussion.

3.4 Low-fidelity prototyping

To concretize ideas regarding the assistant nurses need for ICT-solutions, mind maps of features to include in different devices was developed. They were then discussed with the examiner and the supervisor to get input and broaden the perspective. Inspired by the earlier results and the mind maps, a low-fidelity prototype of eNursing technology, including an information screen, two tablet interfaces and a phone interface, were built using scissors, tape, pen and paper.

The finished paper prototypes were then evaluated during two meetings with the examiner, the supervisor and Tre Stifstelser administrative manager Johan Rindeborg. The meetings began with a presentation of the paper prototypes and motivations to different design choices. The meeting did not have a stated agenda, but was intended to give input on the continued prototype development process. It was decided to scale down the low-fidelity prototype into the phone interface and focus on developing it into a high-fidelity prototype. Motivations for the down-scaling, was the time-consuming development of a high-fidelity prototype and the usefulness of a phone fitted for the daily care work in the elderly home. The assistant nurses are in larger need of a phone solution in their work situation, than the tablet- and information screen solutions.

The paper prototypes were also evaluated through a semi-structured interview session with the assistant nurse instructing in the field study. The template used for the interview is found in Appendix D, and it includes questions about the prototypes usefulness and situation's where they will be used. Questions regarding appreciated and missing features, were also included in the evaluation. The session was held to discuss the prototypes and get input on ideas, possible to use in the organisation and future development, results from this session is presented in 4.3.5

3.5 High-fidelity prototyping

The high-fidelity prototype was developed using Visual Studio, Xamarin. The prototype was built in an Android environment, using Xamarin Android Player and a Nexus 4 (KitKat), Android 4.4, API 19, emulator. The prototype's focus is the interfaces, to visualize ideas and features though to support the assistant nurses in their work situation. The application have therefore only basic back-end functionality and come of the included buttons do not redirect the user anywhere.

3. Methods

After completion of the high-fidelity prototype, it was presented to and evaluated with the field study instructor. The evaluation was of a semi-structured interview technique, according to the interview template found in appendix D. The evaluation consisted both of questions about the high-fidelity prototype and short scenarios regarding the usage of the high-fidelity prototype. Results from this section is found in 4.4.1. The goal was to collect feedback and hear if there is any missing features and to discuss the prototype's usefulness.

4

Results

The result chapter is divided into several sections, covering results the field-study, the process mapping, and the low- and high-fidelity prototyping. The sections presents each category and explains, as well as describes thoughts of the produced prototypes. All results are based on qualitative data and discussion, collected from sessions at the investigated elderly home.

4.1 Field study

Tre Stiftelser is originally three separate foundations, which since year 1988 have been administrated as one. The elderly living within the foundations facilities suffer from dementia, somatic disorders, psychological problems, and the organisation has also a section with younger residents injured in e.g. riding and motorcycle accidents . The field study was performed at Göteborgs sjukhem, located in Änggårdsbacken near Sahlgrenska University hospital, Gothenburg. The facility consists of three buildings connected in an U-shape, with a shared garden in between. The building where the field study was performed consists of three floors and is populated with residents suffering from somatic disorders. The residents are divided into floors according to figure 4.1, where two of the floors have one larger apartment for couples to live in together.



Figure 4.1: Floor plan of the facility used for the field study, with the number of residents and apartments included.

Each floor is separated with its own personnel and the field study were performed at the second floor. Every resident is assigned a contact person, who has the main responsibility among the personnel in the work group. The responsibility includes keep-

ing resident history, contact information to relatives and overall progress updated, as well as cleaning the residents apartment thoroughly every third week. The division into contact persons also makes it easier for relatives and friends to know who to contact for questions and information. Every resident also has an assigned nurse with the main medical responsibility, which as for the contact person makes the contact easier and the care more personalized. To become a resident within Tre Stiftelser facilities, one must apply to the municipality, as for most Swedish elderly homes. The resident is then placed within the organisation through a legal decision from the social services. The decision tells the background of the resident and which kind of care the resident should be provided with.

4.2 Process mapping

The assistant nurse is the profession with the closest contact to the resident, but there are also other professions involved in the care. Nurses, doctors and rehabilitation staff take medical care of the residents, just like the assistant nurses. When staff as management, food supply and personnel responsible for the social activities provide the residents with social care to achieve meaningful conditions. The main responsibilities for the assistant nurses, nurses and doctors are seen in Figure 4.2.



Figure 4.2: Division of the responsibilities between the professions accountable for the medical care of the residents.

Most residents at an elderly home move in when they are too sick or physical disabled to manage their daily life at home and live there until they die. Which can be a period from a couple of days or months, until several years, but there can be exceptions where the residents move to another elderly home or city. If the resident lives within the organisation for a longer period, the documentation regarding the resident must

be updated continuously. The overall process from move in until death or move out is shown in Figure 4.3.

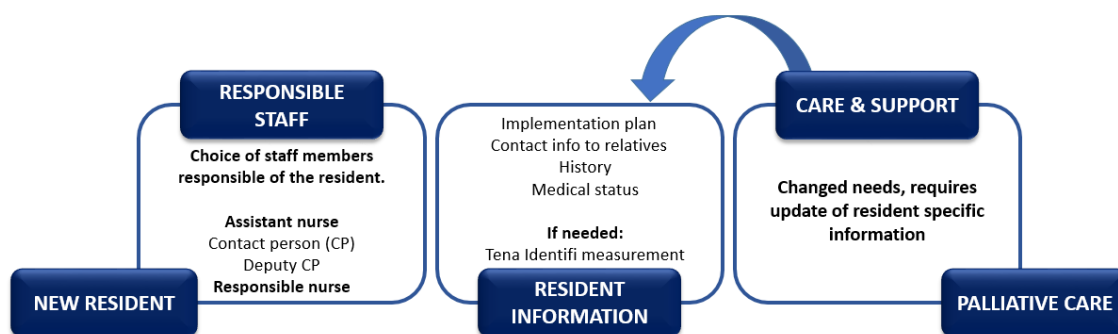


Figure 4.3: The overall process every resident goes through regarding documentation and assigned contact persons, from move in until death or move out.

4.2.1 General process map of the daily routines

Every resident have different needs and the staff must adapt accordingly, some residents perform almost everything by themselves, where others needs a lot of support. A resident's situation may change over time, when the resident gets older and maybe more disabled. The assistant nurses responsibilities, divided into seven time slots, is shown in Figure 4.4. Apart from the different job assignments, the figure also shows which shift that is working at a particular time. Except for weekday mornings, there are three staff members responsible for the resident at one floor, two staff members split the floor in-between and the third member runs between the two halves. Some of the tasks needs to be done by two staff members, for example. when helping one paralysed resident from bed to a wheel chair.

A larger report session is held in the morning, but report sessions is also held in every shift change. In addition to the daily assignments, there are also co-occurent assignments to perform, such as food ordering, purchase of food and other goods, holiday decoration, house cleaning, water flowers, meetings, update documentation, escort to e.g. dentist and communication with relatives, error report, mobility service and hair dresser.

4.2.2 Process map of the morning routines

According to the staff, the most critical time during the day is the morning, where there is a need for well functioning routines to help each resident in a reasonable time. Figure 4.5 shows the morning process for one staff member, from the report session until the mid morning break. On a weekday, each floor have four different routines, where the residents have been in-between. Worth noting, the visualisation of the morning processes as well as the daily processes is generalised.

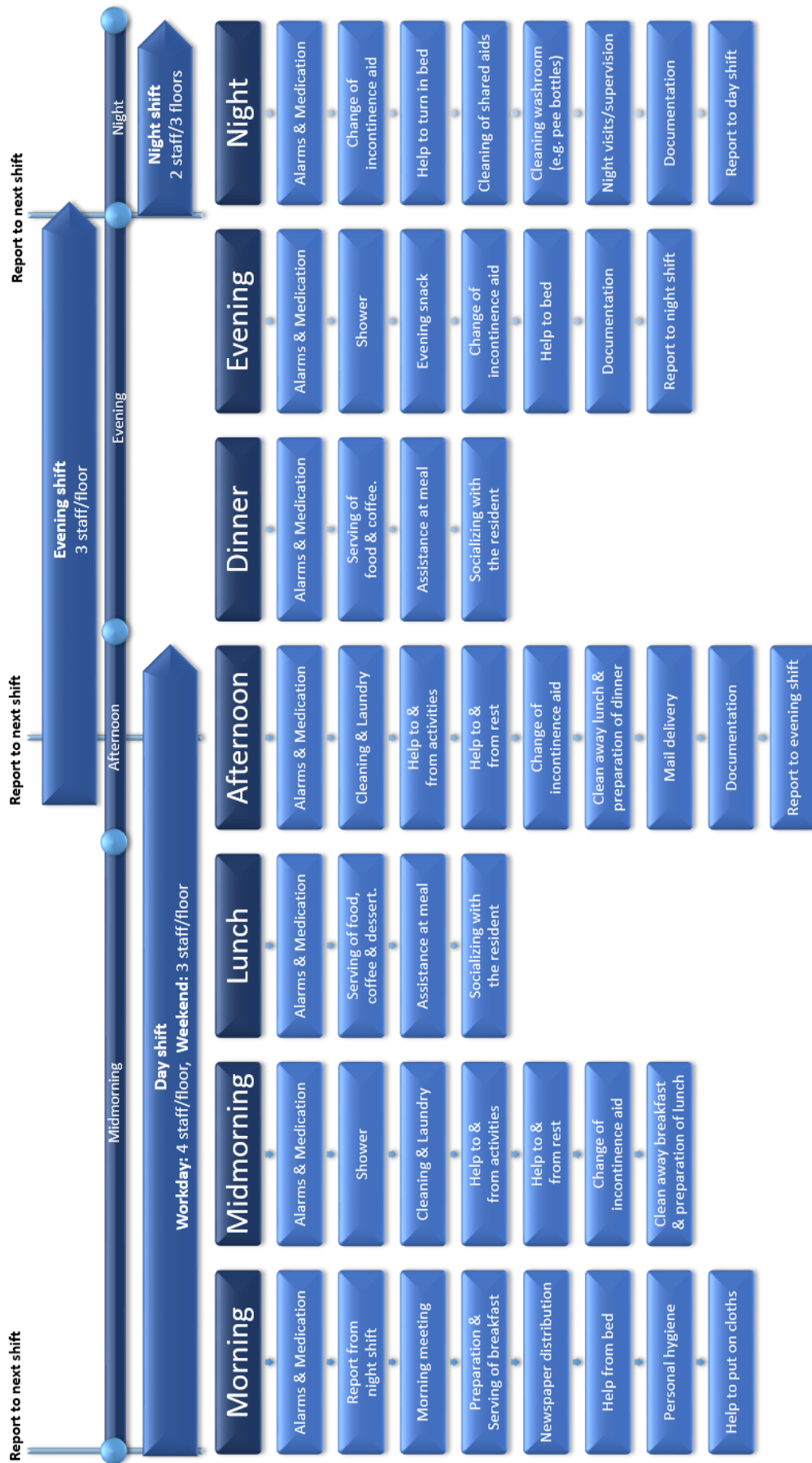


Figure 4.4: Division of the job assignments during each day into seven time slots, and also visualised which staff (day, evening or night) responsible for performing the tasks.

