KAMK • University of Applied Sciences

B

Smart Solutions for Wellbeing Service Development and Management

– developing health care innovations in multidisciplinary student teams 3.0

Härkönen Jaana (ed.)

Smart Solutions for Wellbeing Service Development and Management

– developing health care innovations in multidisciplinary student teams 3.0

Härkönen Jaana (ed.)

Kajaani University of Applied Sciences publications series B

Reports and surveys B 141

Contact:

Kajaani University of Applied Sciences Library

PO Box 240, 87101 KAJAANI

Tel. +358 44 7157042

Email: amkkirjasto@kamk.fi

http://www.kamk.fi

Kajaani University of Applied Sciences publication series B 141 / 2021

ISBN 978-952-7219-95-9

ISSN 1458-9141

Content

Preface

The 5-ECTS course on 'Smart Solutions for Wellbeing Service Development and Management', planned by lecturers at Kajaani University of Applied Sciences (KAMK) and Neu-Ulm University of Applied Sciences (HNU), was organized for the 4th time in spring 2021. Due to the Covid-19 pandemic, new teaching strategies were explored, and the course was organized fully online using different technological solutions. Collaboration is crucial to solve challenges in uncertain times.

The general theme of the 2021 International Week at KAMK was 'We Shape the Future'. The theme is closely linked with meta-skills needed for learning to study. Digital skills, interaction, creativity, networking, resilience (flexibility and anticipation), ethicality, self-regulation and entity management are meta-skills that originate in world-changing megatrends. (Alasoini 2020.) Utilization of digital solutions and platforms, innovation competence, and management and control of digital operations are only a few of the meta-skills named as the most important generic competences and skills in 2035 by the Finnish National Agency for Education (Osaaminen 2035 2019, 29).

As the pandemic forced teaching to be shifted onto online, virtual platforms, teachers had to learn to use new teaching methods and digital solutions. It was no longer possible to organize courses as before; therefore, teachers needed to explore the possibilities that technology offered to find the best one for their courses. One example of this shift to online, virtual teaching was the 2021 International Week as the whole course and related study processes had to be replanned completely.

Besides digital competence, creative problem solving, collaborative learning, self-management and entity management were skills that students needed to share their knowledge and experiences in webinars, OneDrive, WhatsApp groups etc. The results of a survey Samok, the Finnish UAS students' organization, indicate that students' coping and motivation decreased and experienced stress increased during the pandemic and period of distance learning (AMK-opiskelijoiden kokemuksia etäopiskelusta 2020). The shift to distance learning was successful, but it affected the quality of teaching. Teachers' ability to show empathy was considered meaningful. Flexible learning tasks and timetables supported distance learning. (Moisio, Puhakainen & Vehkaperä 2020.)

Technology promotes the fast transfer of information and introduction of new digital tools; yet it is important to consider how other issues related to course content and objectives can be achieved. How can we create trust, communality and social commitment when students have different cultural backgrounds, come from different universities and do not meet each other face-to-face? As distance learning has become a permanent part of education, teachers must be able to facilitate interaction among students and between students and teachers in digital environments in which those students who find studying easy usually succeed best. The importance of meta-thinking is emphasized if digitalization helps to use it more diversely (Pentikäinen 2014).

Returning back to contact teaching does not mean returning back to previously used teaching and studying strategies. Distance learning does not only refer to classes on Teams and monologic narratives. Our world has changed, which has to be reflected in teaching and studying. As teachers act as 'interpreters' to their students, they need to keep up with the times and create perspectives into the future. Perhaps of the future purpose of this course is to introduce collective, individual, and global perspectives in the spirit of 'We Shape the Future'.

Kajaani 9 August 2021

Rauni Leinonen, Kirsi Moisanen, Aleksander Würfel and Jaana Härkönen

Sources

Alasoini, T. 2020. Millaista osaamista tarvitaan tulevaisuuden työelämässä? Retrieved 11.6.2021 https://www.arpeeti.fi/millaista-osaamista-tarvitaan-tulevaisuuden-tyoelamassa/

AMK-opiskelijoiden kokemuksia etäopiskelusta. 2020. Kooste opiskelijakuntien toteuttamien kyselyiden tuloksista kevään 2020 poikkeustilanteesta. Samok: Helsinki. Retrieved 11.6.2021 https://samok.fi/wp-content/uploads/2020/05/amk-opiskelijoiden-kokemuksia-etaopiskelusta.pdf_.pdf

Osaaminen 2035. 2019. Osaamisen ennakointifoorumin ensimmäisiä ennakointituloksia. Raportit ja selvitykset 3. Opetushallitus: Helsinki. Retrieved 9.8.2021. https://www.oph.fi/sites/default/files/documents/osaaminen_2035.pdf

Moisio, H., Puhakainen, E. & Vehkaperä, H. 2020. Kokemuksia etäopiskelusta koronapandemian aikana. eSignals. Retrieved 9.8.2021. https://esignals.fi/kategoria/opiskelu/kokemuksia-etaopiskelusta-koronapandemian-aikana/#619d1a70

Pentikäinen, L. (toim.) 2014. Katsaus suomalaiseen työn tulevaisuuteen. Työ- ja elinkeinoministeriön julkiasuja. Työ ja yrittäjyys 30. Helsinki. Retrieved 11.6.2021 https://tem.fi/documents/1410877/2859687/Katsaus+suomalaisen+ty%C3%B6n+tulevaisuuteen+09092014.pdf

1 Smart Solutions in Wellbeing Service Development and Management

Wűrfel Alexander, Professor, Dr., HNU, Germany
Leinonen Rauni, Principal Lecturer, KAMK, Finland
Moisanen Kirsi, Senior Lecturer, KAMK, Finland

1.1 Background

The recent years and the Covid 19 pandemic have made it clear that the digitalisation of health care is still in its infancy. At the same time, the tension between medical care and digitization of care processes, on the one hand, and data protection and data security, on the other hand, has become more announced. The pandemic has clearly demonstrated the potential of digital solutions and future fields of action in the health care sector. Finding innovative and integrative approaches to health care is becoming increasingly important. And these can only be developed in an interdisciplinary manner if they are to be sustainable.

The importance of the external factor (human factor) in the health care system has also been demonstrated. The pandemic has moved beyond the usual threat scenarios. People are not used to seeing everyday situations as critical or threatening. It is difficult to see friends, relatives and other close persons in the context of life-threatening scenarios. Not least have the outbreaks in retirement homes and hospitals exemplified this problem. New demands have also been placed on health care personnel. In certain situations, personal social care is often no longer possible and social contacts are strictly limited.

Especially in these situations, it became clear that digitization also offers new options in this context. Secure access to care facilities via apps makes it easier to monitor visitors. If visits involve a lot of effort (e. g. registration), circumvention of these access restrictions becomes more likely. Digital test and vaccination certificates can ultimately enable contactless identification and access control.

In the same way, video conferencing, which had previously been used almost exclusively in the professional context, has found new fields of application. Potentials in the field of health care services have clearly been highlighted, as well as opportunities in maintaining social networks for i.e., older people or risk groups.

However, social distancing shows the importance of physical human interaction as well. The pandemic-induced situation, thus, has also highlighted the limits of digitization. To deal with this entirely, an interdisciplinary perspective is needed, which should also include sociological and socio-psychological perspectives. Digital communication technologies are changing the perception and perceptibility of communication partners. Especially the relationship aspect of human communication as described by Watzlawick and Beavin (1967, 4-8) needs nonverbal communication, which requires perceptibility. In videoconferencing, only limited non-verbal communication is possible ("talking heads"). For example, often the participants do not know who is watching whom. This is always the case with a given physical presence and can be controlled by the participants or used in communication. Virtual scenarios might be an option here (eg. Mysteeri 24/7 hankesuunnitelma 2019), but today they are always more manipulative than direct human interaction.

The collaborative course 'Smart Solutions in Wellbeing Service Development and Management' of Kajaani University of Applied Sciences (KAMK) and Neu-Ulm University of Applied Sciences (HNU) has been organized since 2018. The basic idea is to develop innovative digital solutions in a practice-oriented manner. The last few years have made it abundantly clear what potentials arise from digitization in a wide range of areas.

1.2 Methods

Already in 2017/18 and 2018/19, Kajaani University of Applied Sciences (KAMK) and Neu-Ulm University of Applied Sciences (HNU), students of the Master's degree in Social and Health Care and students of the Bachelor's degree in Engineering (information and communication engineering) from KAMK as well as students of the Bachelor's degree programs in Business Administration and Health Management and Health Information Management from Neu-Ulm developed innovative projects in the context of 'Smart Solutions in Wellbeing Service Development and Management'.

The collaboration had to be put on hold in 2020 due to the Covid-19 pandemic. The initial concept of the course included short-term physical mobility of the participating lecturers and students i.e., visits to Kajaani and Neu-Ulm. This was not possible in 2020. Since there was no significant improvement in the framework conditions for 2021 and the International Week at KAMK in Kajaani was organized in March 2021 as a virtual event, the idea arose to realize the course as virtual collaboration.

Unlike in the previous courses, the lectures were limited to one semester (March to June 2021). In addition, the students of the Bachelor's degree in Engineering (information and communication engineering) from KAMK and students of the Bachelor's degree in Health Information Management from Neu-Ulm were not involved.

As in the previous courses, students of the Master's degree in Social and Health Care at KAMK developed the initial ideas for the innovation projects. The innovations were significantly based on the students' practical experiences, which provided the direct practical relevance for the innovations. These ideas were then analysed and further refined from economic and technical perspectives in virtual workshops by students who took part in the virtual International Week at KAMK.

In addition, impulse workshops in the International Week provided students with further ideas and tools that could be incorporated into the project ideas and helped them realizing the project management. As a result, interdisciplinary projects have been realized that are highly relevant to practice, technically feasible and make also economically sense.

The course instructions describe the content of the course as follows: The course was based on blended learning from March 2021 to May 2021 and included two presentation workshops at the end of March 2021 and the end of May 2021. In the first workshop, the students presented their agreed final project idea and showed how they would implement the project further in the coming months. For this purpose, a work breakdown structure, milestones, and work packages were drawn. In the second workshop, the final projects were presented. The final drafts for an article (publication) were presented afterwards.

A first draft of the article was due in early May. Throughout the project, the lecturers provided coaching according to the needs of the individual groups. Coaching included both professional and team-oriented content. Interdisciplinary and intercultural collaboration was considerably hampered by the exclusively virtual communication. While in the previous courses interactive group discussions were possible during the onsite phases in Kajaani and Neu-Ulm, these had to be substituted in the given framework conditions of the virtual cooperation. This was successful overall, although not without friction losses.

1.3 Results

As in the previous courses, the teams used their innovations to address existing problems. In the first approach, this naturally resulted in a strong influence on the projects by the Finnish health care system and the given frameworks there. However, interdisciplinary and international collaboration resulted in a profitable generalization of the problems. The innovations, thus, gained a high degree of transferability to other contexts of use. Subsequent projects have been worked on.

The first innovation can be seen as a relatively classic digitization project. Derived from practice, pharmaceutical waste in a smaller hospital pharmacy was considered. Expired shelf lives of medicines lead to considerable economic losses. The idea behind the innovation was to keep the stock smaller by improving the management of the stockpile and, thus, counteracting waste. This implies a closer integration of patient management and medication supply systems. In the case of patient admission, necessary medicines must be recorded in advance and checked against stocks so that medicines can be ordered from pharmacies at larger hospitals. If necessary, fast deliveries are made. A second necessary interface arises from the treatment of patients in the hospital itself. Medicine requirements are to be recorded prospectively to, for example, surgeries and included in medication management. Furthermore, the system itself can be implemented as a 'self-learning system' by continuously recording inventory changes (orders, consumption) and thus optimizing order quantities as well as inventory levels.

The second smart solution also has its roots in the context of hospital care and focuses on the documentation of patient care. In practice, the problem arose that the nurse does the documentation by the patient's bed. In this situation the nurse cannot really address the patient. Patients may have the feeling of being more of an object than a reference person. Language-based documentation was considered as a solution. The Nurses Pocket Secretary (NPS) can document vital parameters while the nurse is communicating with the patient. No other parallel device, such as a tablet, is needed. The care of the patient is, therefore, more immediate. However, this implies special data protection requirements in case there are several patients in one room.

In addition to hospital treatment, care processes also appear in outpatient or home environments. This is the focus of the third innovation. In practice, home care always involves the coordination of different social services and professionals (nurses, therapists, social workers etc.). Therefore, it is often useful for those involved to coordinate their actions with each other or with the patient's relatives. This is exactly where the Kytkettix innovation comes in. It can be described

simply as a patient-specific appointment planner. Therapists and social workers gain transparency and can coordinate or make appointments using Kytkettix, which enables the optimization of treatment processes and improves communication between different actors. In this context, the project also considers data protection and allocation, and elaborated identity and access management of the people involved.

The fourth innovation developed during this course looks at a completely different context. Last but not least, the pandemic made it clear that work environments will become more and more important in the future. Virtual collaboration will replace a multitude of face-to-face meetings and increase the importance of home offices. But the cohesion of groups and teams is strongly influenced by the interaction and perceptibility of the participants. One example is the random conversation at the doorway in the office. The informal exchange, the small talk, consolidates group structures. In the early 1970s Granovetter described the “strength of weak ties” which can also be observed in today’s organisations. Only a few of these mostly random interactions would be the reason for a virtual contact. Having less interaction and spontaneous communication in virtual meetings does have an impact on the cohesion of and identification with the team. Team-building events aim to initiate a team feeling that is sustainable in everyday life. The innovation ‘Digital platform TTT – Team, Trust, Training’ tries to transfer a corresponding team building into virtual space. In the initial phase, the innovation was designed as a platform to provide interested companies with an overview of possible offers. Application scenarios are games or meetings in virtual rooms that are to be managed by the actors (e. g. virtual escape room scenarios).

1.4 Discussion

The four innovations cover different areas of the digitization of processes in the health care sector. While the optimization of medicine supply has a high direct implementation character and a very strong IT component, the other projects focus mainly on communication.

Language-based documentation changes bedside care processes and communication with patients. The Kytkettix application focuses on improving communication between actors as patients can interact directly with caregivers and therapists. Care processes are better coordinated, and care can be better designed for the patient. In addition, nurses have more time to spend with patients as they have fewer routine or administrative duties; the quality of care improves as the time spent with the patient can be better used. Both applications require the definition of access

rights. Particularly in the coordination of appointments, there is a need to involve the patient in the coordination processes and not to coordinate appointments bypassing the patient. This would degrade the patient (again) to a passive object of the care services. At least close coordination with the patient himself or with trusted persons (e. g. relatives, caregivers) seems to be essential.

The fact that team building in distributed or virtual environments is gaining importance is a finding that has been brought into focus not least by the pandemic. As already shown, the absence of physical presence and interaction is also associated with the absence of spontaneous interaction in the professional environment. As a result, contacts in teams are more limited to the professional context and usually also reduced in numbers. Virtual spaces as interaction spaces could be a basis for counteracting this. Although the TTT innovation focuses significantly on planned events, the question remains whether random encounters can also occur in virtual spaces. It would be conceivable, for example, to design virtual cafeterias or campus grounds to replace corresponding physical spaces and enable, for example, spontaneous meetings during breaks.

The innovations show the potential of interdisciplinary teams. Although the IT perspective was not so strongly represented in this project, complex projects were introduced as the following articles indicate. Through their interdisciplinary perspectives and practical input, the participating students gained a new perspective to problems and gained valuable insights into project management in interdisciplinary teams.

The students were initially critical of the obligation to submit a detailed project plan by the end of March. However, it is precisely these formal requirements that must be regarded as very helpful in hindsight. It was, thus, possible to initiate the virtual cooperation well, since a high level of contact was essential for the teams, especially in the initial phase. The division of work packages also contributed to a good individual work organisation, which took into account the different context factors of the students involved (continuing education, full-time student).

After all, the implementation of the course as purely virtual collaboration can be considered a success. This may also be due to the fact that the interdisciplinarity of the project was reduced as students of the Bachelor's degree in Engineering (information and communication engineering) from KAMK and students of the Bachelor's degree in Health Information Management from HNU were not involved. Because of this coordination and communication processes were somewhat easier.

Although the innovations are very well developed, the intercultural experiences and the personal contacts of the students were not the same as in the previous courses. Therefore, we hope that

the course is organized in the classical way, including exchanges/ visits in the partner countries, in 2021/22.

Sources

Granovetter, M. S. 1973. The strength of weak ties. In: American Journal of Sociology 78(6), 1360-1380.

Mysteeri 24/7 hankesuunnitelma. 2019. Kajaanin ammattikorkeakoulu. Kajaani.

Watzlawick, P. & Beavin, J. 1967. Some formal aspects of communication. In American Behavioral Scientist 10(8), 4-8.