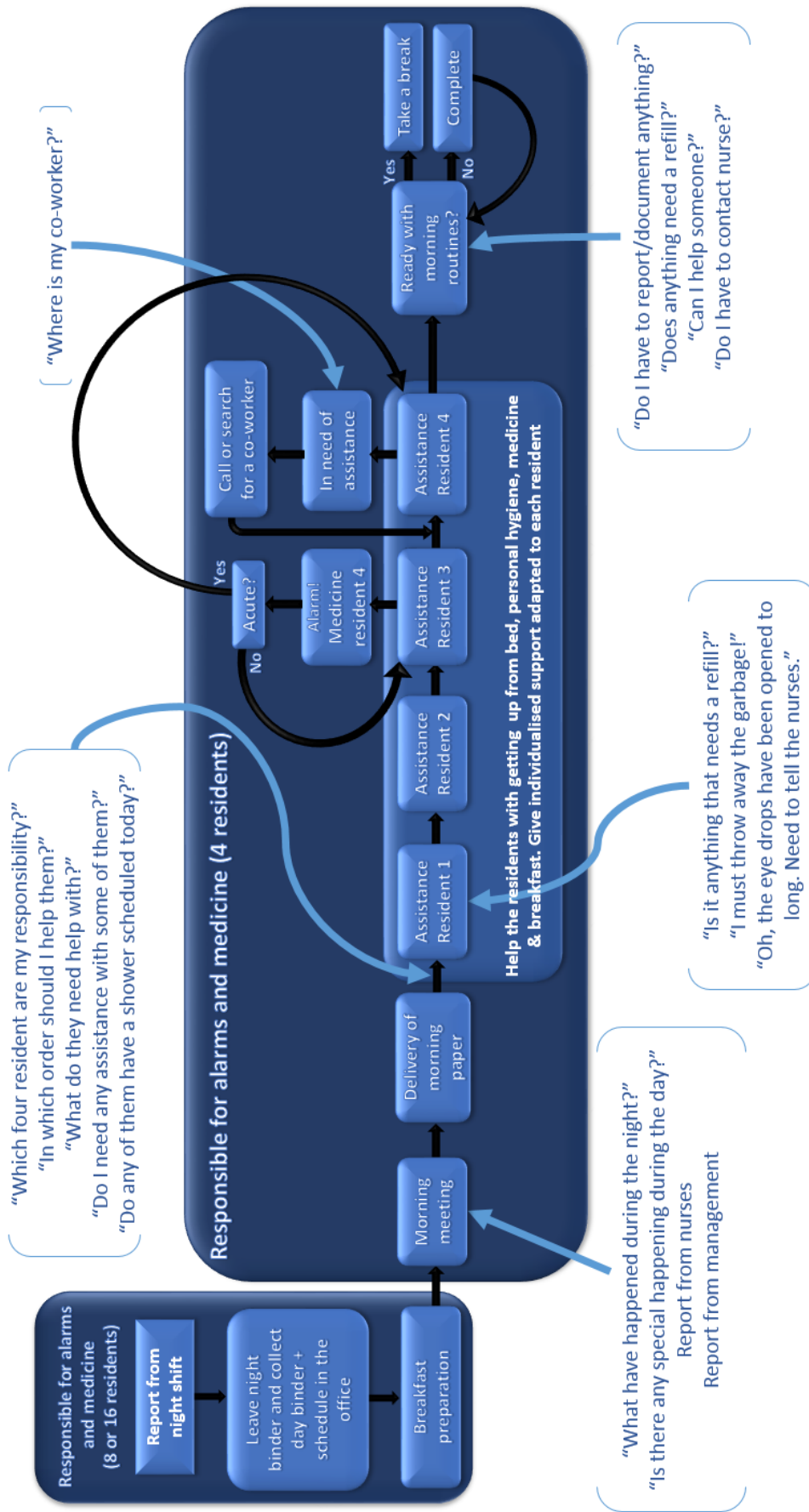


Figure 4.5: Generalized visualisation of the morning routine, the brackets include thoughts and discussion points the staff may have.

4.2.3 Process map of the daily routines

The daily routines can vary promptly depending on the residents mood, condition and other human factors. After the intense morning, the workload is usually lowered during the mid morning and lunch. The work activities during this time varies depending on weekday, social activities and each resident's mood.

After lunch, the evening shift starts and they have approximately two hours of so-called released time. During this time they will not be responsible for any alarms and can use the time to perform activities such as cleaning a resident's apartment thoroughly, follow-up on the implementation plan or take a walk with some resident. When half of the afternoon have passed, the unplanned time is assigned to the day shift and they can now do their extra tasks. During this responsibility hand over, there is also a report session where the day shift informs the evening with important information from the morning meeting and about the morning happenings.

When the afternoon has passed, the evening shift is similar to the morning shift, but more flexible. The workload is not as high in the evening as in the morning, and the resident informs when they want to go to bed. However, during the evening shift it is very important with communication between the staff members, since they plan every task stepwise according to the residents desires. When the evening shift ends, they report to the night shift in the same manner they have been reported to. The night shift then go on with their shift with both scheduled activities and alarms.

4.3 Low-fidelity prototype

Both during the field study and the design process, thoughts on how to include residents, relatives, nurses and management was noted and influencing the final low-fidelity prototype. Before initializing the prototype development, a summation of ideas and thoughts of possible features to include and devices to use, were presented in mind maps, shown in Appendix C. The mind maps were discussed with the examiner and supervisor, to broaden the perspective prior to the prototype development. The proposed low-fidelity concept consist of a phone interface, two tablet interfaces and an information screen, which all will be presented further in this section. A functioning eNursing concept should connect involved devices to avoid double documentation and streamline the data paths, which sets requirements on interoperability. However, they are not included in the solution.

4.3.1 Mobile phone interface

The low-fidelity phone was designed with influences from the field study and the ICT-tools the assistant nurses already use. It should be carried by the assistant nurses during every shift and should be intuitive and easy to use. Earlier experience of different technology and whether or not the assistant nurse is permanently employed should not matter when using the phone. Even if the employee use the phone for the first time, it should be supporting and not take extra time from the care process. Figure 4.6 shows

the first two interfaces the user meets when entering the application, the login page and the start page. Each staff member should have personal credentials used for login, which gives them access to every underlying system, the login feature is shown in Figure 4.6a. When the login procedure is completed, the user is automatically redirected to the start page shown in Figure 4.6b, which gives access to every feature included in the application. Every feature should be easy-accessed by maximum two clicks.



(a) Login page.

(b) Start page.

Figure 4.6: Low-fidelity prototype of the phone two main interfaces, the login page and the start page. Used for login and entering different features.

Figure 4.7 shows three of the features included in the application, the "to do"-checklist, MCSS and the camera. MCSS shown in Figure 4.7a is entered by sliding the start page to the right. It is an appreciated checklist application used today to mark different HSL-interventions, such as giving medication, when they are performed. The "to do"-checklist shown in Figure 4.7b is access if sliding the start page to the left instead, and should be used to mark different work tasks during the day as they are performed. The work tasks and the HSL-interventions are divided into two checklists, to have lighter checklists that is easier to overview. They are access by sliding the start page, since they are probably the most used features and should therefore be access in the easiest way possible. The camera feature shown in Figure 4.7c, is entered by clicking the camera icon at the start page. It enables the staff to take pictures of important events and either add them to the residents calendar or send them as an e-mail to relatives or other staff member. For example, a picture of a dipstick¹ to the regular nurses, or picture of a birthday celebration to the relatives. The staff could also use the camera to add pictures in the documentation system, which can be useful in the implementation plan.

¹Test for urinary infection.

4. Results

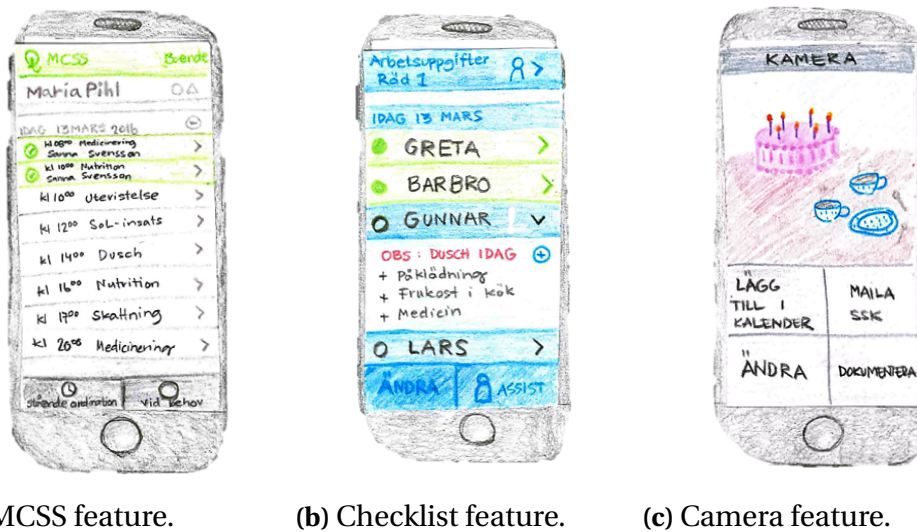


Figure 4.7: Low-fidelity prototype of three features accessed through the start page. The MCSS and the "to do"-checklist is access by slide the start page to to the left and right, and the camera by clicking a button at the start page.

Figure 4.8 shows three features, all access through icons at the start page, a calendar feature, a feature for getting important information and a feature for adding ideas. The calendar feature, shown in Figure 4.8a, is basically four different calendars merged together in one solution, one private, one for each resident, one for a whole floor and one for the whole organisation. The next feature, shown in Figure 4.8b, is an information feature that shows the daily menu and the activities within the organisation. It is useful to have accessible if a resident have questions regarding this. Figure 4.8c shows a feature used to store different ideas and wanted purchases, and enables the staff to add ideas of activities, ways to rationalize the daily tasks and purchases needed, e.g. new curtains in the corridors.

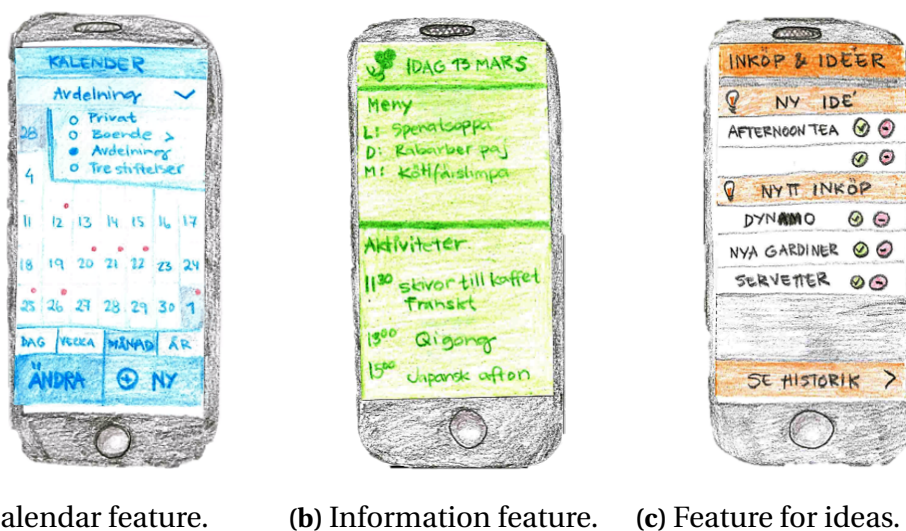
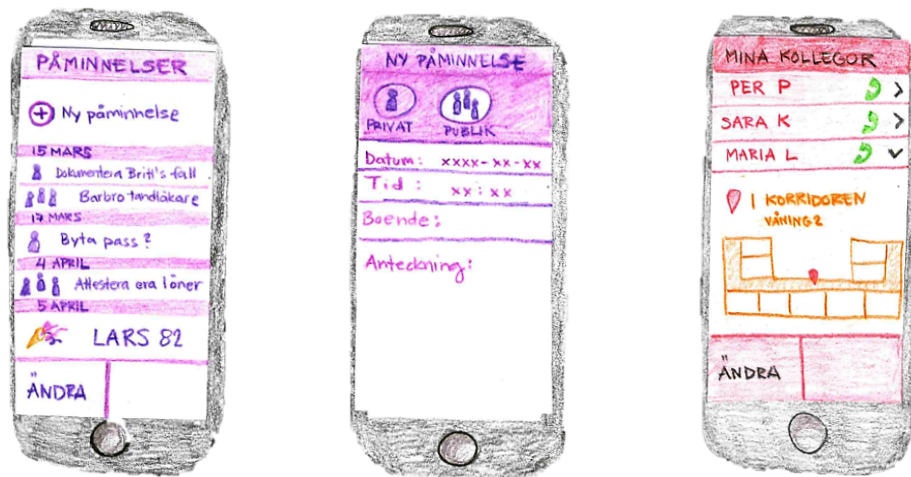


Figure 4.8: Low-fidelity prototype of three of the features accessed through the start page, the calendar feature, the information feature and a feature for adding ideas.

Figure 4.9 shows the last two features of the application, the reminder and a feature for tracking colleagues. The reminder feature, shown in Figure 4.9a, enables everyone to set reminders, private as well as ones concerning the whole organisation. The interface for adding new reminders, shown in Figure 4.9b, is accessed through the previous interface. Each reminder is set at a specific time and date, and for a certain resident or personnel. The last feature is used to track colleagues, is shown in Figure 4.9c. The feature shows which staff members that is working, where in the building they are and also have button to call them.



(a) Reminder feature. (b) Add new reminders. (c) Colleague feature.

Figure 4.9: Low-fidelity prototype of two of the features accessed through the start page, the reminder feature as well as the one for tracking colleagues. The reminder feature is divided into a start page and a page for adding new reminders.

4.3.2 Tablet interface for residents

The low-fidelity prototype of the tablet is divided into two interfaces, one for the residents and one for the staff members. The residents is given their own interface since the iPad circles held at the organisation have been much appreciated and the elderly have shown an interest in the technology. The organisation also have one tablet fixed in every room, which only are used for the medication signing, that tablet could therefore be used for extra tasks without resulting in an increased cost for the organisation.

The interface for the residents is shown in Figure 4.10, and consist of six different features. The upper three features from left to right is a calendar, today's- staff and activities. The calendar feature should be possible to use by both the residents, relatives and the staff. Residents should use it to book activities they intend to visit and to keep of happenings, such as relative visits and dentist appointments, whereas relatives should use it to book their visits and see the availability of the resident. Staff members should use the feature to add entries concerning residents, relative visits and other important information, and keep track of resident's specific happenings. The feature containing today's staff should be used to give the residents an overview of which staff to expect and help them get familiar with each staff member. Every day at least eight assistant

nurses is responsible for the care at a floor, and it might be hard for the resident's to keep track of every staff member. The feature with today's activities should provide the resident's with updated information on the happenings within the organisation and give them an opportunity to book activities they intend to visit. This booking information should also be synchronized with the calendar feature.

The lower three features in Figure 4.10 is the menu, alarm function and a photo viewer. The menu features functions as the daily activities and provides the residents with updated information regarding the served food. The next function, the alarm, provide the residents with a possibility to send more specific alarms, e.g. "Need to go to bathroom", "Hungry" and "Want to get out of bed". More specific alarms can be useful to the staff members in their work situation, if they just get an alarm and do not know the reason, they might rush to the scene. But with the specific alarm function, they know how urgent it is to get to answer the alarm. When the staff get an alarm today, they have the possibility to talk directly with the resident and this feature should be used as a complement to that. The last feature in the resident interface in the photo viewer, which enables the resident's to take pictures of happenings and make them visible to relatives. It also makes it possible for the relatives to upload pictures to keep the resident updated on the life outside the facility, e.g. when the family have visited their shared summer house.



Figure 4.10: Low-fidelity prototype of the tablet interface used by the residents. Including features as calendar, menu, alarm handling, pictures, today's staff and activities.

4.3.3 Tablet interface for staff

The tablet interface used by staff members is shown in Figure 4.11 and consist of eight applications. This interface should mainly be used at reporting sessions to give the staff members a quick update on the situation. The three features to the left is the latest

documentation, reminders and reports from other shifts. The documentation feature is included to keep the staff updated and to enlighten important information at each reporting session, whereas the reminder feature is included to make sure important tasks and information are not forgotten. A reminder could for example, be taxi bookings that needs to be done, relative visits or other important information concerning the staff members. The feature with reporting entries from other shifts is included to keep each shift updated on odd happenings and if someone needs extra attention. In the current situation, they have a specific binder for this.

The middle features contains information on today's staff and statistics. The staff feature is similar to the feature included in the resident interface, but also enables a call function to each staff members. The statistics is included to provide the staff with an easy way of improving their daily work, it should show statistics of a certain floor, e.g. missed medical signing, number of alarms and alarm answering time. Salience statistics should be mentioned at the morning reporting sessions to provide the staff with an early warning of certain happenings, so they get a chance to meet the situation earlier and in a better way.

The last three features, shown to the right in Figure 4.11, is also present in the phone prototype. The first is a phone book with numbers to each staff member, management, taxi services, relatives and other important contacts. It should replace the paper with phone numbers currently places in the pantry and in the office at each floor. The second feature, resident information, contains information on each resident, e.g. allergies and preferred daily activities. Where the last feature, the ideas and purchases, show entries to be discussed at meeting and at daily reporting sessions if necessary.

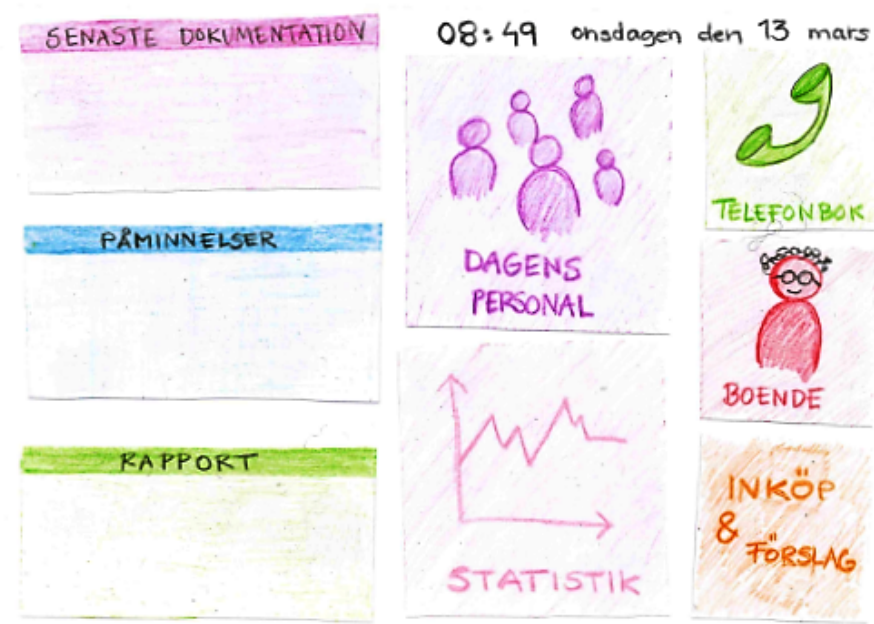


Figure 4.11: Low-fidelity prototype of the tablet interface used by the staff members. Including features as latest documentation, reminders, reporting, today's staff, statistics, phone book, ideas and resident information.

4.3.4 Information screen interface

The information screen is thought to be placed outside the common kitchen at each floor, and replace today's usage of plastic frames stuffed with paper information. It should provide basic information to residents, relatives and personnel and connect the residents with the world outside the facility. The paper prototype of the information screen is seen in Figure 4.12 and is inspired by information screens placed in large waiting areas and commuter trains. The information screen consist of seven features, where most of them could be found in the other low-fidelity prototypes. The first feature in the upper left corner shows today's staff with picture and names, this to provide both residents and visiting friends and relatives with the information on the ones working. There is two features directly beneath today's staff, to the left, a feature where the management can publish information and greetings, e.g. when someone have birthday or when it is holiday. To the right, a feature containing today's menu. Further beneath there is a feature with the weekly activities, similar to the feature found in the other paper prototypes.

The feature in the lower, right corner is a news feature, showing the latest news from a certain news provider. This feature is included to connect the resident with the world outside the elderly home. There is two features above the news, one containing the weather outside and one containing time and date. These features is also included to connect the residents with the outside world.

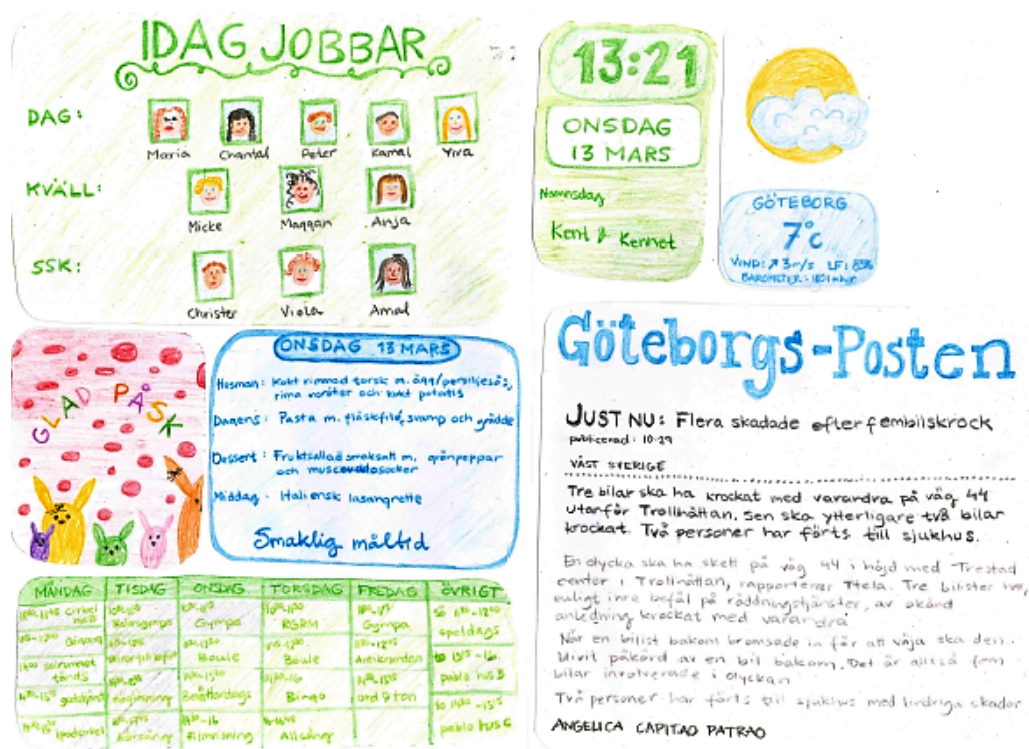


Figure 4.12: Low-fidelity prototype of the information screen, including features as today's staff, menu, today's activities, latest news, weather, clock and date.