2 Reducing Pharmaceutical Waste in Suomussalmi Health Center Hospital

Moilanen Virve, Master of Health Care, KAMK, Finland
Rasp Marius, Business Studies in Healthcare Management, HNU, Germany
Simsek Mehmet, Business Studies in Healthcare Management, HNU, Germany
Leinonen Rauni, Principal Lecturer, KAMK, Finland
Moisanen Kirsi, Senior Lecturer, KAMK, Finland
Wűrfel Alexander, Professor, Dr., HNU, Germany

Abstract

This article discusses pharmaceutical waste in hospitals. The goal is to introduce different possibilities to prevent the excessive pharmaceutical waste to improve the efficiency of the ordering process and to minimize costs. Among other things, this is to be achieved with the help of intelligent medicine cabinets. New processes are also explained using the BPMN concept for the visualization of the process flows. Subsequently, with the help of a SWOT analysis, it is shown which potential risks can arise with this change, but also which possible opportunities this can create on the hospital market. The aim of this article is to find out how to reduce pharmaceutical waste in a hospital ward. The purpose is to reduce costs by reducing pharmaceutical waste.

Keywords: pharmaceutical, waste, technology, management, BPMN, ABC analysis, risk management

2.1 Introduction

The cost of medicines and medical supplies in Finland is 2.6 billion euros every year. Around 3-4% of the prescription medicines remain unused, which means a loss of €95-125 million euros. Artificial intelligence and robotics can be used to improve the distribution of medicines, and advanced patient information systems can increase the safety of drug treatment. The potential cost savings in drug treatment can be estimated at 5-10%. The need to improve health and social services and information management has long been recognized in Finland, and reforms are underway. (Neittaanmäki & Kaasalainen 2018, 21-22.)

The aim of this article is to find out how pharmaceutical waste can be reduced in a health center hospital ward, and the purpose is to reduce costs by reducing pharmaceutical waste. Suomussalmi Health Center has a pharmaceutical waste problem (Table 1).

Table 1. Medicine consumption and wastage in Suomussalmi hospital department (OSTI 2021)

Medicine consumption and wastage	**2020 Costs (€)**	**2019 Costs (€)**	**2018 Costs (€)**
Consumption	40,304.85	85,742.80	120,118.59
Wastage	10,121.80	8,208.68	8,081.25

Medicines are ordered in Suomussalmi Health Center Hospital only on weekdays, and the basic range of medicines is not sufficient. Storage space for medicines is also limited as illustrated in Figure 1 and Figure 2. There are many reasons why medicines are wasted, such as occasional or infrequent use of a particular medicine, death of a patient during hospitalization, too many medicines ordered, too large packages of medicines or too short periods of use. Waste in general is a major problem worldwide as we produce far too much waste. Waste is projected to increase by 75% by 2050. Therefore, solutions are needed one of them being the circular economy. (Dufva 2020, 14.)

Figure 1. Medicine room on Suomussalmi Health Center Ward

Figure 2. Medicine cabinets on Suomussalmi Health Center Ward

In Finland, pharmacies collect pharmaceutical waste from households. It is particularly important to recycle pharmaceutical waste classified as hazardous waste through pharmacies because of the potential environmental impact. (Marttila 2018, 3.) Every year, prescription medicines worth 95-125 million euros are purchased from pharmacies and not used by Finns. The average share of prescription medicines reimbursed by the National Health Insurance is 66%. This means that society's share of the cost of unused medicines is around €63-83 million euros per year. (Lääke-jätettä syntyy jopa 100 miljoonan euron arvosta vuodessa 2016.)

Kainuu Social Welfare and Health Care Joint Authority benefits financially if pharmaceutical waste can be minimized in its units. Finnish society needs ways to reduce the costs of social and healthcare services. The welfare state is facing major changes in the future. Any innovation that reduces costs is very welcome in Finland. (Sote-uudistus 2021.)

The use of automation technology in health care has increased in Finland. It is possible to automate medical treatment with the help of artificial intelligence (AI). By exploring and understanding AI research, we can begin to understand the potential of AI technology for health care. AI also contributes to patient safety. (Kärkkäinen, Vähäkainu, Neittaanmäki, Uimonen & Hänninen 2018.)

2.2 Managing Virtual Teams in a Project

Remote working enabled by ICT is also reflected in the way projects are organised. Increasingly, project organisations are being organised as geographically dispersed virtual teams, and project teams can spread across several countries. However, the management of virtual teams has its own characteristics. Virtual project organisations are best suited to dynamic and complex environments where flexibility and adaptability are of paramount importance. Instant and seamless communication within a project organisation is one of the challenges a virtual team organisation may face even when electronic connections work and face-to-face interaction between people help to keep them on the same wavelength. To function properly, virtual teams need guidance that supports virtual team activities and clear management and reporting practices. Names, contact details and photos of team members should also be available, and the responsibilities of each team member should be clearly defined. The virtual team should have consistent working methods and practices. Procedures should also be standardized to reduce confusion. (Mäntyneva 2016, 27.)

Our project team consisted of one Finnish student from Kajaani University of Applied Sciences and two German students from Neu-Ulm University of Applied Sciences. The Finnish students developed ideas for innovations and the German students were given the choice of which idea they wanted to start developing. The student group worked together online on 4-5 March 2021. After these days, they started to work together to develop the idea further. At the end of March, the project plan was presented to the student group. After that, group started to write the article together. The project team used English to communicate. The aim was to find a solution to the medicine wastage problem.

Our innovation team met on WhatsApp or Teams platforms on a weekly basis. In addition, we communicated by email and WhatsApp when necessary. We shared pictures, sources and study tips with each other. At the beginning of April, the Finnish students met each other and discussed writing an article in their mother tongue. (see Fawns, Aitken & Jones 2019.) The Germans did the same. The article was written together in accordance with the writing guidelines given. The article was finalized in the end of May. Teams spent a lot of time on planning and organizing joint activities, such as scheduling work and agreeing on the division of labour and responsibilities (Vuopala 2013).

2.3 A Smart Solution for Pharmaceutical Waste

2.3.1 Smart Medicine Cabinet

One of the most significant technological innovations in hospitals is smart medicine cabinets. They are drug storage systems. User management ensures that outsiders cannot access the system. Smart medicine cabinets (Figure 3) are integrated with the hospital pharmacy and with the wards' patient information systems and inventory management. The hospital pharmacy has access to real-time information on the medicines on the wards. The smart medicine cabinets are designed to improve patient safety and improve inventory management. (Länsimies 2019, 34-36.)

Figure 3. The smart medicine cabinet (New Icon 2021)

A smart medicine cabinet costs between 40,000 and 65,000 euros, depending on the supplier and the level of equipment (Kainuun sosiaali- ja terveydenhuollon kuntayhtymä 2019). The annual salary of a nurse in primary health care is about 40,000 euros. The annual loss of medicines in Suomussalmi Health Center Hospital is about 8,000 to 10,000 euros. The costs of pharmaceutical waste could be invested in the purchase of a smart medicine cabinet. The purchase would pay for itself in about 4-6 years.

A smart medicine cabinet has many implications for hospitals. Patient safety will increase as human errors in administering medicines are reduced. (New Icon 2021.) Since 2007, more than 200 social and health care units in Finland have reported health care incidents using the HaiPro information system. The system allows the organization to track incidents and take actions to prevent them. Medication-related incidents represent more than 40% of all reports made. Patient safety and medication safety play a major role in healthcare. (Kuusisto, Sneck, Sova & Härkänen 2019.) Traceability prevents misuse of medicines. Simplification of workflows and responsibilities leads to more efficient drug delivery processes. Intelligent medicine cabinets enable real-time inventory management and control.

New technology allows nursing staff to spend more time on patient care. When a department uses a smart medicine cabinet, they know more reliably what medicine, at what dose, when and by whom the medicine was dispensed to the patient. This also provides real-time, centralized inventory management and electronic medication records. (New Icon 2021.)

2.3.2 How to Get the Smart Medicine Cabinet

Is it possible to purchase a smart medicine cabinet for Suomussalmi Health Center Hospital? The biggest questions here are where the money will come from and how the organization is convinced to make the purchase. Other minor issues include finding suitable premises, training the staff and maintenance costs. The money could be raised through sponsors and local actors such as Lions Club Suomussalmi, Suomussalmi Branch of the Finnish Red Cross, North Finland Cancer Society and entrepreneurs. Kajaani University of Applied Sciences and Kainuu Welfare Social and Health Care Joint Authority could, for example, pilot new technology in the health center hospital.

A newspaper campaign could be launched to attract donors and local entrepreneurs could be invited to participate in charitable activities. If the cost of a smart medicine cabinet is not feasible, other solutions need to be considered. These solutions include training nurses in medicines management (with emphasis on the minimisation of pharmaceutical waste) and assigning a pharmacist to the ward to manage the supply of medicines and to supervise the use of medicines. Nurses could also be given more responsibility for stocking and ordering medicines in the ward.

An electronic application that would link the Lifecare patient information system, the OSTI drug ordering system and the Healthport national drug information system to prevent medicine waste is a solution that would benefit many hospitals and health authorities in Finland.

2.4 Change Management

Though health care services aim to reduce the health problems and prevent the potential risks to the health of the community, these services create wastes which are considered as hazardous due to the higher potential of infection and injury possessed by these wastes than any other type of waste. Health care waste management is an integral part of health care services and can create harm through inadequate waste management, thus reducing the overall benefits provided by

healthcare centers. Consequently, hospitals face a big financial pressure under which they have to manage. (Hermann & Mussa 2020, 235.)

Lack of resources leads to old infrastructure and not having enough money for investments and further education of the staff. To underline that pharmaceutical waste is financially avoidable and can be used more efficiently, it must be mentioned that the health care sector in general is strict regulated. The budget given to the health care system is strictly distributed to the different areas in the health care system. Consequently, when there is no possibility to increase the incomes, the only way to generate more money for investments, and at the same time provide the best service to patients, is to lower the expenditure. Medicines must be available in hospitals, but they cannot be stored endlessly and the storage itself costs money. It is important to ensure the availability of medicines and at the same time to avoid permanent storage, as the latter always implies that medicines expire and must be destroyed. (Gottschalk 2014, 58.)

This innovation project describes a system which not only minimizes pharmaceutical waste in hospitals, but also increases the efficiency of medicines distribution to reduce costs and time and to ensure that the right medicine is administered at the right time in the right place to the right person. To make this possible, a self-learning system is created to optimize the stock of medicines. The goal is to move away from a simple ordering process in which orders are placed on a flat weekly basis to a more dynamic customizable system; in other words, a system that is more aligned with patients' actual needs. The idea is to identify medicines which must always be available in a defined range considering, for example, the special needs of the expected patients, and to procure medications in a timely manner. The constant recording of drug orders in the IT system is intended to help optimize order volumes to ensure that short-stay or patients admitted from the ER can be treated. At the same time, it is important to establish solutions to procure medicines very quickly if necessary.

2.5 BPMN

2.5.1 Introduction to BPMN

A crucial aspect in understanding medication ordering and storage processes is the visualization of these. The aim should be to gain an understanding of the process of procuring medications and methods which can be used to make the process more efficient.

To manage and control business processes, they must be described and documented. Texts and tables, which are often used for this purpose, usually lack the possibility to describe more complex processes clearly and meaningfully. For a more exact representation with all necessary aspects, such as branching rules, events and data flows, more suitable notations are needed. Here the first step would be to specify which symbols describe which sub-process and how sub-processes can be combined and structured with one another. This would create a uniform language to show the process in its entirety in a comprehensible way. (Allweyer 2020, 9.)

The Business Process Model and Notation (BPMN for short) has established itself as a pioneer for process modelling in the recent years (Allweyer 2020, 10). From the beginning, the main objective was to be able to graphically record a standard for process notation which could also be used in process automation (Freud & Rücker 2019, 7). In most cases the BPMN concept is used for the following initial situations: on the one hand to optimize already existing processes organizationally, and on the other hand to document the existing processes or to create completely new process conditions. (Freud & Rücker 2019, 2.)

The purpose of this innovation is to move away from a simple ordering process where orders are placed on a weekly basis to a more dynamic process which is more aligned with patients' actual needs and their treatments. The aim is to reduce stocks as far as possible to reduce the waste of unused drugs. The result of such a development is that the organization must be structured differently personnel-wise so that it can react more flexibly to missing medications and take the necessary steps to order them. This can significantly improve profitability with regard to the cost of medications, but on the other hand it can also result in increased personnel costs because more working time is needed for supervision.

The idea of such a system is based on current technical possibilities in ordering processes. Computer-aided ordering can be used to ensure more efficient purchasing where the original order

quantity is not purchased again, but a realistic comparison for the demand is estimated from the outset. From this point of view, we are talking about a self-learning system which is able to better estimate the actual number of medications required based on existing and/ or ongoing documentation and analyses an optimized average for the next order. In the future, better calculations can thus be made, and at the same time there is the possibility that the minimum stock level of the respective medication can be regulated downwards, which reduces inventory costs and prevents waste.

2.5.2 Artificial Intelligence in Computer-Aided Ordering Processes

The concept of so-called machine learning would be the first approach for patient-induced drug procurement. It is a form of artificial intelligence. Typically, when combined with machine learning, the ordering system is trained to use the data entered by humans to provide a better estimate of which medications should be ordered and when. (Chollet & Allaire 2018.) This results in an ordering process that is optimized and adapted by the system itself. At the same time, the situation arises where the system monitors minimum quantities and automatically intervenes when there is too little of a drug.

This means that reorders can be placed automatically as soon as the stock level falls below the minimum. With this form of monitoring, the concept moves away from a standardized system to a patient- or treatment-induced process. This process should be seen in the context of medications, which often have a shorter shelf life or are also needed sporadically.

2.5.3 BPMN Practice Model

The elements and symbols used in the BPMN concept created for hospitals can be seen in Figure 4. The symbols are here divided into ‘Flow Elements’, ‘Connecting Elements’ and ‘Data Elements’. The "other events" category shows which special features can occur in the process flow and how such intermediate processes can be managed.

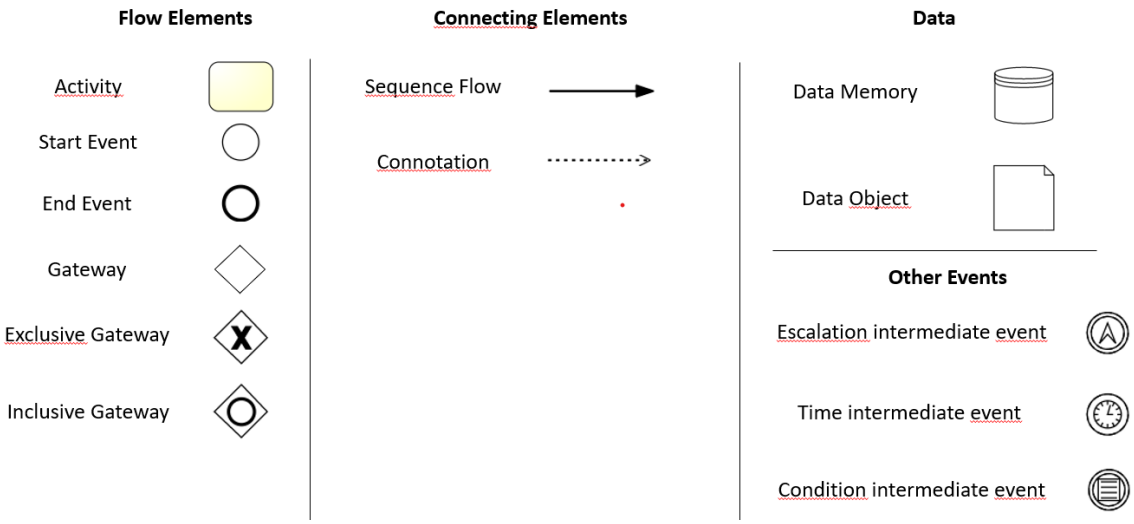


Figure 4. BPMN symbols

It is important for the BPMN concept to include elective care processes so that the necessary interventions can be planned.

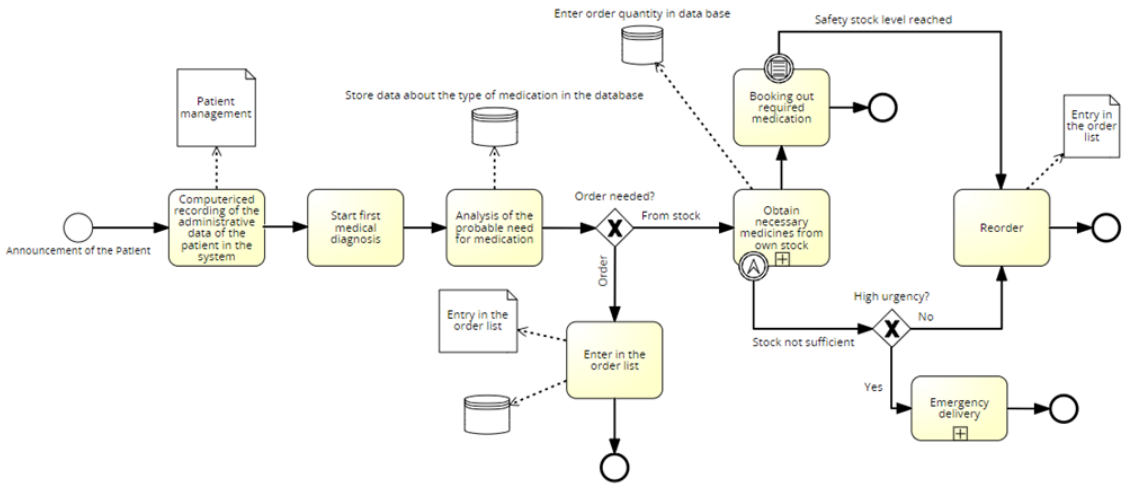


Figure 5. Concept for the creation of the medication list

To understand how the order list in Figure 5 is generated in a patient-induced ordering process, a separate explanation is required. In Figure 4, the start event represents the admission of a patient. The first task is to computerize the administrative data of the patient, whereupon the first medical diagnosis is made. Based on this, the necessary medication is prescribed next. At this point it is important to enter the collected data into the database of the internal system. This is the first data collection for future automated ordering processes and a foundation for a self-learning ordering system. The 'XOR Gateway' represents a kind of crossroads or case distinction. If the ward's/ hospital's own stock is not sufficient, the required medicines are placed on the

order list. This is visualized by the ‘Connotation Element’. Unlike the ‘Sequence Flow’, it indicates the information or message flow, not a further process path. At this point it is important to collect data in the database. However, if no further orders are needed, the necessary medicines can be obtained from the hospital’s own stock and consequently booked out of the system.