4.3.5 Prototype evaluation

The low-fidelity prototypes were evaluated in meetings with both the examiner and supervisor, as well as contact persons from the organisation, the prototypes were all given positive feedback. The field study instructor gave input according to the manuscript found in Appendix D.

All of the presented interfaces are need and important in the care process. However, the way they support the process of providing the residents with salutogenic living conditions differs. The tablet- and phone interface used by the staff, is important when improving the care provided to the residents. Whereas the other interfaces is of a more general importance, since they include residents, relatives and the staff members. Salutogenic living conditions focus on providing residents with meaningfulness, intelligibility and manipulability in their own care situation. The information screen and the tablet interface for residents, is a part of providing this, by connecting the resident with their relatives and friends, as well as the outside world.

If ranking the interfaces according to their importance for the organisation, the phone is of greatest importance, followed by the tablet interfaces and last the information screen. The phone interface provide the staff members with an easy-accessible, support function to be carried along in their daily work situation. However, its important to consider how different features will interact and where information will be collect. The phone will be carried along during every daily task, and it is important that alarm functions and reminders are designed in a way to not interrupt the staff in their work. Since they then cause delays, rather than support the staff in the care process.

The tablet interface for the staff members is meant to be a support in the hand-over process, and basically collects information from the calendar-, schedule- and report binder. Hence, the three solutions used today can be merged together in one tool. Which both will make the information easier to find, and make it easier to update information. The feedback regarding the feature for latest documentation was that it is an useful feature, since if, for example, the staff notices that there is no documentation for the last few days, they will know that something is wrong. According to the field instructor, the least important function in the interface was the statistics. Today the staff is provided with this information from the manager regularly, however they can not get fast feedback and improve their work. Example of statistics that could be improved with fast feedback is alarm answering time and the numbers of alarms.

Many of the residents moving to the organisation today bring their own electronically devices and this number will probably increase in the future. The features included in the tablet solution, are the most necessary and the resident would probably use them, but the extent of the usage depend on each resident and their interests. Apart from the already included features, functions as Internet and other applications should also be possible to access through the tablet. The alarm feature should apart from sending alarms, send messages to the staff. Examples of such a message is "I want to eat in the restaurant on Tuesday" or "I need a haircut".

Having an information screen has already been discussed in the organisation, and would be used by many people, such as assistant nurses, nurses, relatives, visitors, management and the residents. However, it might be more effective to present the information in different slides and change slides continuously.

4.4 High-fidelity prototype

The high-fidelity prototype was designed as a down-sized version of the low-fidelity prototype. Since the phone is the device the assistant nurses use the most in their work, it was chosen for the high-fidelity prototype development. Every assistant nurse carries a phone during each shift and a suiting interface could provide them with accurate, updated and more detailed information than the binder used today. Observations in the field study concluded that the staff wants an intuitive system, which any employee can use, regardless IT-experience and earlier experience of the system. Few clicks should be required to enter desired features and the system should be childishly easy to use.

The high-fidelity prototype consists of a phone application, which include several different features that facilitates the work situation for the assistant nurses. The application is thought of, as a separate operating system, that connects different IT-systems and shows them in a shared interface. This requires interoperability between the different features, which is not included in this section. The application is shown and explained in several steps, starting with the part shown in Figure 4.13, which the user meet when they first open the application.

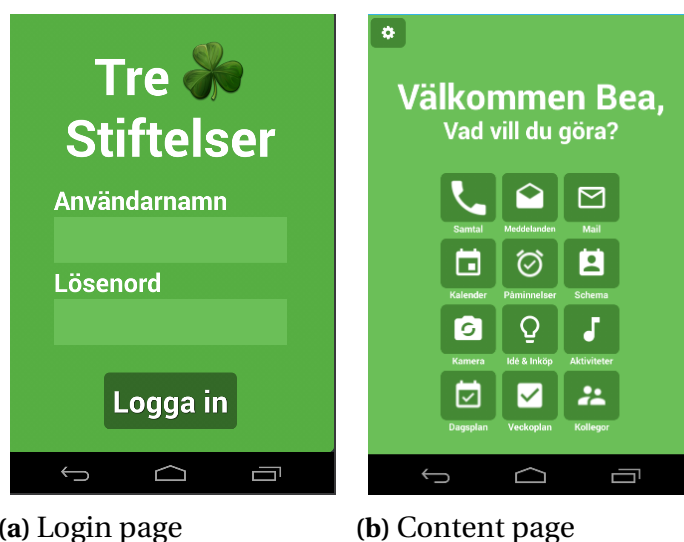


Figure 4.13: The first pages the user meets when starting the application, the login page for entering and the content page to access the features the application holds.

Figure 4.13a shows the login page, which is the first page the user meets. Every assistant nurse should have an individual login that automatically gives them access to all

underlying features and systems, without any further requirements of identification. This sets requirements on the security, since sensitive information is saved within the systems. The IT-systems used today, each requires an own login, which force the staff to have multiple users and passwords to keep track of. If considering the size of the work force and the number of login every day, time and unnecessary irritation can be saved by the use of a shared login system.

The second interface, shown in Figure 4.13b, shows the start page. Every feature in the system, can be reached through this page and it is designed to reduce the number of clicks and to be intuitive to use. The features included in the application, and accessible through the start page are phone calls, messages, e-mails, calendar, reminder, individual schedule, camera, "ideas & purchases", list of daily activities, daily checklist, occasional checklist and "my colleagues". The upper left button in the start page are used to access setting and to log out. Since every staff member have different needs and sometimes perform different activities, it should be possible to personalize the start page layout and adjust the basic setup to a more suiting. To make the application easy-maneuvered, the numbers of included features are limited and reduced to the most crucial.

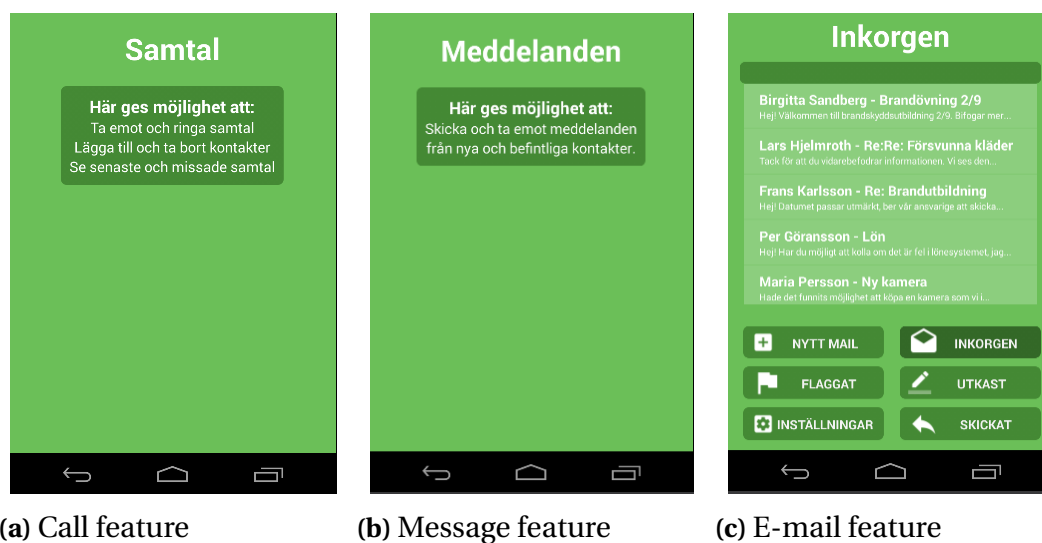


Figure 4.14: Call, message and e-mail feature for communication with colleagues, relatives and management.

Figure 4.14 shows the features presented in the upper three buttons, phone calls, messages and e-mail. Both the phone call and the messages feature, Figure 4.14a and 4.14b should function like in every other phone and were therefore not build in the high-fidelity prototype. Their interfaces instead tells the functionality they should include, call and receive phone calls, add and remove contacts, see latest and missed calls and to send and receive messages from both known and unknown phone numbers. Figure 4.14c shows the interface of the e-mail feature, which is designed to be perspicuous and reduce the number of clicks needed to achieve the intended task. The feature enables four mailboxes, for incoming, draft, flagged and send e-mails. Apart from that,

4. Results

there is a feature to write a new e-mail and one for make settings and searches in your mailbox. The next three features shown in the second row of buttons in the start page, is the calendar, the reminder and the individual schedule, their interfaces are shown in Figure 4.15.

Figure 4.15a shows the calendar feature, which consist of four different calendars, one private calendar, one for a certain resident, one for the whole floor and one for the whole organisation. These four settings exists to give the user an easy overview of what's desired and the user can both add new entries and adjust already existing ones using the buttons below the calendar. Figure 4.15b shows a reminder feature prepared to easily check performed reminders, as well as add new ones and change existing ones. A reminder could either be private or public, depending on the subject. If the assistant nurse must document a fall, but do not have time at the moment, she can set a private alarm for later. Whereas, if there is a class in fall prevention, the management can set a public reminder for all employees. Figure 4.15c, is not fully developed either, but should include functions as overlooking ones individual schedule, send request for shift change, leave application and to attest worked hours. The next row of features included at the start page are the camera, the suggestion sharing and the list of daily activities, seen in Figure 4.16.

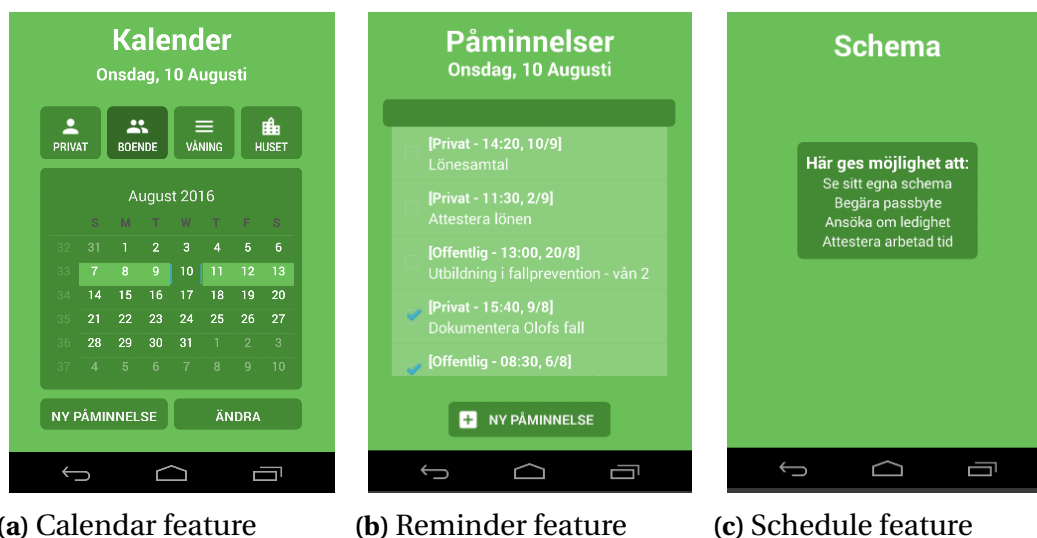


Figure 4.15: Calendar, reminder and schedule feature used to keep track of activities within the organisation, and to get easy access the own schedule.

The developed camera feature shown in Figure 4.16a, contains four buttons apart of the one for taking photos. The buttons is used to save, change, send and use the photo for documentation. As explained in the low-fidelity prototype, the assistant nurse could take a picture of a dipstick and then directly send it to the responsible nurse, instead of carrying the dipstick along. Photos could also be used to add important information to the implementation plan e.g. if a resident wants a certain breakfast, take a photo and upload it into the documentation. This will especially facilitate the work situation for new staff members, but support everyone in providing the resident with the care desired.

The second feature, seen in Figure 4.16b, should be used to share ideas and needed purchases with other staff members and the management. Many ideas and need of purchases are sufficed by the staff, but many might be forgotten along the way. The feature "Ideas & purchases" provide an easy way share ideas and the usage might result in a better care for the residents, if an assistant nurse gets an idea to hire a car and take a few residents, she can share the idea in the feature before talking with the management and share the ideas to other floors within the organisation.

Figure 4.16c shows the daily activities, menu and latest news from the organisation, it is included to provide the staff with the information they need in the interaction with the residents. Instead of searching for the information in the places provided today, the assistant nurse could get the information in her phone before entering an apartment of a resident that use to ask for the information. The last three features is a daily and occasional todo-list and a feature for getting information regarding colleagues, they all are shown in Figure 4.17.



(a) Camera feature

(b) Suggestion sharing

(c) Activity feature

Figure 4.16: Camera, suggestion sharing and activity feature. Used to share and document activities, ideas and purchases. The activity feature contains information on today's menu, latest news and scheduled activities.

The daily todo-list in Figure 4.17a, and the occasional todo-list in Figure 4.17b are quite similar, but there is an important difference. The daily todo-list is thought to be used every day to divide the work tasks between the assistant nurses and they could mark the performed ones, whereas the occasional todo-list should contain work tasks not performed every day. The occasional todo-list includes tasks such as water flower, which should be done every week. If there is spare time, the assistant nurses can easily enter this features and see tasks needed to be done. Both the assistant nurses, as well as management should be able to enter and change tasks in the feature. The daily todo-list contains information from the care decision and the implementation plan and shows the tasks every residents needs help with. A feature not possible in this

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interface, but might still be useful is to add photos which appear if a certain entry is clicked. An example of such of entry could be an image of a breakfast plate, as explained in the camera feature.

The last feature included in the application includes information about colleagues. It gets information from the scheduling system to see working personnel and then load images, phone numbers and employment information from other IT-systems. The user could use the feature to search for a number to call for support, a phone number to a certain colleagues, or if the user is new and do not know any names, she can also use the feature to learn names. Information about the contact persons are not included yet, but should be included in this feature.

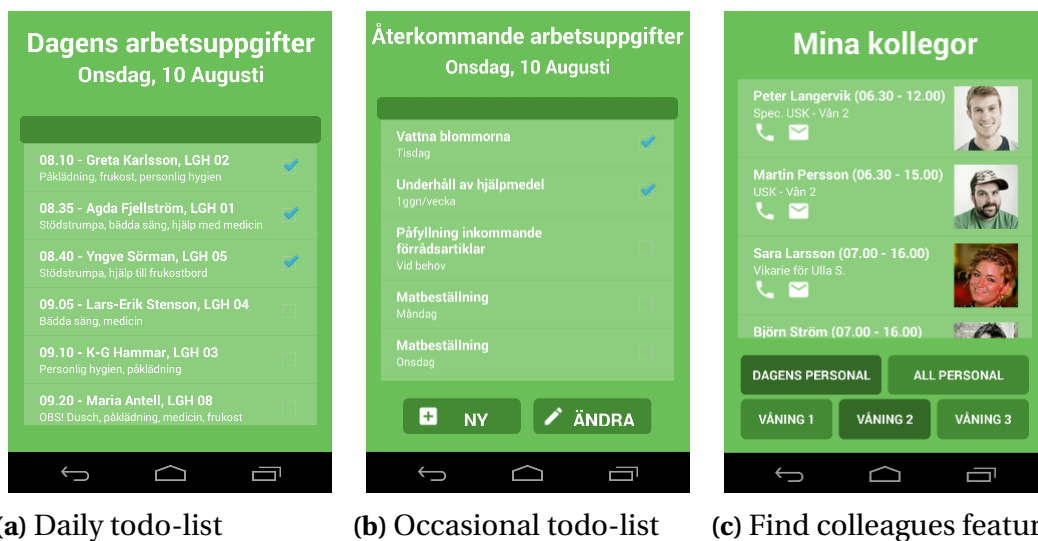


Figure 4.17: Todo-list and feature for finding and contacting working colleagues. The first todo-list is used for daily operations, where the second is used for occasional operation, e.g. water flowers. The photos in the colleague feature are by [49] and [50] licenced under CC BY-NC-ND 2.0 respectively CC BY-NC-SA 2.0.

4.4.1 Prototype evaluation

This section summarize the field study instructor’s input regarding the high-fidelity prototype. The input was collected according to the manuscript found in Appendix D.

The high-fidelity prototype was as well as the low-fidelity prototype given positive response by the evaluating assistant nurse. A solution like this would support the care process and the assistant nurses in their work situation. The usage of the different features is a question of management, it is important that the tools used before the implementation of a system or device is removed, to force the staff to use the new solutions. The most basic functions a work phone must contain is call function, e-mail, messages and alarm, but all the other functions would most probably be used. The none-basic features could be included in a commonly used tablet instead of the phone. However, it would still requires the noting of important information on the arm, or at small paper pieces, which is not preferred.

Every assistant nurse may not use every feature. Some of the features must be used by all employees, where the usage of others may depend on earlier experience of technology and preferred tools to perform different tasks. The interviewed assistant nurse said that she would have used all of the included features throughout the whole day, a translation of her quote, "Only good features, a dream". The checklist features makes the work situation easier for temporary and new employees to find possible tasks to perform. Today many of them perform kitchen tasks when they do not know what to do, and the checklist feature may introduce them to other tasks earlier. The feature provide all employees with information regarding both performed and available tasks, and make it easier to support each other. For example, instead of asking each other if they need help with anything and interrupt each other during the morning routine, the checklist feature can be entered and check if there is any task left to perform. The colleague features was considered an easy and good feature, which could replace today's usage of scheduling binder and lists with phone numbers. Where the camera was consider a good tool for taking photos of information, happenings and for documentation. A question that come up regarding the camera was if everyone should have an own photo collection, or if there should be a common database.

Three different scenarios was investigated during the evaluation, including both how the staff tackle the scenario today and how the might use the phone instead. The section below includes a translation of the question asked in every scenario.

Scenario I

"How do you collect information before a visit at an unfamiliar resident?"

Today: Ask colleagues to get information and tips. May also check the implementation plan, but everything is not noted in details there.

With prototype: Use the checklist feature to get information, but will still talk to the colleagues.

Scenario II

How do you contact your colleague if you get an alarm that you cannot answer and wonder why you colleague have not answered? Note: You do know the colleague you are working with.

Today: Neglect the alarm, which will redirect it to another staff member. If the colleague still does not answer and you do not known the name your colleague. Check the scheduling binder and then search for the phone number or go look for the colleague.

With prototype: Use the colleague feature to find out the ones that is working and call the concerned colleague, might also go and look for the colleague.

Scenario III

How do you go to not forget important information?

Today: Write a note at the forearm.

With prototype: Use the reminder feature in the phone. Could have, for example, reminded herself to document something half an hour before her shift ends.

4.5 eNursing within elderly homes

An eNursing concept of hospital centered care, were stated in a master thesis of last year. To fit the situation in elderly homes, the concept needs some modifications. Care provided in hospitals are more medical centered, whereas the residents at an elderly home needs both medical care and social activities to have a meaningful daily life. Based on the ICT-systems used within the organisation today, Figure 4.18 give a suggestion of an eNursing concept for the specific elderly home.

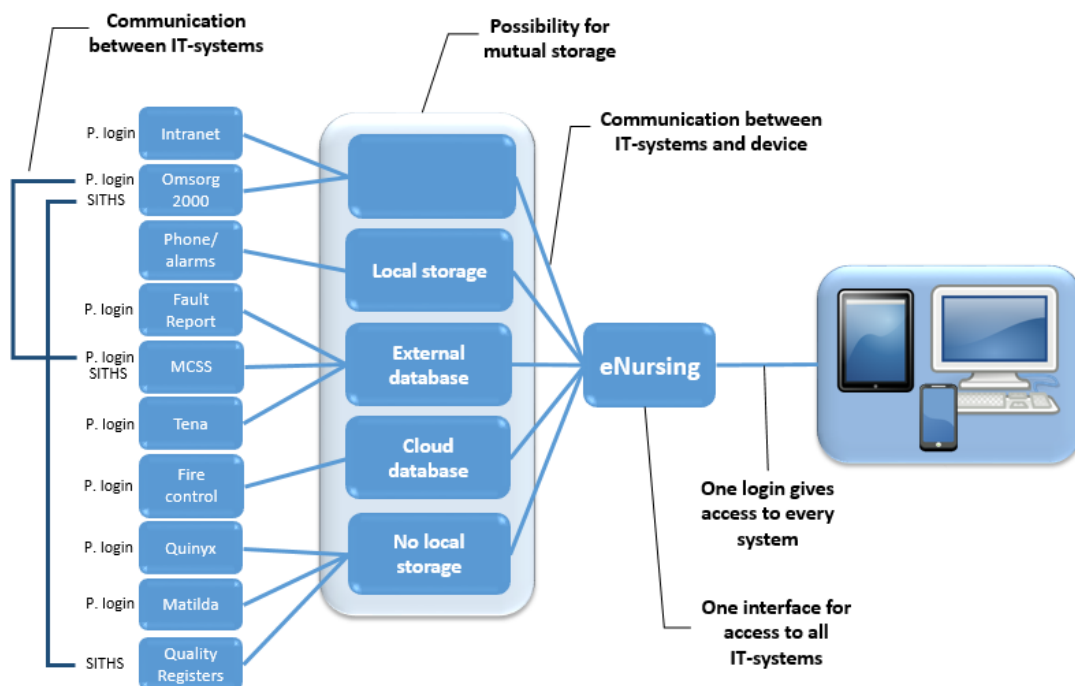


Figure 4.18: eNursing solution adapted to the ICT-solutions used within the investigated elderly home.

The figure shows how the different devices connects the user with an eNursing middle layer, which provides access to all the underlying ICT-solutions. If the device used is carried along the whole shift, e.g. a phone, only one login procedure is required each day. If the device is also used by colleagues, the user must login every time the device is used. The login procedure give the user access to all underlying systems automatically and that will save time for the assistant nurses. Today all systems have separate login's, with different credentials, and there is sometime hard for the employees to keep track

of their credentials. The figure also shows what type of login each system can handle today.