The thick circle sign, ‘End Event’, symbolizes the end of the process provided that the minimum stock level is not fallen too low. Should this be the case, the process ends when a repeat order is placed, entered in the order list and symbolized by the connection flow. The lower part explains how to proceed if the stock is not sufficient. Such a situation can occur, if the system has enough of a medicine, but the hospital or ward has a smaller quantity in stock, in other words a false entry in the system. In this case, the ‘Escalation Intermediate Event’ is a way to proceed further. Again, another ‘XOR gateway’ occurs where it is distinguished whether the order is urgent or not. If the order is urgent, an emergency delivery must be made, and the necessary medication must be included in the order list regularly.

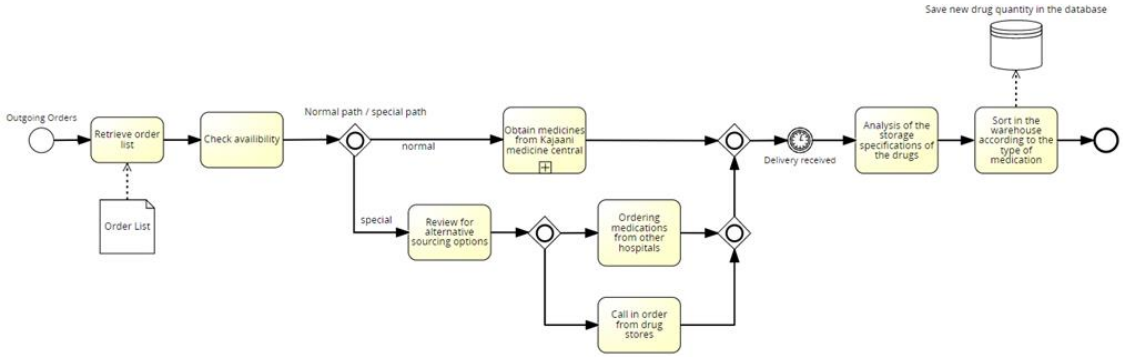


Figure 6. Concept for ordering medicines

Figure 6 shows that the order list created in Figure 5 is the foundation for continuing the process. The first task to place an outgoing order is to retrieve the order list. Here the availability of the medicines is checked, and a decision is made whether these are to be procured in the normal or special way or both (symbolized by the ‘Inclusive Gateway’), depending upon in which constellation the procurement of the medicines works best.

The ‘Inclusive gateway’, in contrast to the ‘XOR Gateway’, combines the various paths. With the ‘XOR Gateway’ two or more ways exclude themselves mutually. In case of a regular order, medications are delivered from the hospital pharmacy at Kainuu Central Hospital. Specialized medications can be delivered from alternative procurement options, for example from other, nearby hospitals or pharmacies. The aim of this strategy is to guarantee the secure procurement of med-

ications and to ensure a transparent supply of medications despite lower stock levels and minimum quantities. As described above, these two paths form a closed process system, which is combined again by the 'Inclusive Gateway'. The 'Time Intermediate Event' indicates that the process flow can only be continued when the previous phase has been completed, in other words the number and type of drugs stored in the database. On the one hand, this ensures that the actual inventory matches the inventory in the system, and on the other hand, it is also used for data collection in the sense of a more efficient ordering process.

2.6 ABC Analysis

The tables below show the types of medicines most commonly used in Suomussalmi Health Center Hospital in 2019 and 2020 (Table 2 and Table 3).

Table 2. ABC Analysis Suomussalmi Health Center Hospital 2019 (OSTI 2021)

Medicine types/ year 2019	**Medicine name**	**Costs (€)**
A	Solvents and diluents	4,587.36
B	Cefuroxime	4,434.50
C	Electrolytes	2,816.86

Table 3. ABC Analysis Suomussalmi Health Center Hospital 2020 (OSTI 2021)

Medicine types/ year 2020	**Medicine name**	**Costs (€)**
A	Oxycodane	6,605.12
B	Cefuroxime	2,926.36
C	Solvents and diluents	2,319.30

In 2020, the hospital needed medicines with a total value of 40,304 euros in stock (Table 2). Medicines worth 10,121 euros (less than 25% of the total value) were discarded, which means that there a percentage increase of 17.1% compared to 2018 and 2019. (OSTI 2021.)

It is expected that a self-learning system can reduce the level of waste by up to 60%. On the other hand, making the ordering process shorter and more aligned with actual patient needs requires more staff, as a database necessary for this system is built. Thus, internal ordering processes become more complex. In this respect, training and coordination of personnel deployment are required. Furthermore, a dynamic, patient-induced ordering process also requires more interfaces in the database to ensure individuality.

2.7 Risk Management

The proposed changeover implies that stockpiles of medicines are kept leaner. When planning the quantities of medicines to be stored it must be considered that medicines with a specific life-saving character and used in emergencies are either available in small quantities or can be obtained within a tolerable period of time. It would be useful to identify critical medications together with experts (physicians) on site and analyse treatment cases of recent years. Thus, minimum quantities that must be available and/ or time corridors for the timely procurement of appropriate medicines can be defined. If certain medications which are rarely used but need to be kept in the stock (because they have a life-saving character), it would be sensible to exchange them at regular intervals with other, larger hospitals that could use them before they expire.

The biggest risk this innovation can face is the unavailability of a medicine due to its rarity and/ or the unlikely situation that the medicine is not on stock anymore based on the exorbitant use of the whole storage and the reserve. To tackle this weakness, an emergency system which can deliver the rarely used medicine within a few hours could be created.

The system is based on the German 'Eilige Arzneimittel Prinzip', or the 'Versandapotheke Prinzip', in which a mail order is placed to pharmacies and delivered to the place where it is needed (Deutsche Apotheker Zeitung 2005). But mail orders are only delivered in emergency cases, because the deliveries must meet the ABC categorisation (A referring to the most commonly prescribed and C to the rarely prescribed medicines) based on the evidence the hospital has.

Ethical aspects are also associated with lean stockpiles of medicines and secure health care processes and must be considered in the implementation of the described innovation.

2.8 Discussion

The aim of this innovation was to study how pharmaceutical waste could be reduced in a health center hospital ward. The purpose was to reduce costs by reducing pharmaceutical waste. During this project we gained a lot of new knowledge about medicines, waste, and technological possibilities. We have also learned what a big problem pharmaceutical waste is in Finland and worldwide. We were able to analyse the development and management needs of wellbeing services related to smart solutions during this course (Smart Solutions for Wellbeing Service Development and Management 2021).

Our international cooperation skills as well as English language and writing skills have improved during the project. We also learned about new technical tools for writing text. Our knowledge of managing virtual teams in a project, innovation processes and digitalisation of health care has increased. This course gave us an opportunity to work in an international project. We all need more experience and knowledge of project management (Mäntyneva 2016, 154). Using a foreign language as a language of learning poses challenges for learning. Using your own mother tongue enables interaction focus on the content in more depth. Learning in an international group requires directing energy towards mutual understanding. (Vuopala 2013, 205.)

New technologies and artificial intelligence are the answers to how pharmaceutical waste is reduced in the future. By preventing wastage and optimising pharmaceutical stocks, we can reduce pharmaceutical costs. New technologies, such as smart medicine cabinets (New Icon 2021), bring savings to pharmaceutical care. In health care, cost control is important, firstly because people care more and more about their health, and secondly because efficiency is essential for cost savings in the competitive health care market.

A new central hospital building was opened in Kainuu in 2020. The new hospital uses smart medicine cabinets, and the feedback has been very good. With the help of the new technology, less pharmaceutical waste is being generated and the costs of pharmaceutical care are reduced. The new premises have allowed the introduction of new solutions at Kainuu Central Hospital. Medication safety has been developed through cooperation between the hospital pharmacy and wards. The smart medicine cabinets have significantly reduced the pharmaceutical waste in Kainuu Central Hospital. The workload of the pharmacy managers has been eased and the time spent on ordering has been freed for patient care. (Moolis 2021.) The next step could be to set up a new project to enable the purchase of a smart medicine cabinet for Suomussalmi Health Center Hospital and to train staff to use this new technology.

Sources

Allweyer, T. 2020. BPMN 2.0 Business Process Model and Notation, BOD-Books on Demand. Norderstedt.

Lääkejätettä syntyy jopa 100 miljoonan euron arvosta vuodessa. 2016. Lääkäriliitto: Helsinki. Referenced from 12.4.2021. https://www.apteekkariliitto.fi/media/tiedotteet/2016/laakejatetta-syntyyjopa-100-miljoonan-euron-arvosta-vuodessa.html.

Chollet, F. & Allaire, J.J. 2018. Deep Learning mit R und Keras, mitp Verlags GmbH & Co. KG: Bonn. Chapter 1.1.2.

Deutsche Apotheker Zeitung. 2005. Schalterpharmazie und Versandapotheken. Referenced from 2021. https://www.deutsche-apotheker-zeitung.de/daz-az/2005/daz-23-2005/uid-14040.

Dufva, M. 2020. Megatrendit 2020. Sitran selvityksiä 162. Referenced from 25.3.2020. https://media.sitra.fi/2019/12/15143428/megatrendit-2020.pdf.

Fawns, T., Aitken, G. & Jones, D. 2019. Online Learning as Embodied, Socially Meaningful Experience. Postdigit Sci Educ 1, 293–297. Referenced from 2.6.2021. https://doi.org/10.1007/s42438-019-00048-9

Freud J. & Rücker B. 2019. Praxishandbuch BPMN – Mit Einführung in DMN, Carl Hanser Verlag: München.

Gottschalk, J. 2014. Das Unternehmen Krankenhaus – zwischen Wettberewerbs- und Komplexitätsfalle, Verlag epubli GmbH. Berlin.

Hermann, C. & Mussa, M. F. 2020. Investitionsfinanzierung und ineffiziente Krankenhausstrukturen, In J. Klauber, M., Geraedts, J., Friedrich, J., Wasem & A. Beivers (eds.) Krankenhaus-Report, Finanzierung und Vergütung am Scheideweg, Springer. Berlin. 231-242

Kainuun sosiaali- ja terveydenhuollon kuntayhtymä. 2019. Älylääkekaapit; päätös ostotilausta varten. Referenced from 6.4.2021. file:///C:/Users/OMISTAJA/Downloads/%C3%84lyl%C3%A4%C3%A4kekaappien%20p%C3 %A4%C3%A4t%C3%B6s%20ostotilausta%20varten.pdf.

Kuusisto, M., Sneck, S., Sova, P. & Härkänen, M. 2019. Lääkehoidon vaaratilanteet – mitä voimme oppia HaiPro-ilmoituksista? Sic! Lääketietoa Fimeasta 1-2. Referenced from 2.6.2021. https://sic.fimea.fi/arkisto/2019/1-2_2019/riskilaakkeet-onko-niita-/laakehoidon-vaaratilanteet-mita-voimme-oppia-haipro-ilmoituksista-.

Kärkkäinen, S., Vähäkainu, P., Neittaanmäki, P., Uimonen, S. & Hänninen, J. 2018. Tekoälyn hyödyntäminen lääkehuollossa. Informaatioteknologian tiedekunnan julkaisuja No 66. Referenced from 6.4.2021. https://www.jyu.fi/it/fi/tutkimus/julkaisut/tekesraportteja/tekoalyn_hyodyntaminen_laakehuollossa_verkkoversio.pdf.

Länsimies, L. 2019. Katkeamaton lääkehoitoprosessi ICMT-palveluna. Tampereen ammattikorkeakoulu. Referenced from 11.4.2021. https://www.theseus.fi/bitstream/handle/10024/266422/Lansimies_Laura.pdf?sequence=3&i sAllowed=y.

Marttila, S-S. 2018. Lääkejätteiden käsittely apteekeissa. Vaasan ammattikorkeakoulu. Referenced from 11.4.2021. https://www.theseus.fi/bitstream/handle/10024/149004/Opinnaytetyo_SimoSanteri_Marttila.pdf?sequence=1&isAllowed=y.

Moolis, P. 2021. Uudet tilat ovat mahdollistaneet uuden tekniikan ja käytännön. Farmasia-lehti. Suomen farmasialiitto. Referenced 2.6.2021. https://farmasialehti.fi/iso-harppaus/#8ef65318

Mäntyneva, M. 2016. Hallittu projekti. Jäntevästä suunnittelusta menestykselliseen toteutukseen. http://kamk.fi/kirjasto Kauppakamaritieto.

Neittaanmäki, P. & Kaasalainen, K. 2018. Sote-toimintojen tehostaminen IT-avulla - kehittämispotentiaali ja toimenpideohjelma. Informaatioteknologian tiedekunnanjulkaisuja No 51. Jyväskylän yliopisto. Jyväskylä. Referenced from 27.4.2021. https://www.jyu.fi/it/fi/tutkimus/julkaisut/tekesraportteja/sote_toimintojen_tehostaminen_verkkojulkaisu.pdf.

New Icon. 2021. Älylääkekaappi sairaaloille. Referenced from 6.4.2021. file:///C:/Users/OMISTAJA/Downloads/newicon_e_med-2020-esite-fin%20(1).pdf.

OSTI. 2021. Medicine ordering system datainformation. Kainuun sosiaali-ja terveydenhuollon kuntayhtymä.

Smart Solutions for Wellbeing Service Development and Management. 2021. Curriculum 2020–2022. Devmoodle. Kajaanin ammattikorkeakoulu. Kajaani.

Sote-uudistus. 2021. Valtionneuvosto: Helsinki. Referenced from 25.3.2021. https://soteuudistus.fi/etusivu.

Vuopala, E. 2013. Onnistuneen yhteisöllisen verkko-oppimisen edellytykset: näkökulmina yliopisto-opiskelijoiden kokemukset ja verkkovuorovaikutus. Oulun yliopisto. Acta Universitatis Ouluensis E 133. Oulu. http://jultika.oulu.fi/files/isbn9789526202259.pdf

3 NPS – Nurses Pocket Secretary

Waschbüsch Luca, Bachelor of Business Studies in Healthcare Management, HNU, Germany
Freund Laura, Bachelor of Business Studies in Healthcare Management, HNU, Germany
Juntunen Tanja, Master of Health Care, KAMK, Finland
Leinonen Rauni, Principal Lecturer, KAMK, Finland
Moisanen Kirsi, Senior Lecturer, KAMK, Finland
Wűrfel Alexander, Professor, Dr., HNU, Germany

Abstract

Speech recognition technology is the key for improving the usability of mobile applications. This technology can also be used, for example, for patient documentation in the health care sector. The purpose of this article is to introduce an innovation called "Nurses Pocket Secretary" (NPS), a voice-activated nursing documentation application, within the Finnish health care system. The aim of this innovation is to reduce long nursing documentation times, which can increase the time and quality of direct patient care. This article gives an overview of the healthcare system in Finland and the development status of digitalization so far and describes the individual functions, implementation, and necessity of the innovation. The strengths, weaknesses, opportunities, and threats of the application are also discussed. However, it should not be forgotten that to achieve important goals such as quality improvement, cost savings or process optimization, factors such as data security or the short-term and long-term implementation of the innovation among the staff must be considered. Thus, this article introduces the NPS within the Finnish hospital system as a sustainable and efficient tool that benefits both the staff and patients.

Keywords: Nurses Pocket Secretary, NPS, speech recognition technology, nursing documentation, innovation

3.1 Introduction

This chapter discusses the current state of the health care system in Finland, describes the direct and indirect patient care as well as care documentation, and, finally, explains the status of digitalization in the Finnish health care system.

3.1.1 Status Quo of the Social and Health Care System in Finland and Kainuu

In Finland, social and health care services are implemented with state support. Municipalities are responsible for organizing the services. They can provide social and primary health care services alone or in cooperation with other municipalities. A municipality can also purchase social and health services from other municipalities, organizations, or private service providers. (Social welfare and health care system in Finland, responsibilities n.d.) Healthcare districts provide specialized care. Some specialized health services are organized under the special jurisdictions of university hospitals.

There are 21 health care districts with central hospitals and five catchment areas for highly specialized medical care areas (ERVA areas) with specific university hospitals at the center. (Special health care n.d.)