When entering the eNursing middle layer, a common interface appear and show all the included ICT-systems. This interface is shown regardless device, but may show different ICT-systems depending on the used device and the role of the employee. This middle layer is basically an operating system, that automatically load data from the storage unit used for the specific system. As seen in the figure, most of the used ICT-systems have different types of storage units. An eNursing solution should offer mutual storage, where all information can be storage securely.

To make the work situation easier for the assistant nurses, there is a need of communication between the ICT-solutions included in the concept. The number of clicks and entries to be made, should be reduced as much as possible. This can be achieved by communication between systems. For example, the checklist features should be able to access and interpret data from both the scheduling system and the implementation plan in the documentation system. This to reduce the administrative burden and avoid that similar or same information is entered several time. The middle layer should handle the communication between systems and provide the interoperability the systems may lack. Which sets requirements regarding interoperability both in-between systems and the middle layer, as well as in every system itself. All exchanged information must be correctly interpret to create the intended value for the user.

4.5.1 Interoperability

As mentioned in the previous section, a well functioning eNursing system sets requirements regarding interoperability. Semantic interoperability is the ability to correctly interpret and understand exchanged information, whereas technical interoperability is the technology that enables the communication between systems. Legal and organisational interoperability regarding the eNursing concept is not covered in this section.

Figure 4.19 shows which type of interoperability that is required in different parts of the concept. Between the user and the device or the common interface, there must be semantic interoperability, so the user can understand and enter data into the different systems. The devices must then communicate with each system and collect and report information to and from the user, which requires a technical interoperability between the systems and the devices. The systems must then be able to communicate with each other and exchange information, which requires both technical and semantic interoperability between the systems. Depending on the IT-systems included in the eNursing concept, there is a possibility that not every system must be interoperable and exchange information with the others. The IT-system must also both be technical and semantic interoperable with ICT-tools, such as sensors, that might be included in the concept. To save all data the IT-systems store in a secure location, the systems must be interoperable with the storage unit. The system need to be able to collect and add information to the storage unit in a correct way.

To gain interoperability in an eNursing system, the transmissions of data must be structured and coded in a way that is common for the communicating systems. Which is achieved by the use of interoperability standards, the most convenient standard to use in the eNursing concept have not been investigated, and is not included in the report.

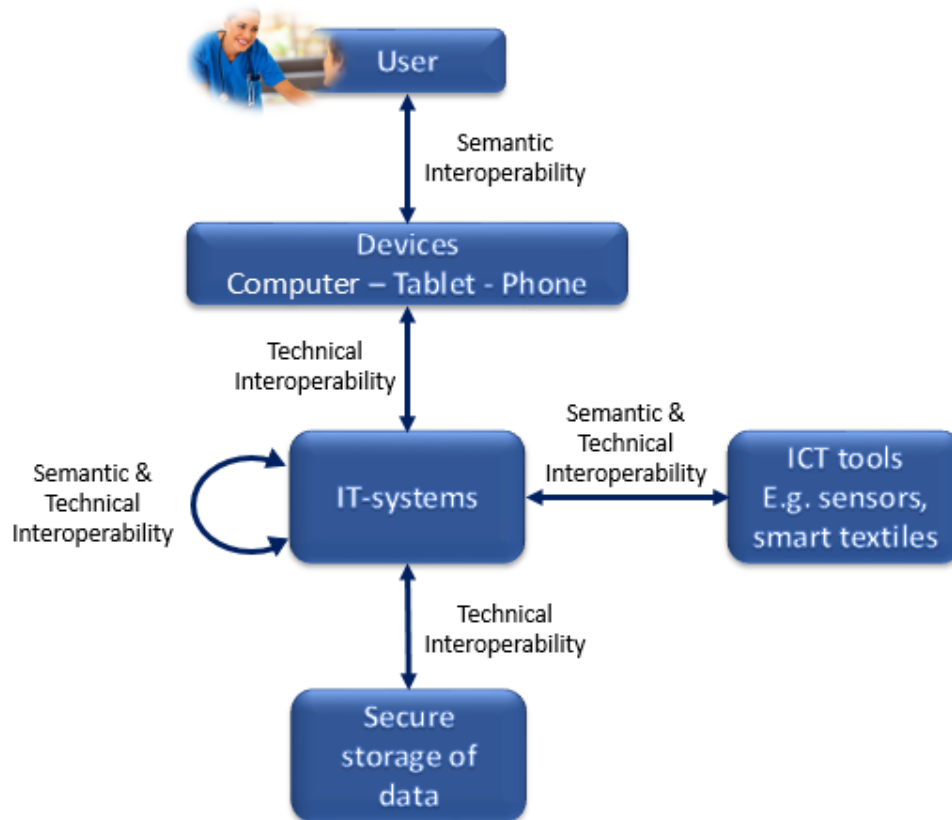


Figure 4.19: Visualisation of the requirement of semantic and technical interoperability between the user, devices, IT-systems, ICT-tools and the storage unit.

5

Discussion

This section discuss the achieved results, methods used throughout the thesis, as well as future aspects. The section includes thoughts about eNursing and its future within elderly care. The achieved results is based on qualitative data collected from the elderly home and the situation may differ if investigating another organisation.

5.1 Used methods

The time spend in the field gave a good understanding of the organisation and their work process, it is unsure if an enlarged study would have effected the end-result. The field study could have been improved with a more planned observational method and a more clear goal formulation. The goal of the field study was not stated as clearly before the study. The process mapping could probably been improved and done more time effectively, if the field study had been performed under more structured circumstances.

The time spent developing the low-fidelity prototype could have been reduced, since a more basic prototype would have shown the concept as well. This was realised after the completion of the prototype and though of during the development of the high-fidelity prototype. This resulted in a high-fidelity prototype with basic functionality, which does not give as much extra input to the concept as planned. The low-fidelity would been enough to state and show the concept, and an usability study might given more valuable input than the development of the high-fidelity prototype gave.

Both the low- and high-fidelity prototypes where evaluated to see if the developed prototypes would facilitate the assistant nurses work situation. The evaluation of the low-fidelity prototype where done with both the examiner, supervisor and an assistant nurse, where the high-fidelity prototype only there evaluated by an assistant nurse. Feedback from the evaluations where positive and the evaluating parties could see potential in the developed prototypes. An usability study, where the prototypes where used in its natural settings could have given input on the usability of the prototypes and further design considerations for future projects. However, that kind of investigation were never performed.

5.2 Commercial eNursing technology

Myco, COSMIC Nova and Phoniro Care, was presented as three commercial eNursing technologies, but neither of them completely match the target group and the solution aimed in this thesis. Ideas from all the investigated systems have influenced the proposed concept, but none of the vendors have a full solution fitted for the situation in an elderly home. Both Myco and COSMIC Nova have solutions fitted for hospital centered care and have included functions that are unnecessary in elderly homes. Apart from easy battery exchange and PBX communication, there is limited benefits with Myco, in comparison to a regular mobile phone.

COSMIC Nova connects different products into a complete solution, as in the proposed eNursing concept. However, solutions as the COSMIC Nova team screens wont be necessary in the same manner in an elderly home. Hospitals have their intense medical care with x-rays, continuously monitoring and examinations, whereas elderly homes have social activities and offer a worthy daily life.

The Phoniro Care system is developed for the whole elderly care sector, but its features is better suiting for home care. Functionality as unlocking doors, tracking of visits and visit time are not as important in an elderly home. However, the checklist provided is an important function both in home care and in elderly homes.

5.3 eNursing concept

Both earlier research within the field and commercial systems, mostly offers hospital eNursing solutions. This thesis focus on elderly care in nursing homes, which is an important healthcare sector that continuously grows. eNursing could be one solution that meets the future needs in the sector. Within elderly homes, the assistant nurse is the one in closest contact with the resident, but she cannot achieve high-quality care alone. Both staff, such as management, nurses and doctors, as well as the relatives are important to make an elderly persons daily life worthy. An eNursing concept should not be designed for a specific profession, rather a sector, even though everyone in the sector will not use every feature.

Several different ICT-solutions are used in an elderly home, each with a separate login and storage method. The law states that resident sensitive information should be stored securely, protected from unauthorized persons and theft. An eNursing concept could collect all data in a shared storage unit and provide a perspicuous situation. eNursing is not meant to provide different features and functionality, rather connect systems from different companies. This sets interoperability requirements on each systems, since both communication in between systems and with the interface must work properly.

An eNursing interface should only include the most basic functions and facilitate the assistant nurses work situation with easily used tools. The use of the concept, should

not increase time spent using ICT-solutions, instead it should liberate time for care work. If the assistant nurses could document happenings, search for phone numbers and get checklist directly in their phone, their time spent in the office and searching for information would be reduced. eNursing should connect several different systems and opens possibilities regarding communications, which the systems alone do not have.

The proposed prototypes delivers solutions that help the staff in reporting sessions, and throughout the day when they perform different activities. The solutions should make it easier to find out what to do and document when different actions have been performed. They should also ensure that important tasks are not forgotten and that the organisation continuously improves and perform important tasks. The usage of the solutions remove the need of binders that requires much work to keep up to date and are not as easy to work with as an ICT-solution. The proposed features in the prototypes have not been chosen to support any specific task, rather support the assistant nurses in everything they do.

All ICT-systems used by the organisation is of importance, but it is unclear if every one of them must be accessible in every device. It might be useful to show different systems and features in different devices, e.g. a feature for writing short documentation in the phone, where changes in the implementation must be done in a computer interface. In eNursing, the process of using every included device, must be streamlined for the nursing workflow.

5.4 Future aspects

The thesis gives a perspective on eNursing within elderly homes and the differences with other healthcare sectors. If an eNursing concept would be developed as whole, the assistant nurses views on the prototypes must be mapped further. Today it is unclear if the actual solution provide the support the profession needs.

As mentioned, not only the assistant nurses should be included in the future solution, the view of other professions must also be investigated. Implementation of an eNursing solution within elderly homes would be a massive project, connecting several IT-systems from different vendors, and providing solutions for all professions involved in the care. The hardest part in such a project would be to connect all systems and make them interoperable with each other, which requires usage of interoperability standards by all the included vendors.

The proposed eNursing concept should be seen as a server and operating system, connecting devices with already existing features. This investigation is a part of a larger project, and deliver an insight in eNursing within elderly homes. The possibility eNursing within other organisation is also investigated, and the concept might be tested as a live system in the future.

6

Conclusion

The elderly care in Sweden is a growing sector and it is important to meet future needs. eNursing is a concept that can be used to facilitate the work situation of assistant nurses and other professions within the field. Which features that should be included in a concept must be further investigated. eNursing in elderly homes differs from other healthcare sectors, because of the long-term stay of the residents and the importance of making their every-day life worthy and enjoyable. A well-functioning eNursing concept in elderly homes should be easy to use and enhance and facilitate the personnel's daily work situation. Both features such as colleague communication, reminders, phone book, messages, as well as checklists, daily information and documentation must be involved in a solution. All the systems used in the explored elderly home is of importance, but all may not be needed to use in each device. Both an eNursing concept, as well as a high-fidelity prototype of a phone interface have been suggested in the thesis. eNursing should introduce communication possibilities through interoperability, which different ICT-systems do not have on its own.

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A

Field study preparation

Fältstudie

Målbeskrivning

Denna studie genomförs för att få en ökad förståelse för det dagliga arbetet på avdelningen, samt för att få en insikt i hur olika tekniska IT-system används i arbetet. Under studien kommer jag att skugga personalen, främst en specifik USK. Detta för att observera och dokumentera den aktuella USK och hennes vårdteams rutiner. Studien ska också ge en insikt i förbättringsmöjlighet och hur personalen tror de kommer att använda IT-lösningar i arbetet i framtiden. Under utförandet av studien kommer observationer att dokumenteras skriftligt för att sedan utvärderas och lägga grunden för utvecklingen av ett koncept som ska vara personalen behjälpligt i deras dagliga arbete.

Att tänka på under utförandet

- Fråga om arbetet medan det utförs och be personalen beskriva vad de gör.
 - Följ personalen runt - se vart det går, vilka de interagerar och samarbetar med.
 - Anteckna allt som pågår, reflektera kan du göra senare.
"Min data är det jag observerar och informationen jag får utifrån det".
 - Vad berättar personalen?
 - Vilka besöker de (boenden & annan personal)?
 - När och var besöks dessa?
 - Vad diskuterar personalen med varandra & boenden?
 - Öppna dina ögon, försök observera så mycket som möjligt.
 - Inget är trivialt, bedöm inte om det är intressant eller inte.
 - Det handlar inte om mig, utgå från personalens perspektiv.
 - Kom ihåg att personalen lär mig om deras arbete, visa uppskattning.
 - Det sker alltid "arbete", oavsett vad personalen gör.
 - Det går inte att påverka informationen som ges och det finns alltid mer att hämta.
 - Oftast spenderas för mycket tid på att inhämta data och för lite tid att fundera över den.
 - Försök få en förståelse om hela organisationen, det som studeras är bara en liten del.
 - När det oförutsedda händer uppstår strukturer/arbetsätt i arbetet som inte normalt används.
-

Frågeställningar att besvara

- **Normal arbetssituation**
 - Hur ser de dagliga rutinerna ut?
 - Vilka är arbetsuppgifterna?
 - Hur mycket tid spenderas vid varje uppgift?
 - Vilka rutiner återkommer vecko/månadsvis (ej. dagligen)?
 - Bruka några glömmas bort/vara svåra att komma ihåg?

B

Process map evaluation

Frågor till Therese 19/4

Arbetsuppgifter

Stämmer de olika arbetsuppgifterna jag lagt till under dagen? Ska något adderas/ ta bort?

Korrigerat

Har ni fler "övriga" arbetsuppgifter än de jag har nämnt? Vilka?

Fixa färgsystem till schema, skriva ut/om schema, kringsysslor (vattna blommor, fylla på sådant som är slut, beställa mat/annat, felanmäla), städa kontaktpersonsrum (1ggn/3 veckor – damma osv.).

Morgonrutiner generellt: Skulle du säga att ni arbetar så här?

Överlämning mellan skift

Vad brukar ni generellt ta upp under morgonmötet?

Rapport från natten

Rapport från SSK

Kolla i kalendern, är det något speciellt idag.

Schemapärm + Morgonpärm

Sker det muntlig rapport mellan natt - dag, dag - kväll och kväll - natt. Vad tar ni upp då?

Yes, om det är något speciellt som hänt. Går igenom alla boende och berättar om det är något specifikt. Samt annan information som nästa skift kanske inte har fått.

Är morgonmötet enda gången på dagen alla som jobbar samma pass är samlade på ett möte?

Ja, om det är inte möten för hela verksamheten.

Arbetsfördelning

Hur är personalen fördelad under dygnet?

Som jag har förstått är ni 1 person på 4 boende på morgonen + 1 löpare, sedan 2 personer på 3 våningar under natten.

Finns det 1 dubbellgh på varje våning? Alla våningar har 16 lgh, två av våningarna har dubbellägenheter

SSK vs. USK

Generellt vad skiljer det sig i ert och SSK arbete?

(vårdarbete, linda ben, medicinhantering, uppföljning)

Hur sker informationsutbytet mellan er och SSK?

IT-system

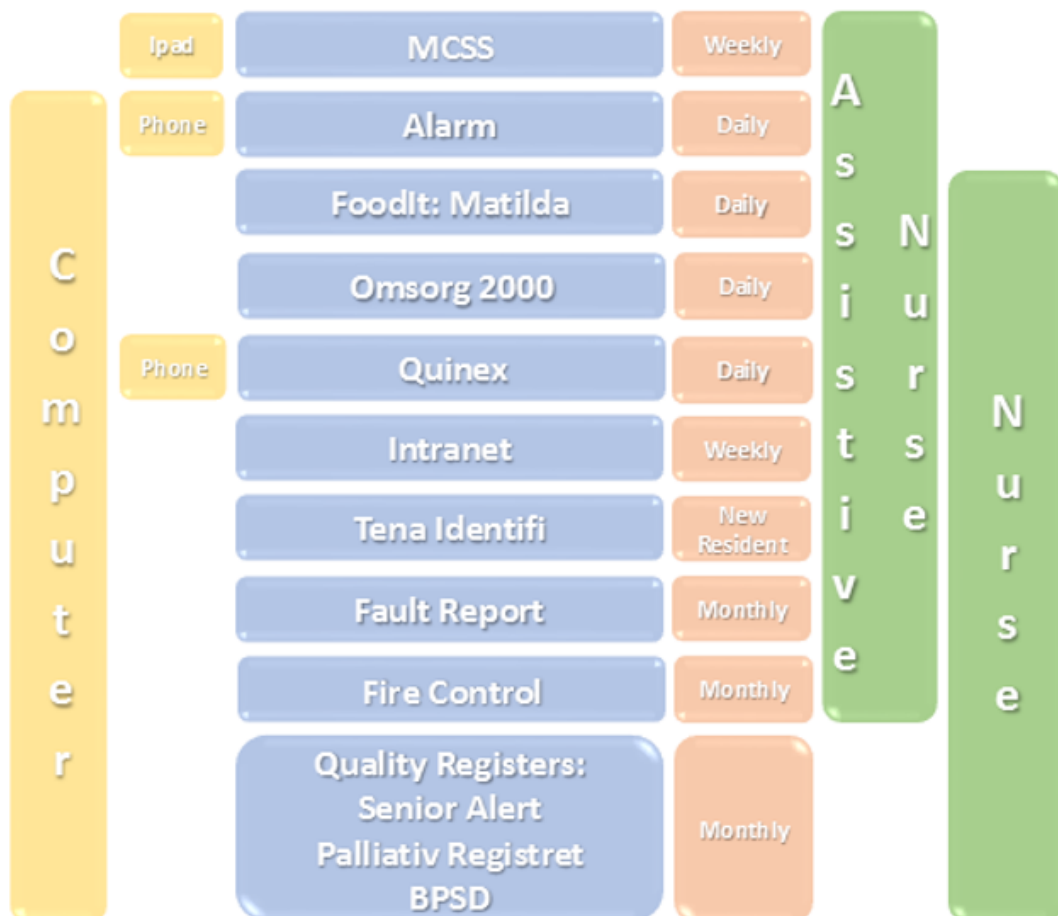
- IV Larm: Alla typer av larm kommer till telefonen (dörr, säng, medicin)?
Bara USK som har larm funktion?

FoodIT: Bara USK som använder programmet?

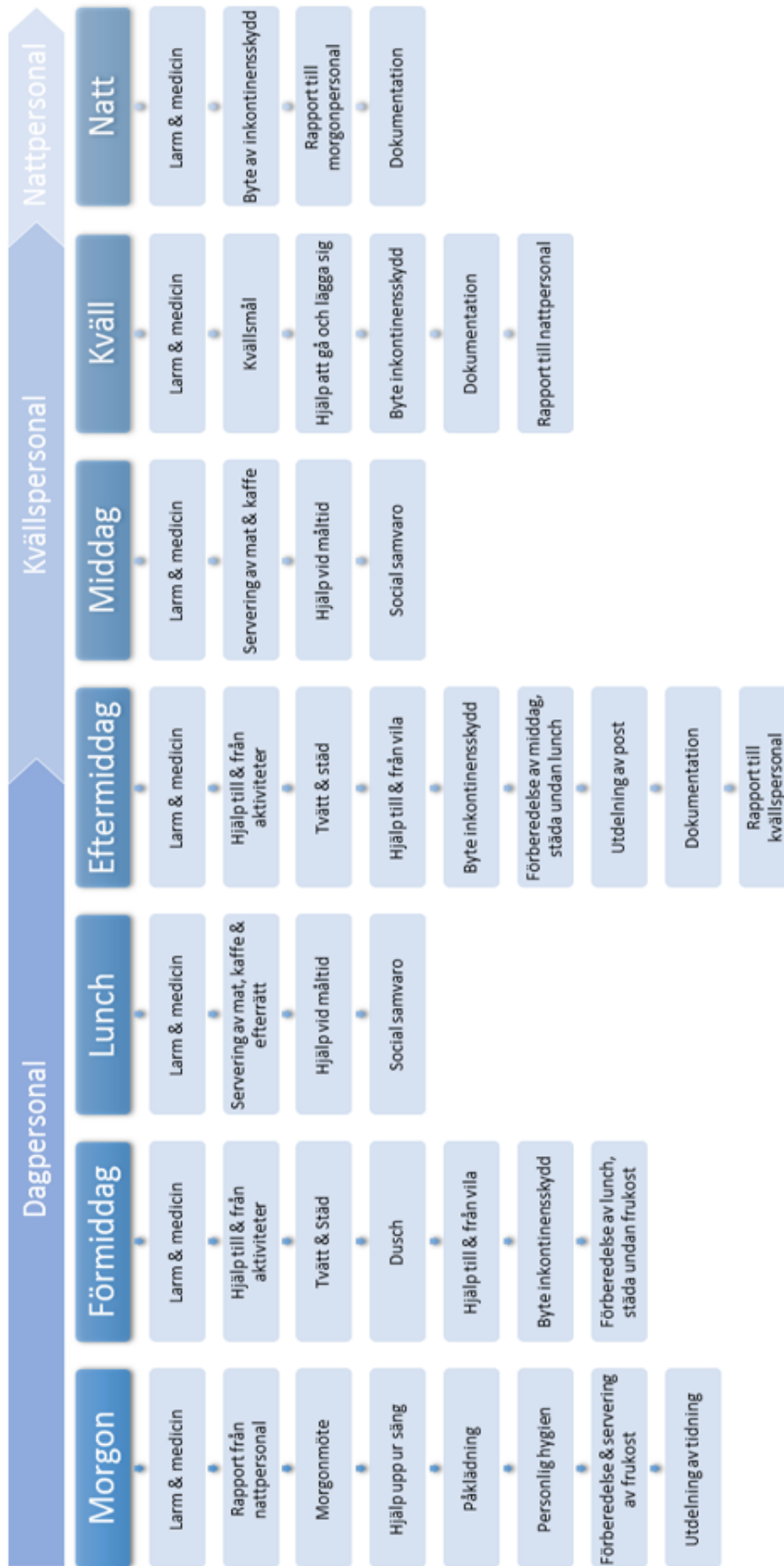
Kvalitets R: Vilken personal använder det?
Hur ofta?
Hur fungerar det?