Kainuu is a small health care district. There are about 72,000 people living in eight municipalities in Kainuu which belongs to the Oulu University Hospital specific catchment area. Kainuu Central Hospital is located in Kajaani. The quality policy of Kainuu Social Welfare and Health Care Joint Authority (Kainuun sote) states that services provided are client-centered, delivered in a timely manner, respect freedom of choice, and uphold human dignity. The aging population needs more services; therefore, health care policy needs to be rethought. (Quality politics 2018.) Due to long distances and increasing costs, services are increasingly provided digitally, maintaining high quality and cost-effectiveness. The vision of Kainuun Sote is to enhance the digitalization of the services provided.

3.1.2 Nursing Documentation in Finnish Hospitals

Ensuring quality and safety of nursing care is a growing challenge for nurses and nursing managers in a rapidly changing nursing environment. Caregivers are often experiencing exhaustion and frustration because the work cannot be done as well as desired. The staff mention that there is not enough time for patient care. (Kaustinen 2011 15,31.) Lavander (2017) states in her thesis that a large proportion of nurses' working time is spent on activities other than patient care. For example, Kaustinen (2011 15, 31) describes that one of the biggest changes in nurses' work is the increase in time spent on documentation. There is more documentation and reporting and therefore less time for direct patient care.

The working time of nursing staff can be divided into direct and indirect patient care and activities outside nursing work. Direct patient care consists of basic nursing procedures involving a patient's physical, mental, social, and spiritual needs. Indirect patient care, in turn, includes planning and preparation of interventions, requesting tests and reviewing results, documentation and reporting as well as training (e.g. mentoring students) and many other tasks. Indirect patient care is essential for the patient's comprehensive care, although it does not occur in patients' immediate vicinity and is often invisible for them and their loved ones. (Hiltunen 2016; Antinaho 2018, 45-49.) The time spent by the nursing staff on direct patient care has been associated with high quality patient care. Interaction is seen as a prerequisite for good care. Sufficient time for interaction can make reciprocal and equal interaction possible. For this reason, it is assumed that the time spent on direct patient care is also related to the amount and type of patient-nurse interaction. (Kaustinen 2011, 24; Antinaho 2018, 45-49.)

Patients' experiences of public health care have recently sparked a lively debate. Nurses sitting in the office have also repeatedly been named in the discussion, seemingly in no hurry and not interested in what is most important: namely the patient. Satisfaction, both for the patient and the nursing staff, can be increased, for example, by increasing the proportion of time spent on direct patient care. This requires a review and innovative development of nursing practices and operational processes. To develop the processes further, multidisciplinary collaboration, use of competence and information, determined and competent change management and, above all, a positive attitude are required. (Hiltunen 2016.)

The amendment to the Act on Care Services for Older Persons (980/2012) entered into force on 1 October 2020, aiming to make direct and indirect patient care visible. The definition of indirect and direct patient care aims to ensure the adequate and competent number of staff. The service

provider must set aside and allocate adequate and separate human resources for indirect patient care. The law applies to round-the-clock care for the elderly. (L 980/2012.)

3.1.3 Digitalization of Patient Documentation

Finland is the international leader in electronic information management in health and well-being as evidenced by the digital Kanta services including the Patient Data Repository which “is a service where patient data is safely accessible by professionals and in long-term storage in one place” (Potilastiedon arkisto n.d.). The repository provides the transmission of data between health care providers. Kanta also stores information about the patient’s living will and patient’s position to organ donations. Heath care units also have access to patients’ main health information through Kanta. Patients’ consent required if patient data is retrieved from other health care providers. (Potilastiedon arkisto n.d.)

Nursing data is recorded electronically into patient records and comments made by patients are an important support for the patient's multi-professional care. A structured nursing report is a part of a patient record on nursing, and their structures are defined in a uniform manner. (Reponen, Kangas, Hämäläinen, Keränen & Haverinen 2018.) Healthcare information integration, systems and digital solutions are also an important cost factor. Future digital solutions can ensure that health care will remain reasonably priced. The development of information systems directly affects the quality and efficiency of healthcare. (Patrikainen 2020, 14.)

Finland has 21 health care districts. All health care districts have an electronic patient information system, and electronic prescriptions have been in use for many years. In addition to electronic patient records, digital images analyses and transfer systems are used in public health care. In Finnish health care, communication and data transfer between organizations and private sectors have also improved over the years. (Patrikainen 2020, 11.) In Finland patient information systems are precisely regulated by law, and there are several acts on processing patient data including the Act on the Status and Rights of Patients (L 785/1992), the Act on Health Care Professionals (L 559/1994) and the Act on the Electronic Processing of Client Data in Healthcare and Social Welfare (L 159/2007).

The purpose of patient records is to serve the planning and implementation of care and to promote the continuity of care. The nursing report is attached to the overall care plan to which the nursing plan contributes. In addition, the nursing report includes daily records of the patient´s

treatment and condition. The patient record is intended as a multi-professional tool. Documentation of nursing data is a task that is performed by nursing staff on an ongoing basis. For efficient and smooth documentation, the usability of the documentation model and system is important. It is important for multi-professional health care that the documentation of nursing data supports information sharing and decision making between nurses and other healthcare professionals. Also, it is important that the documented information is up to date where it is needed. (Nykänen & Junttila 2012, 3.)

Innovation is needed because the current system is slow and ineffective. The patient information system currently in use does not support the work of nursing staff. Several problems related to the current system hinder the efficiency of it. In addition, the system should provide more support for interprofessional cooperation. Development work should focus on the development of mobile, simple and efficient systems. (Kaipio 2011.)

One problem related to the current patient information system is that nursing staff have to spend a lot of time at the computer and data transfer is delayed because nurses as well as doctors do not have time to capture the information immediately. Many resources are wasted due to work dedicated on IT use and inefficient documentation, and nursing staff spend more time with computers than with patients. (Kaipio 2011, 70–71; Lavender 2017.) The rapid development of technology is changing the way we operate. Soon, for example, virtual and voice-controlled devices will be used daily. The introduction of new technology will require cooperation between different stakeholders and the consideration and resolution of ethical issues. (Dufva 2020.)

According to Blackley, Schubert, Gross, Assad, Garabedian and Zhou (2020), speech recording saves time, increases efficiency and allows more details to be documented. It also increases the quality of documents. Speaking is a much faster and easier way to produce information than typing on a keyboard. Speech recognition systems convert the caregiver´s speech into text in real time, resulting in patient documents being completed instantly. The fast creation of information has a significant impact on the patient care. It also drastically minimizes the time spent typing. (LifeCare puheentunnistus. Uuden sukupolven palvelupohjainen puheentunnistusratkaisu n.d). Kainuun Sote uses a patient information system called LifeCare. It is possible to integrate a speech recognition program to this system.

3.2 Nurses Pocket Secretary

The Nurses Pocket Secretary (NPS) will be a mobile application for nurses that facilitates patient documentation in hospitals and home care. The NPS can be used on mobile phones or tablets and works with a speech recognition software that enables the dictation of important information, instead of typing it. The nurse only needs to check the dictated report afterwards to eliminate potential mistakes. The application will enter the spoken information right into the patient record. To do this, the NPS will interact with the existing patient information system. This innovation enables the nurse to take notes while interacting with the patient, which leads to more detailed information as well as less time spent on documentation. The application will not only be able to provide dictated patient records but also standardized text modules and the option to type text freely, which will guarantee user satisfaction and as well efficiency of the smart device.

Figure 1 shows the process of documentation in more detail. Without the use of the innovation the nurse will first visit all her patients and maybe take a few notes while providing care, which takes around one hour per patient. Afterwards she or he will turn to the nurse's computer to start with the actual patient documentation of the shift. The nurse normally does all documentation work after the visits, which leads to the risk of missing information and uncomplete or undetailed patient records. The documentation of e. g. three patients takes about one hour. In some hospitals, nurses spend more time typing on the computer than treating patients. The NPS is designed to change this. The nurse can provide care to the patient while simultaneously dictating, and thus, documenting all important information easier and faster. The risk of forgetting important information decreases. (Johnson, Lapkin, Long, Sanchez, Suominen, Basilakis & Dawson 2014).

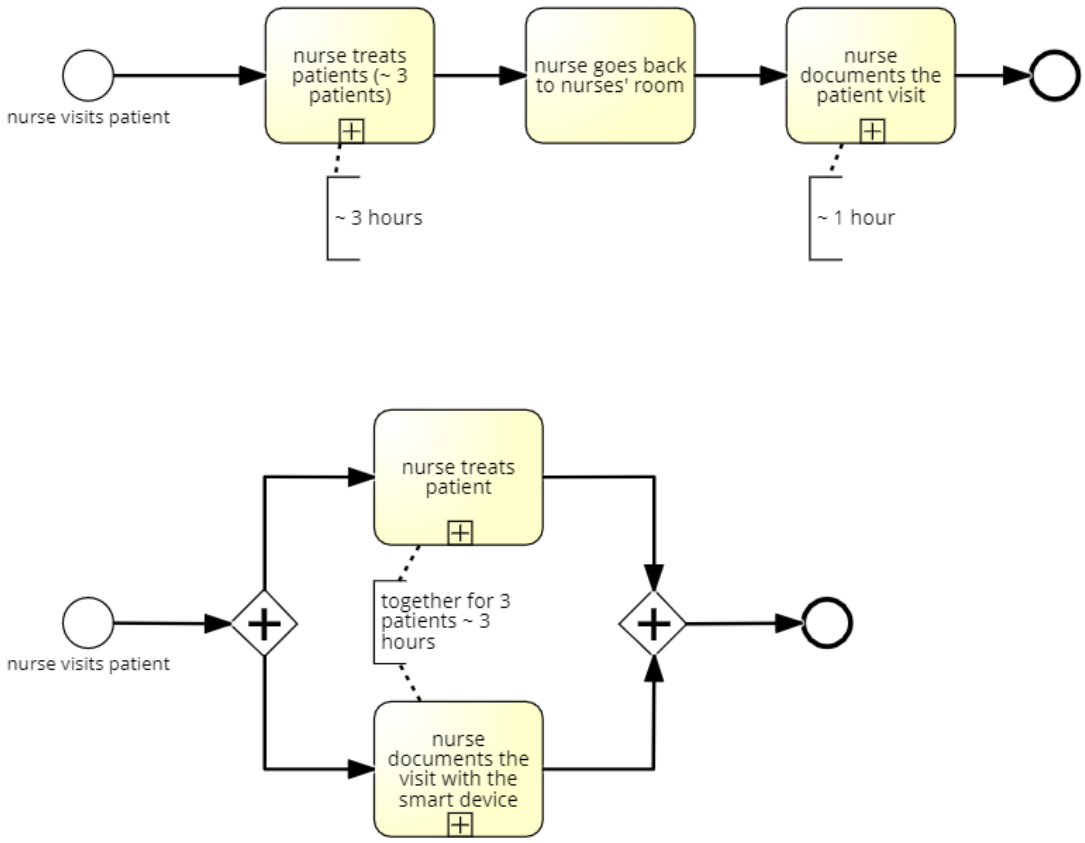


Figure 1. BPMN model documentation process (authors' presentation)

The overall time for the care and documentation for three patients could be limited to three hours, saving one hour per day, which would give the nurses would have more time per patient or more time for additional patients or limit their overtime.

Current projects and software show that if the implementation of the new system is successful, the productivity and efficiency of patient documentation will increase, and consequently the time spent on documentation will decrease. The error rate (grammar mistakes etc.) in typed and dictated patient records is nearly the same, but speech recognition software increases the quality of the records in terms of details of information dictated. (Johnson & al. 2014, 6-13; Conn 2015.)

To ensure the productivity, efficiency and quality of patient documentation, users must be trained to use the selected software. Change is always difficult, because time is limited; therefore, to enhance user satisfaction, training must meet the users' specific needs. The software can be used without training, but short training sessions would increase the efficiency and eliminate issues with the new technology, thus enhancing user satisfaction and successful implementation of change. (Ahlgirm, Maenner, Baumstark 2016, 1-7; White & Scott 2015, 15-17.)

3.3 Technical Details and Functions of the Nurses Pocket Secretary

To have access to the patient records the nurse will have to log into the application. Every nurse will have different access data (username and password) as well as different user views, depending on the department where the nurse works or his or her area of responsibility. This is important to guarantee data security and that unauthorized persons do not get access to valuable patient data. (Masrom & Rahimly 2015, 58.) The application itself could also be secured with, for example, a pin or fingerprint. To access a specific patient, record the nurse enters the respective patient number or scans a barcode worn by the patient on his or her wrist or available at the patient's bedside. One option to open the application faster on the mobile could be a signal word like "Open NPS", which activates the application automatically.

Now the dictation can begin. Artificial intelligence (AI) technology which improves the conversion of speech to text has developed hugely in the past ten years and AI is now able to "learn" new words. "A vocabulary learning function of the speech recognition software is mandatory for a clinical speech recognition system" (Ahlgirm & al. 2016, 2) as the terminology in medicine and its different specialties is highly specialized. Words can be fed into the system can be fed in advance and while using the application if it does not know them. Similarly, the NPS will expand its vocabulary over time, which leads to increased efficiency and user satisfaction. Furthermore, new words can be saved for the use of one person or all nurses using the application. This not only makes the technology personalized but can also improve interaction between different nurses working with the new system. Commands such as "speak slowly" or "speak clearer" can also be added to eliminate mistakes. *(*Ahlgirm & al. 2016, 1-7; Chouffani 2018; White & Scott 2015, 15-17; Nikuliak 2020.)

Comparably to German doctor's letters and different existing examples, the NPS will also have standardized text modules available as an option. This option provides more detailed records without the need to spend more time spent on structuring the information and is helpful to make it clear for everyone what is stated in the record. One example given by Peter White and Elaine Scott from the Alder Hey Children's hospital is the following: The nurse gives a verbal command such as "Dragon ward ready" and more detailed data about the patient's oxygen saturation rate and status appears on the screen. In addition, the nurse can change the sentence depending on the situation. (White & Scott 2015, 16.)

As soon as the text is completely generated, the data is stored in the database and patient records are automatically updated in the patient information system. Similarly, if changes are made on

the computer, they are also visible on the smartphone. As can be seen in Figure 2, the goal is to generate a continuous update loop between the database, smartphone and computer in order to provide real-time retrieval of data close on any device.

In addition, the application software must not only be linked to the hospital database, but also to the software of the extant information system used on the computers. This allows every device to access all necessary and relevant data. It would be beneficial if real-time processing was used for data transfer between different devices.

Hence data transfer errors are less likely and could be detected more easily with, for example, a warning system. The warning system could also send an alarm if new data seems to be conspicuous.

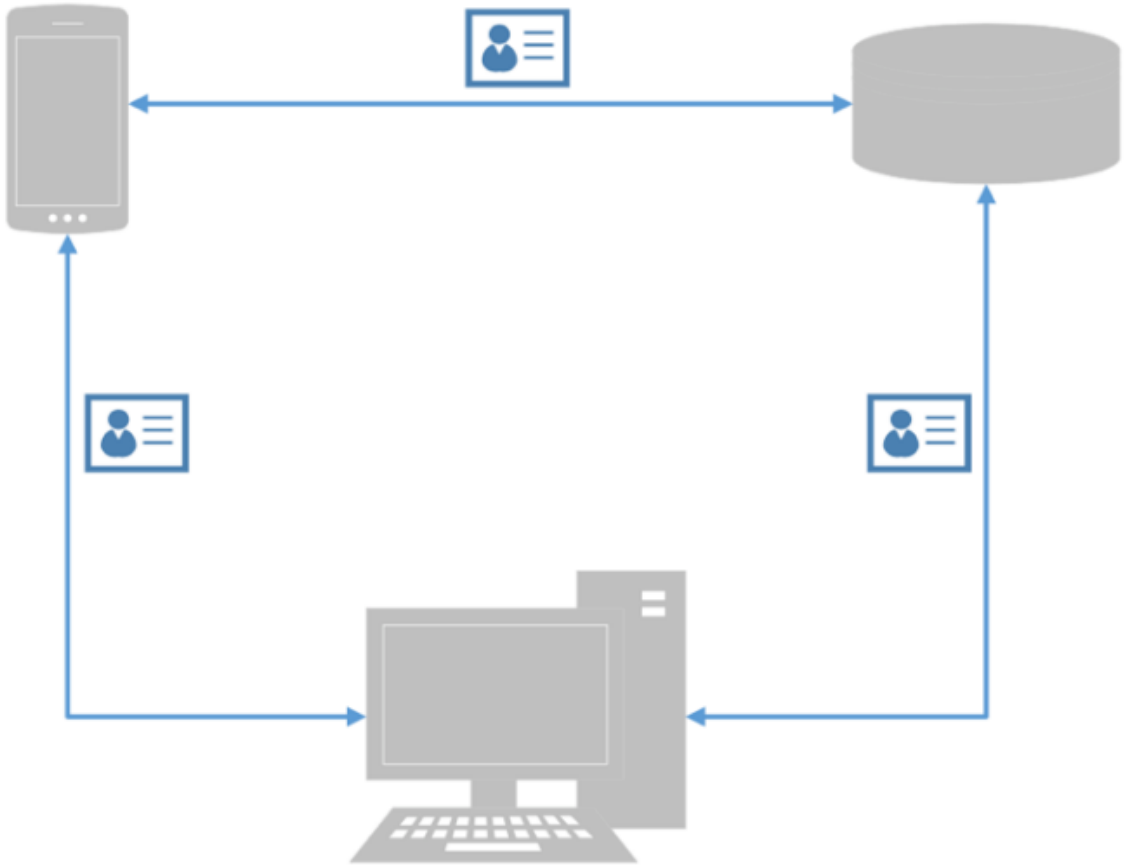


Figure 2. Data circulation (Authors' presentation)

Another important feature of the NPS is data security. The system must be monitored continuously, and security tests performed regularly at all costs to protect confidential patient data.