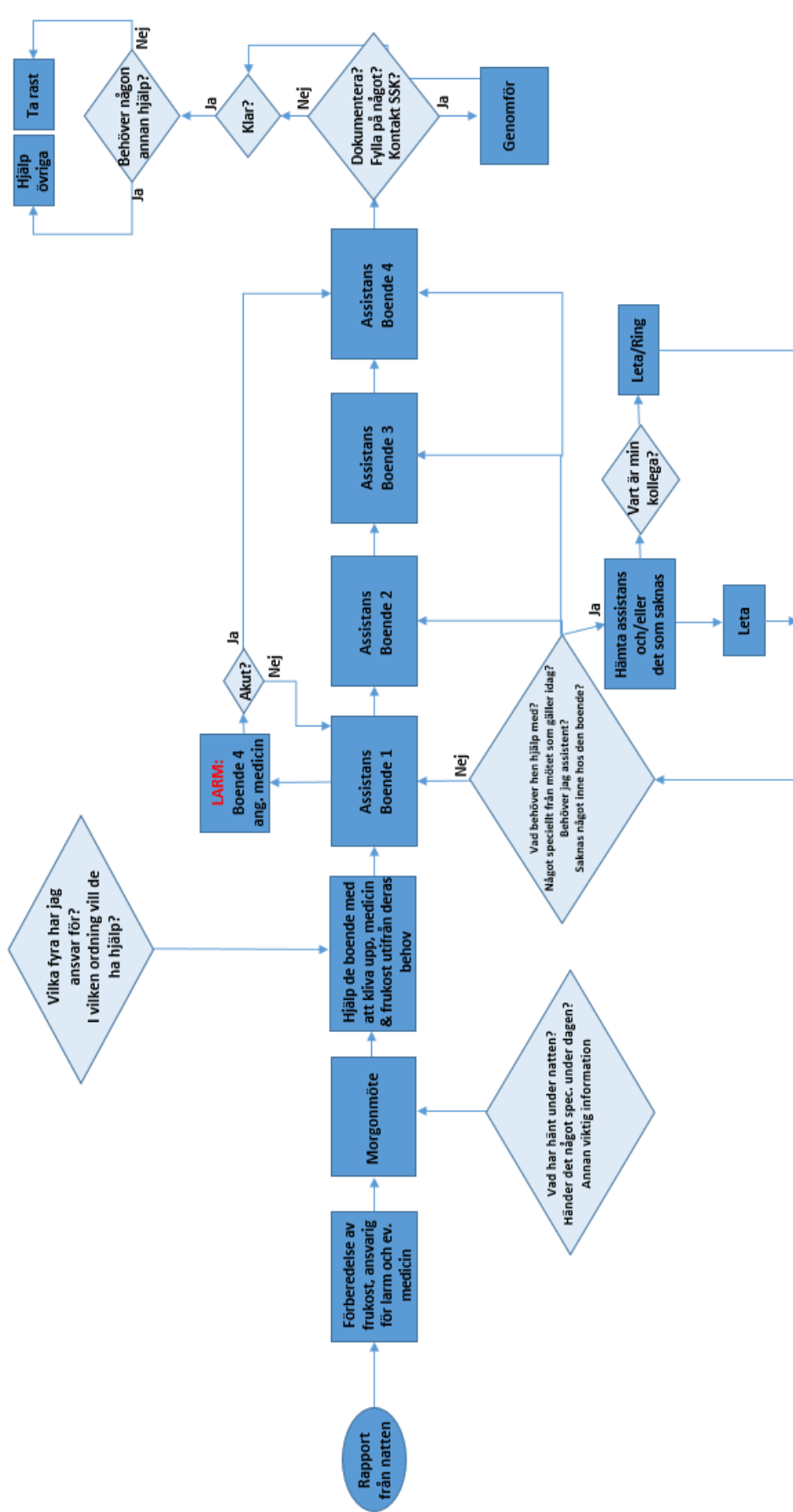
Brandkontroll: Vilken personal?
Vad är det?
Hur ofta?

Telefon: Måste man logga in?



B. Process map evaluation



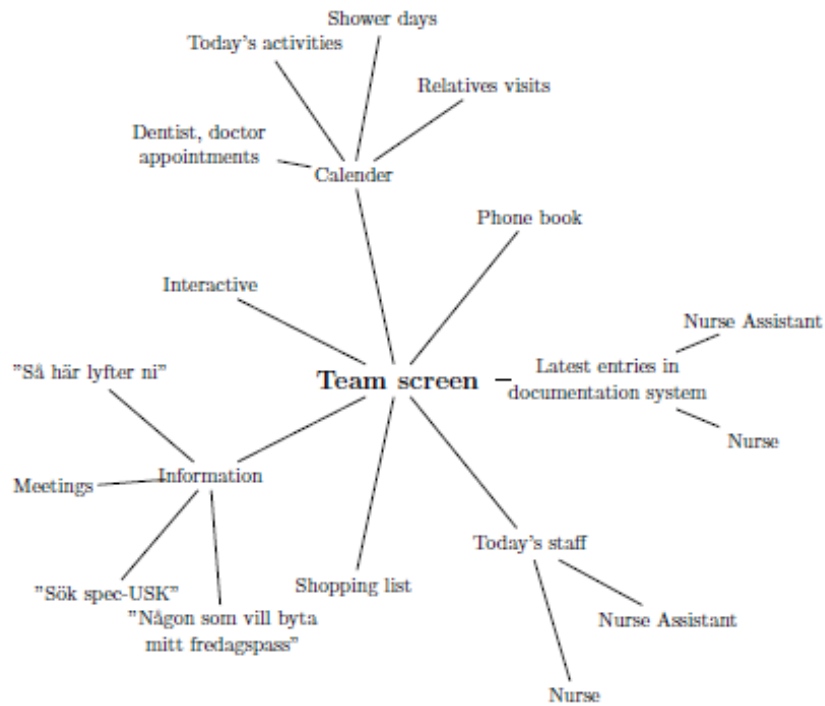
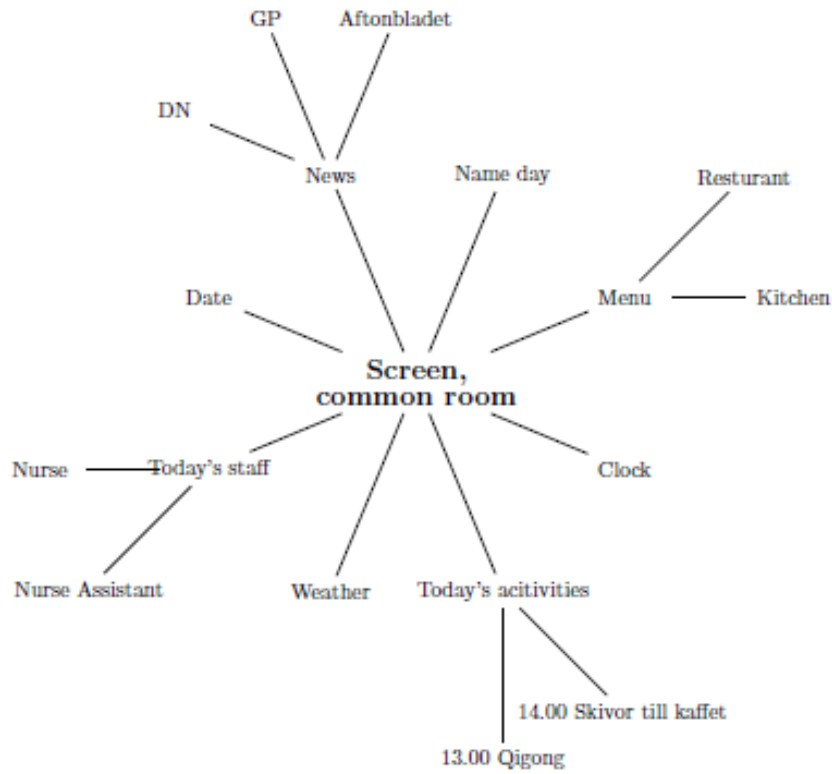


C

Low-fidelity prototype mind maps



C. Low-fidelity prototype mind maps



D

Low- and High-fidelity prototype evaluation

Utvärdering av prototyperna

Målformulering

Hur upplevs prototyperna av brukarna, innehåller de funktioner som hade varit användbara eller saknas någon funktionalitet. Gör en kontroll på hur användarvänlig prototypen verkar vara.

Utförande

Tidsåtgång: Maximalt 90 minuter

Utrustning: Pappersprototyp, telefonprototyp i emulator, inspelningsutrustning i mobil, anteckningsblock & penna.

Steg I - Pappersprototyp

Presentera pappersprototypen och dess olika delar.

Mobil - Surfplatta personal - Surfplatta boende - Informationsskärm

Utvärdera varje del av prototypen separat.

- Hur tror du att prototypen hade använts?
- Hur ofta?
- I vilken situation hade respektive lösning använts?
 - Mobil - Kontinuerligt i dagligt arbete
 - Surfplatta personal - Vid överlämningar
 - Surfplatta boende - Kontinuerligt under dagen
 - Informationsskärm - Istället för pappersinformation

Steg II - Telefonprototyp i emulator

Presentera prototypen och dess olika delar, låt brukaren klicka runt själv.

Undersök hur lättanvänd prototypen är och om den uppfyller de önskvärda funktionerna

Scenariotest, "Tänk högt"

Du ska arbeta morgonpass på en ny våning, där du varken känner de boende särskilt väl eller den övriga personalen. Du har fyra boenden du är ansvarig för under morgonen. Hur går du tillväga för att samla information innan du besöker den första boende?

Går in i den funktionen för dagliga checklist och hämtar information under det aktuella besöket.

Du får plötsligt ett larm från en boende som inte är ditt ansvar och du håller precis på att duscha din aktuella boende. Vad gör du?

Kontrollera vilka övriga som arbetar och kontaktar den ansvarige personen.

Den ansvarige personen har inte möjlighet att hjälpa till vid larmet. Du hjälper din aktuella boende att bli färdig i duschen, för att sedan besöka den boende som skickat larm. På väg till den boende inser du att glömt sätta på stödstrumpor, samt att den boende sagt att den vill boka klipptid. Du vet inte hur rutinerna om någon vill klippa sig fungerar och behöver därför höra dig för. Hur går du tillväga för att inte glömma detta?

Skriv en påminnelse i telefonen, alternativt skriv en påminnelse till morgonmöte el. till ordinarie personal.

- - - - -

Steg III - Utvärdera telefonen

- Vad tyckte du om prototypen?
 - Bra funktioner?
 - Mindre bra funktioner?
- Finns den några funktioner som saknas i prototypen?
- Är de några av de befintliga funktionerna som du inte tror kommer bli använda?
- Upplevs lösningen enkel att använda?
- Vad tycker du är viktigt att tänka på i den fortsatta utvecklingen av en arbetstelefon?

Acronyms

DECT - Digital Enhanced Cordless Telecommunications

ICT - Information and Communications Technology

IEEE - Institute of Electrical and Electronics Engineers

IE11 - Internet Explorer 11

PBX - Private Branch Exchange