The data on the server and on all devices used as well as the transmission of data between the different devices and servers must be encrypted to protect them properly. The internet connection used to access to the application should be encrypted, which, in combination with further computer security features, will guarantee the security of all patient data. There are several laws in Finland, as mentioned before, that require data security.

Medical confidentiality and patient privacy are important ethical principles in medicine. Medical confidentiality could be seen as the cornerstone of medical treatment as it ensures that the doctor as well as other members of the medical staff will keep anything a patient confides to them private.

This is important for patients that confidential information about them is not abused, and that medical staff do not compromise this confidentiality and treat them right. Confidentiality of patient data is secured by several laws. If a doctor violates medical confidentiality, he can lose his job and face imprisonment. (Hinweise und Empfehlungen zur ärztlichen Schweigepflicht, Datenschutz und Datenverarbeitung in der Arztpraxis 2018.) Patient intimacy could be understood as "a state of extreme interpersonal emotional closeness" (Pam 2013) of the patient (L 559/1994).

Both medical confidentiality as well as patient privacy need to be protected at all costs in the hospital. It is important to address them in situations where medical staff speak about sensible patient information aloud using a speech recognition tool. Regardless of the speech recognition application, medical staff will discuss patient cases in patient rooms where there will always be a small risk of unauthorized persons hearing the discussions.

But doctors and nurses should not discuss highly private things with other patients in the room and ask friends and family to leave the room for private conversations with the patient. Similarly, nurses must avoid violating medical confidentiality or patient intimacy even accidentally when they are dictating important and confidential information. If there are too many people in the room and they cannot be asked to leave, there is still the option of typing confidential information into the smart device instead of dictating it.

Medical language is full of technical terms that "ordinary" people and patients do not often understand and that are often abbreviated into "shortcuts". The NPS application will change these shortcuts to proper words. The fact that only medical staff usually understand what the nurse is dictating into the patient record using shortcuts and nurses' sense of responsibility will ensure medical confidentiality and patient privacy.

3.4 SWOT Analysis of the Nurses Pocket Secretary

The SWOT analysis provides a comprehensive overview of how a company can position itself in the market through an internal analysis of strengths and weaknesses and an external analysis of opportunities and threats. In addition, the SWOT analysis shows constructively which issues a company may still need to focus on. (Berry & Wilson 2000, 89.)

Figure 3 shows the strengths, weaknesses, opportunities, and threats of the NPS application. The strengths are specific features that offer advantages compared to competing products. Thanks to the innovation, time spent daily on documentation can be reduced. This time can then be used by the nurse to attend to patients' personal needs and wishes. As a result, patient safety can be increased and patient satisfaction as well as nurses' job satisfaction improved.

Other strengths and opportunities of the NPS include the intuitive and easy to use interface and the fast and uncomplicated exchange of data. However, data security needs to be ensured in regard to data exchange as well as compliance with medical confidentiality. In particular, the integrity and privacy of the patient are to be ensured.

An innovation such as the NPS requires interest from investors and smoothly running Internet connections to be successful and properly realized and implemented.

Figure 3. SWOT Analysis of the NPS

In conclusion, the weaknesses and risks should be considered and, if possible, turned into strengths and opportunities. Nonetheless, this innovation offers high potential and is particularly appealing because of workload reduction and higher patient safety.

3.5 Change Management for the Implementation of the Nurses Pocket Secretary

After all precautions regarding data security, doctor-patient confidentiality, and patient privacy, as described in Chapter3, have been established, all persons involved in patient care – doctors and nurses – must be prepared for the changeover from the old nursing documentation process to the use of the NPS. According to Scott and Mannion, three different subcultures can be distinguished: doctors, nurses, and administrative groups. (Scott, Mannion, Davies & Marshall 2003, 940.) Doctors are the most influential subculture, as they are clearly the main actors in health care services. The doctors can thus be seen as managers of the staff or nurses. Thus, it is the manager's task to be able to deal with feelings such as anger, pessimism, panic, exhaustion, insecurity, and fear experienced by the staff in every phase of change. These emotions could undermine attempts to promote change.

The goal, then, is to transform these negative emotions into positive and productive feelings such as confidence, optimism, or enthusiasm. To achieve these positive feelings, Campbell (2008) recommends Kotter's "see-feel-change" approach. In other words, the manager should create a compelling, salient, and dramatic situation designed to help an employee envision and find a solution to a problem. With the NPS, a concrete problem such as a documentation error could be introduced to nurses and the NPS demonstrated as a solution to the problem. Finding solutions to concrete problems helps to overcome the negative emotions towards the change and lets positive feelings prevail, which promotes and drives the change. Campbell maintains that "when behavior is driven by emotion, it is more likely to last longer." Since nurses are very often confronted with problems regarding documentation in their daily work, an attempt should be made to implement this approach as nurses benefit most from the use of the NPS. After convincing them, further measures can such as internal training or language training be organized. (Campbell 2008, 23-39; Gao & Gurd 2020, 1-11.)

3.6 Conclusion

As mentioned in the beginning, the purpose of this article is to introduce an innovation called "Nurses Pocket Secretary" (NPS), a voice-activated nursing documentation application, within the Finnish health care system. Finland is already one of the most developed countries in Europe in the context of digitalization in healthcare. Due to the increase of patient documentation regulations, there is now a need to find a more timesaving way to document patient data. Nursing staff

are often experiencing exhaustion and frustration because they cannot do their work as well as they would like to because they spend much time documenting every step of patient care (Kaustinen 2011, 15, 31). Lavander (2018) has found that nurses spend 4-41% and practical nurses spend 45% of their working time on direct patient care. Both professions spend 13-21% of their time documenting patient care. The rest of their working time is taken up by miscellaneous activities such as guidance, counselling, meetings, personal activities, and so on.

The work of nursing staff in different wards consists mainly of value-added care for patients, of which less than half is direct patient care. The time spent by nursing staff on patient care should be evaluated on a regular basis to ensure that the amount of direct patient care does not decrease from the current level. The work of nursing staff and other professional groups need to be evaluated and reorganized. (Antinaho 2018, 49.) Research shows that dictated documentation can make patient documentation easier and more efficient (Johnson & al 2014, 6-13). The aim of the NPS is, using voice recognition, to help nurses accomplish more tasks with the patient and spend less time on documentation.

As shown in the SWOT analysis there are some aspects to consider. Implementing new technology is always a big change for the staff and is rarely accepted by everyone. Therefore, it is important to offer nurses good training in the use of the application as well as to create more awareness of the topic and the need for this innovation generally.

The introduction of NPS into everyday hospital life can prove to be initially particularly difficult; some staff members may not see the problems with the current state of patient documentation and the administration needs to be convinced that the acquisition of the software and possibly hardware required can be amortized. Moreover, as one of the first steps of implementation, the see-feel-change should be followed in terms of emotions, which was earlier in this article.

To make the NPS work as well as possible it is essential to cooperate with the IT apartment and include the whole nursing staff in the process. It is best to introduce the NPS first in one department and not in the entire hospital. The acute ward could be an option to start with.

Overall, the Nurses Pocket Secretary (NPS) can be a beneficial tool that helps nurses with their everyday work. In addition to the benefits the NPS offers nurses and hospitals, it also benefits patients per se. The time saved by using the application allows more personalized and individualized patient care. Further development and research will be needed for further optimization and error prevention.

Sources

Ahlgirm, C., Maenner, O. & Baumstark, M. W. 2016. Introduction of digital speech recognition in a specialised outpatient department: a case study. BMC medical informatics and decision making 16 (1) 1-8. Retriewed 15.5.2021 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5070188/.

Antinaho, T. 2018. Potilaalle lisäarvoa hoitotyöstä. Toimintatutkimus työajanseurannasta hoitotyön kehittämisessä. Department of Nursing Science. Faculty of Health Sciences. Number 472. University of Eastern Finland. Kuopio. Retrieved 15.5.2021 https://erepo.uef.fi/bitstream/handle/123456789/20148/urn_isbn_978-952-61-2836-8.pdf?sequence=1&isAllowed=y

Berry, T. & Wilson D. 2000. On Target: The Book on Marketing Plans. Palo Alto Software Inc, Eugene, 89.

Blackley, S.V., Schubert, V.D., Gross, F.R., Assad, W.A., Garabedian, P.M. & Zhou, L. 2020. Physician use of speech recognition vs. typing in clinical documentation: A controlled observational study. International Journal of Medical Informatics 141. Retrieved 7.4.2021 https://doi.org/10.1016/j.ijmedinf.2020.104178.

Hinweise und Empfehlungen zur ärztlichen Schweigepflicht, Datenschutz und Datenverarbeitung in der Arztpraxis. 2018. Bundesärztekammer Kassenärztliche Bundesvereinigung. Retrieved 19.04.2021 https://www.bundesaerztekammer.de/fileadmin/user_upload/downloads/pdf-Ordner/Recht/Hinweise_und_Empfehlungen_aerztliche_Schweigepflicht_Datenschutz_Datenverarbeitung_09.03.2018_.pdf

Campbell, R. J. 2008. Change management in health care. The health care manager 27(1), 23-39. Retriewed 15.5.2021 https://doi:10.1097/01.HCM.0000285028.79762.a1

Chouffani, R. 2018. Patient care documentation benefits from dictation tools, AI. Biz Technology Solutions. Retrieved 08.04.2021 https://searchhealthit.techtarget.com/tip/Patient-care-documentation-benefits-from-dictation-tools-AI.

Conn J. 2015. Nurses turn to speech-recognition software to speed documentation. Retrieved 29.03.2021 https://www.modernhealthcare.com/article/20151212/MAGAZINE/312129980/nurses-turn-to-speech-recognition-software-to-speed-documentation.

Dufva, M. 2020. Megatrendit 2020. Sitran selvityksiä 162. Vantaa. Erweko. Retrieved 5.4.2021 https://media.sitra.fi/2019/12/15143428/megatrendit-2020.pdf.

Gao, T. & Gurd, B. 2020. Impact of a management innovation on professional subcultures–the case of a balanced scorecard implementation in a Chinese hospital. Chinese Management Studies. Retriewed 15.5.2021 https://doi.org/10.1108/CMS-11-2019-0408

Hiltunen, P. 2016. Mistä on hyvä hoito tehty? Retrieved 19.4.2021 https://www.taja.fi/verkkolehti/blogit/16.9.2016-mista-on-hyva-hoitotyo-tehty-piritta-hiltunen/.

Johnson M., Lapkin S., Long V., Sanchez P., Suominen H., Basilakis, J. & Dawson, L. 2014. A systematic review of speech recognition technology in health care. BMC medical informatics and decision making 14 (1) 1-14. Retriewed 15.5.2021 URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4283090/.

Kaipio, J.(2011. Usability in Healthcare: Overcoming the Mismatch between Information Systems and Clinical Work. Aalto University School of Science Department of Computer Science and Engineering Strategic Usability Research Group. Aalto University Publication Series DOCTORAL DISSERTATIONS 105. Helsinki. Retrieved 5.4.2021http://urn.fi/URN:ISBN:978-952-60-4334-0.

Potilastiedon arkisto. N.d. Kanta-arkisto Retrieved 8.4.2021 https://www.kanta.fi/ammattilaiset/potilastiedon-arkisto.

Quality politics. 2018. Kajaani. Kainuun Sote. Retrieved 8.4.2021 https://sote.kainuu.fi/strategia-ja-toiminta-ajatus.

Kaustinen, T.(2011). Oulu-hoitoisuusluokitus ja hoitohenkilökunnan ajankäyttö hoitotyön laatuvaatimusten näkökulmasta. Acta Universitatis Ouluensis D Medica 1134. Oulun yliopisto. Lääketieteellinen tiedekunta. Terveystieteiden laitos. Hoitotiede. Oulun yliopistollinen sairaala. Retrieved 19.4.2021 http://jultika.oulu.fi/files/isbn9789514296437.pdf.

Special health care. N.D. Helsinki. Kuntaliitto. Retrieved 8.4.2021 https://www.kuntaliitto.fi/sosiaali-ja-terveysasiat/terveydenhuolto/erikoissairaanhoito.

L 159/2007. Act on the Electronic Processing of Customer Data in Social Welfare and Health Care. Retriewed 18.5.2021 https://www.finlex.fi/fi/laki/ajantasa/2007/20070159

L 559/1994. The Act on Health Care Professionals. Retriewed 18.5.2021 https://www.finlex.fi/fi/laki/ajantasa/1994/19940559

L 785/1992. Act on the Status and Rights of Patients. Retriewed 18.5.2021 https://finlex.fi/fi/laki/ajantasa/1992/19920785

L 980/2012. Act on Supporting the Capacity of the Elderly and Social and Health Services for the Elderly. 28.12.2012. Retriewed 15.5.2021 https://www.finlex.fi/fi/laki/smur/2012/20120980

Lavander, P. 2017. Nimikesuojattujen ja laillistettujen ammattihenkilöiden työnjako yliopistosairaalan muuttuvassa toimintaympäristössä. Acta Universitatis Ouluensis D Medica 1431. Oulun yliopisto, Lääketieteellinen tiedekunta. Medical Research Center Oulu. Oulun yliopistollinen sairaala. Retrieved 14.5.2021. http://jultika.oulu.fi/files/isbn9789526216683.pdf

Masrom, M. & Rahimly, A. 2015. Overview of data security issues in hospital information systems. Pacific Asia Journal of the Association for Information Systems 7(4), 5. 51-65.

Social welfare and health care system in Finland, responsibilities. N.d. Helsinki. Ministry of social affairs and health. Retrieved 8.4.2021 https://stm.fi/en/social-and-health-services/responsible-agencies

Pam, M.S. 2013. INTIMACY. PsychologyDictionary.org. Retrieved 19.04.2021 https://psychologydictionary.org/intimacy/.

Nikuliak, A. 2020. Voice Recognition Technology for Effective Healthcare. Retrieved 10.04.2021 https://www.scnsoft.com/blog/speech-recognition-healthcare.

Nykänen, P. & Junttila, K. 2012. Hoitotyön moniammatillisen kirjaamisen moniammatillisen asiantuntijaryhmän loppuraportti. Suositukset ja toimenpide-ehdotukset hoitotyön ja moniammatillisen kirjaamisen kehittämiseksi. Helsinki. Terveyden- ja hyvinvoinninlaitos. Raportteja 40. Retrieved 5.4.2021 http://urn.fi/URN:ISBN:978-952-245-666-3

Patrikainen, M. 2020. Terveydenhuollon digitalisaatio ja sen tuomat hyödyt ja haasteet. Information Systems, Bachelor's Thesis. Retrieved 10.4.2021 https://jyx.jyu.fi/bitstream/handle/123456789/68780/URN%3ANBN%3Afi%3Ajyu202004302987.pdf?sequence=1&isAllowed=y

Reponen, J., Kangas, M., Hämäläinen, P., Keränen, N. & Haverinen, J. 2018. Tieto-ja viestintätegnologian käyttö terveydenhuollossa vuonna 2017. Tilanne ja kehityksen suunta. THL-raportti nro 5. Oulun yliopisto ja Terveyden- ja hyvinvoinnin laitos. Retriewed 10.4.2021 http://urn.fi/URN:ISBN:978-952-343-108-9

Scott, T., Mannion, R., Davies, H. & Marshall, M. 2003. The quantitative measurement of organizational culture in health care: a review of the available instruments. Health services research 38(3), 923–945. Retriewed 15.5.2021 https://doi.org/10.1111/1475-6773.00154

LifeCare puheentunnistus. Uuden sukupolven palvelupohjainen puheentunnistusratkaisu. N.d. Tieto Evry Retrieved 5.4.2021 https://www.tietoevry.com/fi/toimialat/sosiaali-ja-terveyden-huolto/puheen tunnistus/.

Valvira. 2020. Valvontaviranomaisten ohje välittömästä ja välillisestä työstä vanhusten tehostetun palveluasumisen ja laitoshoidon toimintayksiköissä. Retrievd 19.4.2021 https://www.valvira.fi/-/valvontaviranomaisten-ohje-valittomasta-ja-valillisesta-tyosta-vanhusten-tehostetun-palveluasumisen-ja-laitoshoidon-toimintayksikoissa.

White P. & Scott E. 2015. Applying speech-to-text systems in documentation. Nursing Times 111 (15), 15-17. Retriewed https://www.nursingtimes.net/roles/childrens-nurses/applying-speech-to-text-systems-in-documentation-06-04-2015/.

4 Kytkettix – an appointment scheduler

Amelie Maurer, Bachelor of Business Studies in Healthcare Management, HNU, Germany
Miriam Witthüser, Bachelor of Business Studies in Healthcare Management, HNU, Germany
Suvi-Maria Tolonen, Master of Health Care, KAMK, Finland
Rauni Leinonen, Principal Lecturer, KAMK, Finland
Kirsi Moisanen, Senior Lecturer, KAMK, Finland
Alexander Würfel, Professor, Dr., HNU, Germany

Abstract

Digitalization is the origin of new technologies and innovations nowadays, supporting processes and cooperation in the health care sector. The aim of this article is to introduce a solution that responds well to with the increasing need for effective time management and multi-professional communication and exploits the possibilities of increasing digitalization as well as shows the background in health care and the development of the innovation and its possible limitations. Building on practical experiences in the health care sector, the need for an application to facilitate cooperation between clients and service providers in everyday life became apparent. Based on an extensive literature research, legal requirements and technical specifications for an innovation were elaborated. To face time management and cooperation issues the concept for an application named Kytkettix was created. The purpose of the Kytkettix innovation is to make it easier for clients who use many social and health services to manage the details of their treatment, to facilitate good communication between service providers and clients, and to provide a clear service platform for both sides. The purpose of this article is to present Kytkettix as a planning and communication tool within the Finnish health care system.

Keywords: application, health care services, innovation, multi-professional platform

4.1 Introduction

“Ever flees the time; it will wait for no man” is a quotation by Geoffrey Chaucer (Chaucer n. d.). It says that time is always passing by, and nobody can stop this process. Therefore, people should make use of their time and not postpone doing things to live a successful life. As the number of smartphone users worldwide is increasing steadily, digitalization is nowadays a big part of many people's lives and firmly integrated into people's daily routines. (Gu 2020.) Thus, it makes sense to also manage personal appointments via a smartphone. By using new technology, the right time can be assigned to the actual activity very easily. (Management Study Guide n. d.) Furthermore, communication between people, whether it is a phone call or an SMS, is just a click of a button away these days. In other words, digitalization and use of modern technologies support easy and effective time management and communication.

In social and health services, we increasingly encounter clients with a wide range of support needs (Palvelujen tuottaminen - Sote-uudistus 2021). Clients may be surrounded by many multi-professional and multi-stakeholder networks. Actors may include sectors such as primary health care, specialized health care, early childhood education and care, and the third sector. Often the actors have different appointment and client information systems which do not communicate with each other. In such situations, overlaps, missed appointments and ambiguity on agreed topics easily occur. It is difficult for professionals to make appointments with clients. Situations are especially challenging for clients who try to remember their appointments with all professionals and things agreed with them.

Kytkettix is an application designed to facilitate collaboration between clients and professionals in everyday life. The purpose of the application is to help multi-professional networks to stay up to date on clients’ situation and ongoing support measures, and to facilitate cooperation between professionals.

The name Kytkettix is a combination of German and Finnish words. The first part of the name comes from the Finnish verb ‘kytketty’ which means ‘connected’. The rest is derived from the German word "fix" which means fast or quick. The name reflects the idea of the application to facilitate fast networking between service providers and clients, thus ensuring organized and flexible collaboration. The design of the logo, as shown in Figure 1, underlines and strengthens this idea.

Figure 1. Logo and name of the innovation

4.2 Background

In Finland, social and health services are provided by many different actors. An important unit in the service network is a municipality which is responsible for primary and social services. In some social and health services the responsibilities are usually divided between social and health care actors. (Palvelujen tuottaminen - Sote-uudistus 2021.)

The reform of Finnish health and social services is a major issue in the forward-looking program of the Centre for Social and Health Services in Finland. One of the main goals of the service system reform is to increase client orientation, accessibility, and equality in the service system. The goals can be achieved by increasing client inclusion. (Sosiaali- ja terveydenhuollon uudistaminen 2019.)

Health and social services offer a wide range of services to families and clients. Multi-professional and multi-disciplinary cooperation can be offered by the municipality or through day care and the third sector. (Sosiaali- ja terveydenhuollon uudistaminen 2019.) The third sector refers to clubs, associations, foundations, interest groups and other types of non-profit organizations that are organized for people and serve the public good.

Coordinating appointments that need to be made on a daily or weekly basis can be stressful and overwhelming for clients. The network around the client can consist of dozens of professionals. In health and social services, strict legislation determines what information is available to the different actors and what kind of information about their clients they can share among themselves. All actors have their own information and appointment systems that do not communicate with each other. In these situations, appointments can overlap, which creates additional costs for all parties involved.

mHealth, which can be broadly defined as the provision of healthcare services via mobile communication devices, is considered to play an important role in this context (Altendorfer 2017, 45; Moumtzoglou n. d., 253). Experts point to the advantages that, on the one hand, the workload of healthcare personnel can be reduced because, for example, recorded values or client information can simply be transmitted via apps, which saves time. On the other hand, they support the transformation of client's role which is increasingly becoming more participatory, and thus also increase patients' awareness of health issues. (Altendorfer 2017, 45.) Furthermore, mHealth establishes health communities in which clients can easily participate, incorporates applications and systems that let clients coordinate and actively manage their care remotely, and creates new points of contact with clients, changing the frequency and intensity of health care. (Moumtzoglou n. d., 253-254.) According to the results of a research by Heponiemi, digital health care services also have the potential to reinforce existing social and health inequalities (Heponiemi et al. 2019), which is an important point to be considered in the process of planning new digital innovations.

The potential of mHealth applications is the motivation to develop digital applications that would specifically address the issues described above. The purpose of this article is to present an application called Kytkettix as a planning and communication tool within the Finnish health care system, to provide a suitable solution for the increasing need for effective time management and multi-professional communication, and to show the background in health care and the development of applications, as well as their possible limitations. The purpose of the Kytkettix innovation is to provide a suitable solution for the increasing need for effective time management and multi-professional communication, and to show the background in health care and the development of applications, as well as their possible limitations. The purpose of the application is to help multi-professional networks to stay up to date on clients' situation and ongoing support measures, and to facilitate cooperation between professionals.

The considerations for this application resulted in the Kytkettix app. The aim of this innovation is to support clients who work with many professionals and who must keep many appointments. By avoiding overlapping appointments and having a clear overview of appointments, the client's overload is reduced. The app can increase transparency and trust between different actors and clients. The innovation helps the authors involved in the multi-professional framework to coordinate appointments with clients without getting in each other's way.

4.3 Methods

The course “Smart Solutions” started in March 2021 as part of the virtual international week organized by Kajaani University of Applied Sciences (KAMK). The participants of this course were Master of Health Care students from the programs Advanced Practice Nurse and Management of Health and Social Care at KAMK in Finland and Bachelor of Business Studies in Healthcare Management students from Neu-Ulm University of Applied Sciences (HNU) in Germany. The students were able to listen to presentations on megatrends, eSports, health measurements, project management and other innovation-related topics. During the international week, multidisciplinary teams were formed to work on their own innovation throughout the spring semester 2021.

Due to the Covid-19 pandemic, it was not possible for the course participants to meet in person. For this reason, the weekly meetings within a team took place virtually as well. The first meetings had the purpose of working out an innovation and developing it further. The starting point for the innovation idea was the workplace of Finnish students. It was important to ensure that every team member understood and knew the problem and the need for the innovation. Some discussion and brainstorming sessions later, the concept of creating an application named Kytkettix was decided on. The concept consists of the need, purpose, benefits, possible limitations, and functions of Kytkettix. A project structure plan and a work breakdown structure were developed to get a better overview of the time frame for the project, including further tasks, responsibilities, and milestones.

Over the next few weeks, the application was finalized. During this process, research on existing similar innovations and the legal situation in Finland helped to identify chances and limitations of Kytkettix. Concepts on the technical requirements and different functions of the application were also completed.

4.4 Legal Requirements

When developing any medical product, it is essential to comply with the legal requirements of Finland and the European Union. Since the Kytkettix innovation works with personal data, the aspect of data security plays a particularly important role. When processing data, a so-called data system must be used. A data system is "a software or a system implemented for the electronic processing of social welfare and health care client data and used to store and maintain client and

patient documents and the information they contain". Such a data system can be used or purchased from an external provider, as creating one's own involves a lot of extra work and specific expertise in this area is necessary. The external provider of a data system is responsible for the conformity of the data system with the legal data regulations. (Social welfare and healthcare data systems 2021.) Thus, the producer of the Kytkettix app does not run the risk of not having sufficiently observed important regulations.

The Act on the Electronic Processing of Client Data in the Social and Health Care Sector defines the general requirements for the electronic processing of client data in the public and private health and social care sector. The Act on the Secondary Use of Social and Health Data also contains further legal requirements. The aim of this law is to enable efficient and secure processing of personal data. (Terveydenhuoltolaki 1326/2010.)

The Act on the Openness of State Interest poses three general obligations of confidentiality on public authorities. These include Confidentiality (§ 22), Professional Secrecy (§ 23) and Prohibition of Exploitation (§ 23). (Laki viranomaisten toiminnan julkisuudesta 621/1999.) Confidentiality of documents means that the confidential authority document or a copy thereof may not be shown or handed over to a third party or made available to a third party for inspection or use by means of a technical connection or in any other way (Terveydenhuoltolaki 1326/2010). This requirement can only be circumvented by the patient's written consent that his or her patient information may be disclosed to a third party. This primary criterion is contained in the Patients Act. (Laki potilaan asemasta ja oikeuksista 785/1992.) Therefore, it is of enormous importance to obtain the patient's written consent for each health care facility as well as for each individual professional at that facility who is to have access to the patient's data and documents via the Kytkettix app. The patient’s consent must be obtained in writing and, as will be described in more detail later, it is one of the first steps in registering as a user of this innovative app.

Furthermore, when accessing data collected by other health care providers by means of information systems, the use of patient data must be monitored in accordance with § 5 of the Act on the Electronic Processing of Client Data in Social and Health Care (Laki sosiaali- ja terveydenhuollon asiakastietojen sähköisestä käsittelystä 159/2007). Confirmation of the existence of a doctor-patient relationship between the patient and the person requesting the disclosure of data shall be obtained by means of information technology. This process will not be described in detail in this article, as it will take place in the background between the health care providers and the management company; this article will focus mainly on the use of the app from patients and healthcare managers’ point of view.

Three main principles have been defined for the digitalization of social and health administration: client-oriented development of social and health services, user-friendliness, and security of services, and opening of service interfaces for social and health care companies and citizens (Digitalisaatio terveyden ja hyvinvoinnin tukena. Sosiaali- ja terveysministeriön digitalisaatiolinjaukset 2025 2016). These principles form the basis for the Kytkettix innovation. The app's client orientation, user-friendliness and security in handling patient data will be described in more detail below by outlining its technical development and functionality.

4.5 Technical Specifications

The innovation is created with an open-source platform called Xamarin. The decision was made in favor of this development environment because Xamarin allows the application to be created for iOS, Android and Windows, hence a large range of applications and therefore a large range of patients can be covered. About 90% of the application can thus be released across platforms. Accordingly, the entire program can be written in a single programming language, namely the C# language. This implies that it is still a native app in terms of performance and appearance. (Microsoft Corporation 2021.) The design of Kytkettix is to be adapted and elaborated mainly to mobile phones, tablets and laptops, since it is assumed that these are the devices the app will most often be applied to.

After finishing the development and design of the application, it can be put into operation. Kytkettix is first offered to providers of health care services. If an institution is interested in using the application, the administration company (provider of the app) creates an overall account for the company, and single accounts for every provider who is working in direct contact with clients within that company account. Every company that uses the Kytkettix application is added to a network, including all participating companies and institutions, which enables cross-institutional sharing of information and appointments if necessary.

If an institution is added to the Kytkettix network, it can offer the use of the appointment-coordination app to its patients. The whole registration process can be followed visually in the BPMN model as illustrated in Figure 2. An interested client gets handed out the necessary forms by the institution using the application. These forms include a written request and the terms of use which need to be agreed on by the client, and documents including a list of all institutions using the application. Here the client must choose (1) which institution he/she is receiving treatment

from, (2) which provider/institution is allowed to access information of a patient (e. g. list of all institutions providing treatment to the patient), and (3) which staff/ therapists specifically have access to patient data. The completed form is returned to the institution which forwards it to the administration company. These decisions can be changed later, but they must always be requested in writing, as they entail patient-related data.

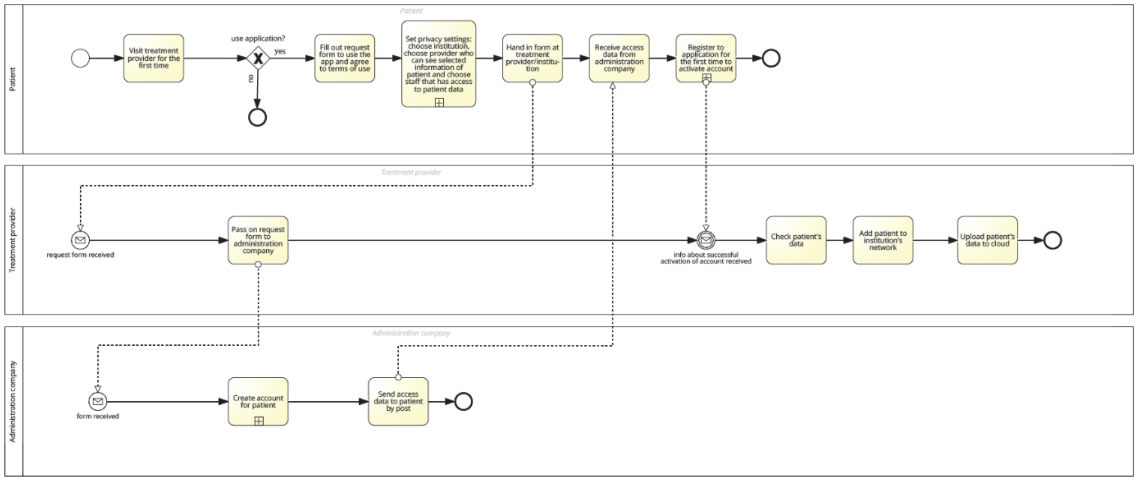


Figure 2. BMPN registration

The administration company creates an account for the patient and sends the data to the patient by mail. Then the patient can log in for the first time, which activates the account. Once the patient account of a patient receiving treatment at the institution is activated, the institution will be informed, the request will be checked, and the patient will be added to the network of the institution. After that the patient information that is necessary for the application will be uploaded to the cloud. The access right to these are already defined by the patient (as described before). Now the institutions that provide treatment to the patient can enter his or her appointments to the app. This process is illustrated in Figure 3.

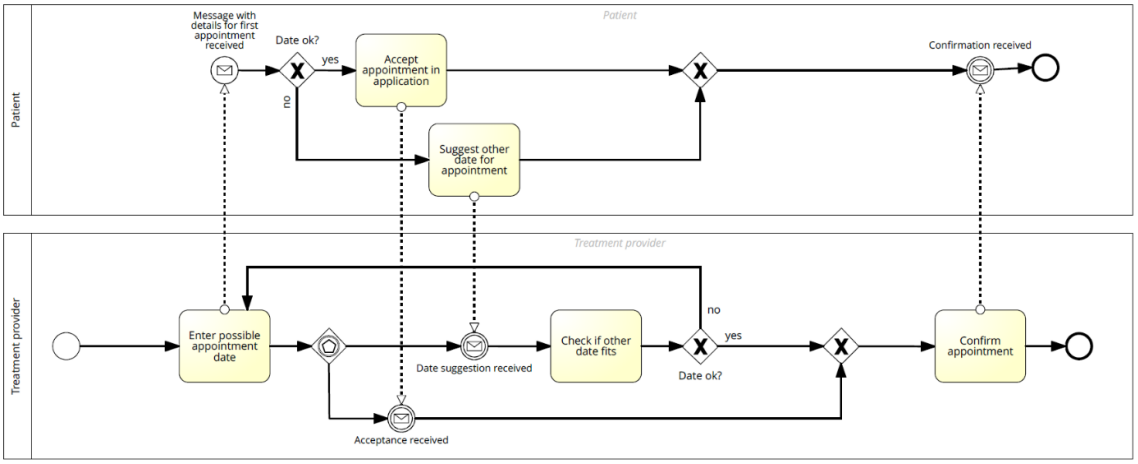


Figure 3. BPMN first appointment

It is also possible to request access for patients' relatives, even several persons. This must be requested in writing. The relative is given his or her own account, which is linked to the patient account so that he or she can be treated as an independent person when it comes to making appointments, and it can be noted whether the relative is participating in an appointment or not. In addition, this separate account approach is important because the patient must also give permission to this person to view personal information; the patient can also deny access to certain information. However, if the relative acts as a caregiver or guardian, e. g. in the case of patients suffering from dementia, a power of attorney can be issued for them. In this case, no additional account is required for the relative; instead, it is noted in the patient account that the account is managed by a relative or guardian.

The patient data, which is necessary to be uploaded by the institution, must include all important information about the patient and the treatment at one glance. Hence, the treatment provider immediately knows what the needs of the patient are and what kind of appointment is to be arranged. The provider is also able to react quickly on requests made by the patient considering the essential knowledge. Consequently, the uploaded data is the master patient data, a description and list of all treatments the patient should receive, including the names of the professionals providing the treatments. Furthermore, a time schedule of the treatments should be available, from which it should be seen how often and how long treatments should be provided. Additionally, it would be helpful to add notes of times when the client is available for appointments, as well as specific notes of the provider.

As described, patients themselves describe who specifically have access to their data due to data protection rights. But it is also essential to take precautions to ensure the secure transmission of data between the patient and the authorized persons. The Kytkettix app uses cloud technology to share the data, which allows the professionals to work on the appointment scheduler simultaneously without losing data. Automatic updating of the data facilitates reservations and avoids appointment overlaps, increasing the overall utilization of operations, which enables multi-user usability. For secure internet connections and protecting sensitive data, encrypted data transfer via an SSL (Secure Sockets Layer) server (Was sind SSL, TLS und HTTPS 2021) is employed.

The aim, in terms of funding the Kytkettix app, is that it can be accessed by physicians. The physicians who work in the institution issue a request to use this application. Then, the patient can submit the request to their health insurance company. The patient then receives a code that enables a free download of the application. The requirements for this procedure are, firstly, that the patient uses at least two services from different service providers, which would justify the need for the application. Secondly, the application must be verified as a so-called service-oriented application and be recognized by the health insurance company, so that they subsequently take over the financing of it.

To move from the technical basics of the application to the functionality, the user roles and the associated rights must first be defined. There are two types of user roles in this application, determined by the administration company: the provider and the client. These roles are assigned to the users directly when the account is created. Both roles are assigned certain rights that are unique to that role. However, there are also some rights that are granted to both roles, such as accessing and reading the patient information a professional has entered. At this point, it is important to point out again, that individual professionals can only view patient information if the patient has given them the permission to do so. Besides, both roles can set appointment reminders and write messages: the provider to the client or to other providers, and the client to the providers. The most fundamental difference in the distribution of rights is that the client has no right to enter appointments or to change an appointment. This right is reserved to the provider. But the patient is, of course, also involved in the scheduling and, therefore, has the possibility to ask for appointments, suggest changes and cancellations in scheduled appointments.

4.6 Functions

The purpose of the Kytkettix app is to provide patients with one platform where they can manage all their medical appointments to avoid overlapping appointments and to get a clear overview of their upcoming appointments. Therefore, the application must include specific functions.

After a successful registration to Kytkettix, the patient can choose from different tabs in the menu which are the following: Home, Appointments, Calendar, Documents, Messages, Contacts, Information, and Settings. In the first tab, 'Home', the patient can see a reminder for the next appointment he has, including the name, date and time of the treatment, and the name of the treatment provider. He can choose whether he wants to set an alarm as a reminder at a desired time before the appointment or not. Furthermore, the patient gets a small preview of unread messages.

The second tab, 'Appointments', helps the patient to manage and arrange his treatment appointments. Besides seeing his upcoming appointments, the patient can make an appointment suggestion in this tab. For that, the patient chooses a date for the appointment; after that the type of treatment, the desired time and the name of the treatment provider are chosen. Then the patient can submit the suggestion and wait for the appointment to be confirmed or an alternative date suggested by the treatment provider.

To get an overview of all appointments, the patient can open the 'Calendar' tab. Here, appointments for one month are displayed. By swiping to the left or to the right, the display switches to the previous month or to the next month.

As the name already says, the patient can manage his documents by using the 'Documents' tab. He can upload additional files concerning his medical background/ history, medication plans, relevant treatment reports, doctor's letters, and further necessary documents. Moreover, the patient can share documents with treatment providers or other network partners.

To communicate with treatment providers, the patient opens the 'Messages' tab which displays all messages and chats. By tapping on a message, the chat with the respective treatment provider opens. The patient has also the possibility to write new messages by tapping the respective button at the bottom.

The next tab, 'Contacts', lists all saved contacts. By tapping on a contact, all relevant information concerning a person, such as name, profession, address, and phone number, appears. The patient can also add new contacts.

The seventh tab is ‘Information’. In case the patient needs further information about health and wellbeing, not concerning his treatments, he can open this tab and access links to various websites about wellbeing and social and health services. Furthermore, a map gives directions and helps the patient to get to the institution where a specific treatment is provided. The addresses of the institutions are also listed in this tab.

The patient is also able to change some of his privacy settings in the last tab, ‘Settings’. More precisely, he can manage his personal data, like profile picture, name, address, and phone number. Furthermore, he has an overview of the people who have access to his personal data and documents. In case, the patient wants to change some of these access authorizations, he must request a form in which he can update the access rights via the app.

The application layout for treatment providers looks quite identical to the patient’s one. The only difference in the menu is that the treatment provider can choose the ‘Shift Planner’ tab which displays each day and the shifts of the treatment provider and his colleagues.

To give a better overview of the different functions of Kytkettix, the different mobile phone screens are demonstrated in Figure 4. Each screen shows either how the screen of a specific function could look like or how the starting screen of the application or the menu can be visualized when it comes to the implementation of Kytkettix.

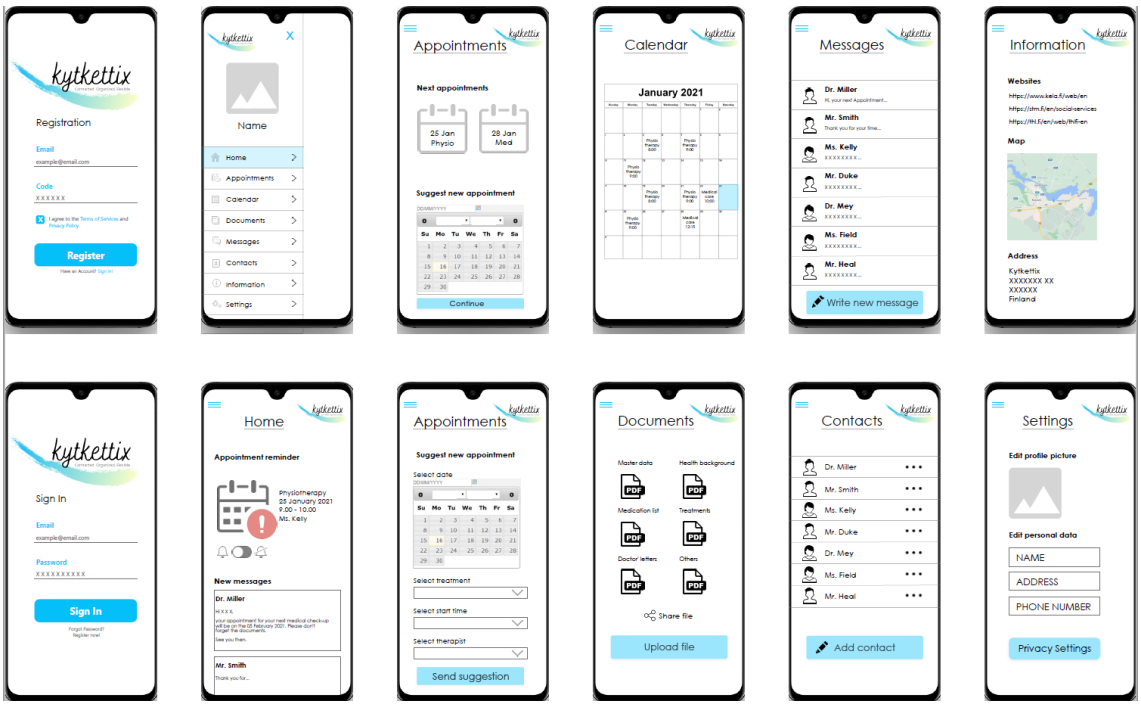


Figure 4. Simplified, possible visualization of the application for better understanding

4.7 Conclusion

The aim of this article was to introduce a solution that responds well to the increasing need for effective time management and multi-professional communication and exploits the possibilities of increasing digitalization. The purpose of the Kytkettix innovation is to make it easier for clients who use many social and health services to manage the details of their treatment, to facilitate good communication between service providers and clients and to provide a clear service platform for both sides. The purpose of this article was to present the application Kytkettix as a planning and communication tool within the Finnish health care system and to provide a suitable solution to the increasing need for effective time management and multi-professional communication, and to introduce the background in health care and the development of applications, as well as their possible limitations.

The principles of digitalization in the social and health sector as well as the reform of the service systems provide criteria that innovative applications in this sector should meet. In social and health services, we increasingly encounter clients with a wide range of support needs. (Palvelujen tuottaminen - Sote-uudistus 2021.)

The primary requirement for the Kytkettix app is client orientation or the client-oriented development of a health service. Kytkettix meets this requirement and offers the client a platform through which he can clearly manage all his medical appointments. The client can coordinate his multi-professional appointments with the weekly and monthly displays of his appointments and can set appointment reminders and quickly contact the service providers, should questions or comments arise. User-friendliness is enhanced with the easy accessibility of the app, which is possible via a smartphone, laptop, or computer.

The app also serves to optimize the quality of communication between the patient and the service provider. On the one hand, it is important to put the client as an individual at the focus of the treatment. On the other hand, the application helps both users to manage their time efficiently by using the ‘Messages’ function of the app. (Moumtzoglou n. d., 51.) The client has the possibility to communicate directly with the service provider, whereby arrangements can be made simply and promptly. Through this possibility, as well as through the option for the client to view his or her health information at any time via the app, this application reinforces the realization of the client's share of the service and the quality of communication. According to the results of a re-

search by Heponiemi, digital health care services also have the potential to reinforce existing social and health inequalities (Heponiemi et al. 2019). That is an important point that has to be considered in the process of planning new digital innovations.

The Kytkettix app promotes interfaces between social, health care providers and patients, enabling a network between them that is continuously strengthened, promoted and expanded through the use of the app. Close cooperation and communication between the service provider and the patient, as well as the same level of access to information and documents, increases transparency and trust between them. The network between multi-professional service providers is also strengthened, as they no longer act as competitors in finding appointments and struggling with overlapping appointments but can simply enter appointments in the patient's calendar during a free period. Cloud technology makes it possible for service providers to work on a patient's calendar at the same time and to update data immediately, thus preventing overlapping appointments.

Data protection and security guidelines require that the application must be based on a solid legal foundation to ensure that the user data of an mHealth app, such as the Kytkettix app, is always secured (Moumtzoglou n. d., 16). To guarantee a secure Internet connection to protect sensitive data in the Kytkettix app, the security of the system is ensured by the encrypted data transfer via an SSL server.

Despite all these benefits, the data protection regulations can be seen as a limitation for the application. These can be counteracted by an externally acquired data system. This means that the system provider, not the developer of the innovation, must ensure compliance with data protection regulations. The procedure of obtaining a written consent from the patient before a professional can access the patient's data also contributes to the fulfilment of the legal requirements and makes the application compliant as well as efficient. Nevertheless, great attention should continue to be paid to compliance with data protection regulations during the development.

Since digitalization will continue to advance, it is also advantageous here that the innovation provides compatibility for further future developments. A conceivable further development would be, for example, a link with the Electronic Health Card, should this be further implemented in the Finnish system in the next few years. The Xamarin development environment, which covers a wide range of systems and is highly compatible, lays the foundation for such a link. Thus, the Kytkettix innovation is an all-encompassing solution not only for the present, but also for the near and perhaps even the distant future.

Sources

Altendorfer, L. 2017. Neue Formate der digitalen Gesundheitskommunikation. Nomos Verlagsgesellschaft Baden-Baden.

Chaucer, G. n. d. The Clerk's Prologue, Tale, and Envoy. in: The Canterbury Tales. Harvard University. Retrieved 05.05.2021 from https://chaucer.fas.harvard.edu/pages/clerks-prologue-tale-and-envoy.

Digitalisaatio terveyden ja hyvinvoinnin tukena. Sosiaali- ja terveysministeriön digitalisaatiolinjaukset 2025. 2016. Sosiaali- ja terveysministeriön julkaisuja 5. Sosiaali- ja terveysministeriö. Retrieved 25.04.2021 from http://urn.fi/URN:ISBN:978-952-00-3782-6.

Gu, T. 2020. 43% of Active Smartphones Will Be 5G-Ready by 2023: The Global Mobile Market Is on Track for Substantial Growth and Game-Related Engagement. Newzoo (Ed.) Retrieved 28.04.2021 from https://newzoo.com/insights/articles/mobile-game-market-2020-smartphone-users-game-revenues 5g-ready-engagement/.

Heponiemi T., Jormanainen V., Leeman L., Manderbacka K., Aalto A-M & Hyppönen H. 2019. Digital Divide in Perceived Benefits of Online Health Care and Social Welfare Services: National Cross-Sectional Survey Study. Retrieved 30.5.2021 from Journal of Medical Internet Research - Digital Divide in Perceived Benefits of Online Health Care and Social Welfare Services: National Cross-SectionalSurvey Study (jmir.org).

Laki potilaan asemasta ja oikeuksista 785/1992. Retrieved 29.04.2021 from 785/1992 Säädösmuutosten hakemisto - FINLEX ®.

Laki sosiaali- ja terveydenhuollon asiakastietojen sähköisestä käsittelystä 159/2007. Retrieved 29.04.2021 from Laki sosiaali- ja terveydenhuollon asiakastietojen… 159/2007 - Ajantasainen lainsäädäntö - FINLEX ®.

Laki viranomaisten toiminnan julkisuudesta 621/1999. Retrieved 29.04.2021 from Laki viranomaisten toiminnan julkisuudesta 621/1999 - Ajantasainen lainsäädäntö - FINLEX ®.

Management Study Guide. n. d. Time Management - Meaning and its Importance. Retrieved 27.04.2021 from https://www.managementstudyguide.com/time-management.htm.

Microsoft Corporation. 2021. What is Xamarin. Retrieved 18.04.2021 from https://docs.microsoft.com/de-de/xamarin/get-started/what-is-xamarin.

Moumtzoglou, A. n. d. Mobile Health Applications for Quality Healthcare Delivery. P&A Kyriakou Children's Hospital. Greece. 194.95.20.115.

Palvelujen tuottaminen - Sote-uudistus. 2021. Terveyden- ja hyvinvoinninlaitos (THL). Retrieved 25.04.2021 from Palvelujen tuottaminen - Sote-uudistus – THL.

Sosiaali- ja terveydenhuollon uudistaminen 2019. Retrieved 28.04.2021 from https://vm.fi/documents/10623/9444692/Sote-uudistusSTM092019.pdf.

Social welfare and healthcare data systems. 2021. Valvira. Retrieved 18.04.2021 from Social welfare and healthcare data systems - valvira englanti – Valvira.

Terveydenhuoltolaki 1326/2010. Retrieved 29.04.2021 from Terveydenhuoltolaki 1326/2010 – Ajantasainen lainsäädäntö - FINLEX ®.

Was sind SSL, TLS und HTTPS. 2021. DigiCert. Retrieved 18.04.2021 from https://www.websecurity.digicert.com/de/de/security-topics/what-is-ssl-tls
https#:~:text=SSL%20steht%20f%C3%BCr%20%E2%80%9ESecure%20Sockets,zwischen%20zwei%20ystemen%20%C3%BCbertragen%20werden.

5 TTT – a digital platform that promotes trust and cooperation at work

Karekivi Tiia, Master of Social and Health Care, KAMK, Finland
Asani Marigona, Bachelor of Business Studies in Healthcare Management, HNU, Germany
Leinonen Rauni, Principal Lecturer, KAMK, Finland
Moisanen Kirsi, Senior Lecturer, KAMK, Finland
Würfel Alexander, Professor, Dr., HNU, Germany

Abstract

Healthcare is experiencing a time of change. Changes are driven by technological developments, but also by changing patient expectations and societal changes. The strong digitalization of the industry emphasizes technological know-how. This article describes a digital healthcare innovation called TTT – Team, Trust, Training. The innovation aims to develop wellbeing at work by promoting trust and uses a digital platform which meets the future needs in healthcare. The purpose of the innovation is to promote trust, collaboration and problem-solving in an educational digital environment. Digitalization and technology in healthcare foresight and promotion of wellbeing and trust in workplaces form the theoretical framework. This article describes the innovation process and discusses the content and structure of the TTT platform, SWOT analysis and further innovation ideas. Current examples to build trust and use digitalization as an educational tool are also addressed. The TTT innovation was presented in an online innovation workshop during the 2021 International Week at Kajaani University of Applied Sciences. The innovation team consisted of a Master of Health Care student from Finland and a Bachelor of Health Management student from Germany. The team's vision for the innovation was to impact work cultures with latest information and future trends.

Keywords: team building, digital environment, cooperation, healthcare management, business

5.1 Introduction – digitalization and technology in healthcare foresight: trust and effective cooperation brings success to organizations

Effective cooperation is one key feature of successful organizations. Everyone can influence their own cooperation with their attitude, enthusiasm, and interaction skills. Members of a work community must meet the set goals by committing to them. When the work community understands the strategic goals set by the management, it is easier to commit to them. The level of trust among both the employer and co-employees must be high. Work and work-related issues can be developed together. The responsibility for managing well-being at work lies with the management and supervisors, but successful leadership also requires a well-functioning work community committed to shared goals. (Johda työhyvinvointia tuloksellisesti 2021, 6.)

The innovation topic of the course called Smart Solutions for Wellbeing Management and Development is based on health care foresight. The concept of the topic combines business expertise with healthcare and future orientation. Healthcare is experiencing a time of change. The strong digitalization of the industry is shifting the emphasis towards know-how in technology and systems development. For example, the Lääkäri 2030 project identified several megatrends that may have a significant impact on health care and the role of experts. The industry is digitalizing, information is increasing, and the importance of patient self-care is growing. Changes are driven by technological developments but also by changing patient expectations and societal changes. (Megatrendit 2021.)

Most megatrends in healthcare are not new but have been driving the development of healthcare for some time. Data growth and digitalization, increased self-care, genetics, intelligent information systems and virtual environments have been defined as future megatrends. (Megatrendit 2021.) Patja (2018) also estimates that in the future it will be clear that finding information will be easier. Learning features and elements are beginning to enter patient information systems as decision-support algorithms and artificial intelligence become more common. This is the reason why we focused on developing an educational digital environment for the topic.

In this article we describe a digital healthcare innovation called TTT. The aim of this article is to describe well-being at work by promoting trust. We also wanted to face the future needs of healthcare by developing a digital platform on the subject. The purpose of this article is to promote trust, collaboration and problem-solving in an educational digital environment. The theoretical framework lies in the digitalization and technology in healthcare foresight and promoting well-being and trust in workplaces.

5.2 Promoting Well-Being and Trust in Workplaces with a Digital Innovation

One of the first priorities of entrepreneurs and managers is to ensure the organization's future. It is important to make the leaders focus on developing business: growth, profitability, cash flow, competence development and support for well-being at work. All this is necessary when building a successful business. (Mitronen & Raikaslehto 2019, 244.) Well-being at work as a concept is quite new and depends on the view taken. A recent positive psychological approach pays attention to individual and organizational strengths, which is also a combined positive emotion and motivation state. (Heikkilä-Tammi, Nuutinen, Bordi & Manka 2015, 146.)

Trust is interaction between two people. It is affected by both emotions and knowledge (Laine 2008, 57, 74). Lack of trust affects a company financially. Less investment is made and risk-taking is lower, which is reflected in the company's result. The positive effects of trust are more challenging to measure compared to the effects of distrust in a workplace. All social activities, cooperation and organizations require trust. (Blomqvist 2006, 1.) If there is no trust between an employee and employer, the employee can't commit to common goals and decisions. The employee's satisfaction with a supervisor increases and he or she is motivated to work when he or she trusts his or her supervisor. Trust has the strongest effect on job satisfaction and commitment. (Blomqvist 2006, 2.) Nummelin (2008, 54) claims that work atmosphere is built by good human relationships, which is also a key job satisfaction meter. Good atmosphere at work improves work motivation, innovation, and efficiency.

The objective of this innovation was to develop well-being at work by promoting trust. When the innovation process started, we had an idea to build a teambuilding tool, which would enhance cooperation and promote trust in workplaces. We created a plan for the original idea and started designing the right format for the content. Our options were to build an application or a game. However, as the innovation process progressed, we decided to create a platform as the basis of the innovation. According to the expert consulted, it is good to start the game or application building process by first getting acquainted with the existing games and applications that correspond most to the innovation being developed. Accurate planning is a very important part of the process. At this point we chose to create a platform, which helped us to create more content to the innovation. We think that this decision and this article represent the first step of reaching the objective of our innovation. We present the application and game building tool as further innovation ideas in the end of this article.

This project was managed through a structured and well-considered plan. After a brainstorming session, ideas were sorted out. We defined the resources as human and material and applied a project management tool called the Work Breakdown Structure (WBS). It is a graphical structure that includes elements and tasks. It allowed us to draw clear definitions and define the project scope as well as to monitor and manage the project. Based on this structure, we created a project plan and a schedule with the respective responsibilities, milestones, tasks, and durations.

5.3 SWOT Analysis of the Platform

Why should organizations focus on developing well-being and promoting trust? Is this topic worth an innovation? In the beginning of the innovation process, we completed a SWOT analysis of the topic. The SWOT analysis is a strategic planning technique (Table 1) used to help an organization to identify strengths, weaknesses, opportunities, and threats related to project planning. Trust is a skill that can be developed. Trust building needs dialogue, communication, and cooperation. We describe the innovation and the platform more closely in the next chapters.

We wanted to focus on developing well-being at work by promoting trust in this article. Trust also includes how confidently we act and how we can trust others. Tasks performed in a work community require trust in both our own colleagues and supervisors. Effective learning, communication, and problem solving all require trust. Trust also relates to work-related goals. When there is trust between the manager and the employee, the employee also dares to tell if something is wrong. (Kupias, Peltola & Pirinen 2014.) One of the most important feelings in organizations is trust, and it plays a role in a company's ability to innovate and survive in a difficult time. Atmosphere and trust at work encourage innovations and experimentation of new things as well as increase courage and promote openness. (Salonen 2017, 188.)

Table 1. Swot analysis modified from the TTK article (Laine & Rauramo 2017)

THREATS	OPPORTUNITIES
○ ORGANIZATIONAL RESOURCES ○ BAD OR POOR LEADERSHIP ○ LACK OF COMPETENCE AND INFORMATION ○ EMPHASIS ON CONFLICT SITUATIONS ○ TALKING BEHIND BACK MAY INCREASE ○ IN DISCUSSIONS, THE STRONGEST OPINIONS WIN ○ FAVORITISM PREVAILS ○ DISPUTES SPREAD ELSEWHERE IN THE WORK COMMUNITY ○ DISPUTES SPREAD OUTSIDE THE WORK COMMUNITY	○ EFFECTIVE WAY TO INCREASE BUSINESS AND PROMOTE TEAMWORK ○ MORE INNOVATION AND POSSIBILITIES TO DEVELOP SERVICES OR BUSINESS ○ USING TRUST AS A STRATEGIC METHOD TO COMMIT TO SHARED GOALS ○ FACILITATES THE IMPLEMENTATION OF CHANGES ○ INCREASES COMMUNICATION AND COOPERATION IN ORGANIZATIONS ○ IMPROVED EFFICIENCY
WEAKNESSES	**STRENGTHS**
○ OPERATIONAL DIFFICULTIES ○ ORGANIZATIONAL RESOURCES ○ SARCASM OCCURS ○ DISCUSSIONS MAY TURN TO DEBATES ○ GROUP THINKING REPLACES INDEPENDENT JUDGMENT	○ BETTER WORK ATMOSPHERE ○ BETTER WORK SATISFACTION AND LEADERSHIP ○ LESS NEED FOR CONTROL, FREE RESOURCES ○ MORE COMMITMENT TO ORGANIZATION AND ITS GOALS ○ BETTER WORKABILITY ○ REDUCES CONFLICTS AND MAKES THEM EASIER TO SOLVE ○ REDUCES THE RELATIVE IMPORTANCE OF AND NEED FOR FORMAL CONTRACTS ○ REDUCES TIME SPENT ON DETAILED RECORDING ○ BETTER CUSTOMER SATISFACTION ○ REDUCES SICK LEAVE AND OCCUPATIONAL HEALTHCARE COSTS, STAFF TURNOVER AND CONFLICTS WITHIN THE WORK COMMUNITY

How to deal, prevent and treat contradictions in a prosperous work community and work atmosphere is one of the key questions in an organization (Kantola 2019, 310). Human relationships affect the workplace atmosphere by as much as 90%. For example, economic and other material resources affect the atmosphere by only ten percent. Work community skills and communality promote work motivation, quality of work, customer satisfaction and commitment to work. They also reduce sick leave and occupational healthcare costs, staff turnover and conflicts within the work community. (Ropo, Ravanti & Pääkkönen 2015, 17.)

5.4 Purpose of the TTT (Team, Trust, Training) Platform

The digital TTT (Team, Trust, Training) platform is designed to improve the quality, safety and efficiency of health care. The innovation, which is based on literature related to teamwork, trust and team training, presents instruments, training strategies and approaches to improve team

trust and performance in health care. It also introduces information, studies, news, and digital educational tools related to trust in the workplace. Moreover, toolkits, instructions, checklists, structured communication tools and information sheets are available to support the implementation and further improvement of the platform.

Thereby the innovation also creates transparency and illustrates the current relevance of the topic in health care. An enhanced understanding of the concept and the purpose of the platform is provided by the definition of terms, videos, and images. The visualization will support the illustration of our idea. The platform includes an overview of studies that underline the perception that teamwork and trust are important components of safe and efficient healthcare systems.

To support this subject, Singh, Thomas, Petersen & Studdert (2007) found that failures in communication have attributed up to 70% of adverse events in health care. The results of a literature review by Gillespie Gillespie, Chaboyer & Murray (2010) show that team training interventions can lead to an improved team communication and unity. The failures are rooted in the barriers that health care providers must deal with daily; they can, however, be overcome by building trust. Tools and strategies give the workforce the capability and willingness to implement the instruments in every difficult situation. Challenges that arise are inconsistency in the team membership, lack of information sharing, lack of coordination, lack of role clarity, defensiveness, hierarchy, misinterpretations, workload or less follow-ups with coworkers. (Henriksen, Battles, Keyes & Grady 2008.)

These barriers can be overcome by applying various tools and strategies, for example briefing, role plays, feedback, cross-training, simulation, and classroom-based team-training. Simulation and classroom-based training are powerful and effective learning strategies, especially for teamwork skills. (Weaver 2014.) The company will achieve multiple positive results, for instance mutual trust in the team, higher team performance, team orientation, effective leadership, better communication, and coordination. Through this outcome patients will benefit from higher safety and quality levels in health care. (Henriksen et al. 2008.) In the next chapter the scope and the content of the digital platform are specified.

5.5 Scope and Content of the Platform

The technological progress has enabled the emergence of new business models based on digital platforms. Every new digital offer that is published on a platform presents a digital innovation. A

specific group of actors belong to a platform, which at least contains the platform providers and the targeted customers. (Meinhardt & Pflaum 2019, 12.) A broad range of health care facilities represent the customers and the user groups of the platform. The TTT innovation is aimed at acute care facilities such as academic hospitals, community-based hospitals, medical care centers as well as military health systems. However, care facilities, hospices, medical practices, medical students, and clinical trainees will also benefit from the innovation. To satisfy the diverse needs of customers with further innovative solutions, we search for suitable partners who can support the creation of value. This creates complementary digital offers (for example in the form of applications, trainings, instructions) for the implementation of the TTT platform which we as the sole initiator would lack the necessary resources or skills for. To generate value for customers, it is necessary for partners to enter collaborations with the platform providers. This can reduce risks, optimize the business model and acquire resources. (Meinhardt & Pflaum 2019, 119.)

The platform will also be beneficial for the partners by giving them access to the market and the customers. An example of a partner could be the company TeamSTEPPS. It is an organization that offers team strategies and tools to increase performance and patient safety through trainings. It is specifically designed for healthcare professionals. (TeamSTEPPS® 2.0 2021.) Local consulting agencies that provide further information, support and lectures about how to build trust in a workplace are also prospective partners. To increase the range of the platform, it is necessary to create a collaboration network with partners.

The focus of the strategies in the platform lies in the development of emergent states like trust and cohesion among team members. In team training, learning success is focused on the development and reinforcement of knowledge, skills and teamwork behaviors. With exercises the team members should experience in practice how trust in built and how communication and collaboration are improved. Moreover, situational awareness, leadership and role clarity should also be aimed at in team training. Team training strategies include assertiveness training, cross-training, error management training, guided team self-correction, metacognition training, team adaptation and coordination training. (Salas, Weaver & Gregory 2012.) In the following section an example of a team training strategy – cross-training – is discussed in more detail.

Trust is critical, especially in cross-functional teams. Collaboration between members of different units is a central part of the daily operations in health care. Therefore, it is crucial to build trust among team members to enhance the productivity, effectiveness and functionality of interdisciplinary teams. Using the method of cross-training it is possible to achieve this goal. During the training participants learn the roles that compromise the team, as well as the tasks, duties and

responsibilities which are realized by fellow team members. It is recommended to proceed as follows: Members should be informed “about the roles and responsibilities of other team members and how they operate do achieve these”. (Weaver 2014.) They should know who they depend on for information. Role plays could be helpful “to shadow another role”. During the training the members should be able to provide feedback, so they can adjust their expectations. Trust, cooperation and teamwork are necessary in interdisciplinary teams to ensure patient safety. If team members are aware of their own and other team members’ responsibilities, the number of mistakes decreases. To achieve a high level of effectiveness by this strategy it is important to raise the willingness and awareness of the shared goals. (Weaver 2014.) Team members should all follow the same direction and be willing to cooperate and coordinate with each other. Therefore, it is not sufficient to co-locate individuals together but also to increase their motivation and understanding regarding the individual goals of the institution. Health care professionals must harmonize their tasks with the goals (for example, patient safety and performance).

A wide variety of health care professionals has been included because the methods should be applied interdisciplinarily as well as intradisciplinarily. For example, in cross-training team members learn the roles, tasks and responsibilities of other professions, so they can have a better understanding, trust and communication. The goal is to improve trust, coordination and teamwork in healthcare facilities through overcoming boundaries between the different departments and professions. There are three possibilities how health care staff could be combined: First, different professionals from one unit assemble, and, for example, surgeons, surgical nurses and anesthetists work as one team. In the second option, the same professionals from diverse departments gather round: for example, one member from the trauma department, another from the surgical team and a third from the pediatric ward. In the last option health care professionals from the individual and existing team work together, which creates diversity which consequently facilitates the application of the tools.

Different workbooks provide tools to promote trust and well-being. Laine and Rauramo’s (2017) workbook directs and supports a joint reflection session between teams to build trust. The workbook helps document the concrete results of the reflection to all participants. To use the workbook, you need a group and a leader, such as a supervisor. The facilitator initiates the development work by inviting community members by email. Rauramo’s (2009) second workbook is intended for the systematic development for personal and work well-being. The first step is to analyze the current state of personal and work well-being, the second step is to identify barriers and threats to wellbeing, and the final step is to set targets and make an action plan using the stairs

for well-being at work model. Also themes such as management and leadership could be discussed and more information about identifying and resolving conflicts sought from various publications.

The challenge in the design of a service is to meet customers' wishes and requirements. In consideration of these challenges and the value of the service, the integration and involvement of the customer offers great potential. The end-user is the person or organization that receives the result of the service and that perceives and interprets the quality of the service. To generate value for the customer it is crucial to include him in the digital platform service. This requires established direct interactions with the customers. The basis of an interaction is physical, virtual, or mental. (Sandmann 2015, 25.) Therefore, the platform creates opportunities to get in touch with the customers so they can influence the service and benefit from the added value. Those interactions can be displayed using a technique called service blueprinting which offers a customer-focused approach. A service blueprint maps the structure of a service that contains all essential and marketing-relevant characteristics. Figure 1 illustrates the service blueprint of the TTT digital platform.

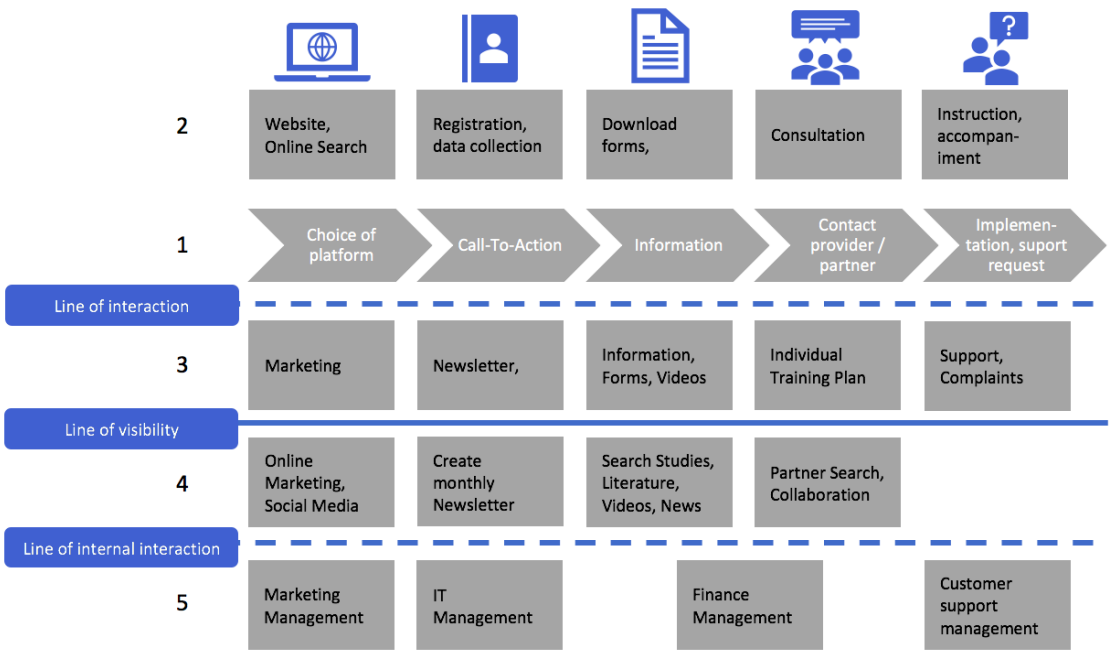


Figure 1. Service Blueprint (authors' presentation)

The goal of this visualization is to develop and underline the relationship between people involved in a business process with all its necessary components. It represents a specific customer journey. The service blueprint is an effective tool to detect shortcomings in the process and to improve customer satisfaction, effectiveness, and efficiency. The map is divided into 5 parts: touchpoints

(2), actions of the customer (1), actions of the provider (3), background activities (4), and supportive processes (5).

The line of interaction considers all activities that involve customers, which is critical to success. The main service that health care facilities use is the information about trust, communication, and collaboration in the work community. Above the line of interaction activities in which the customer participates are presented, for example the registration on the website and/or the newsletter. Under the line of visibility all activities take place “backstage” and all events above the line are visible to the customer. For instance, collaboration with an external partner allows an individual training plan for the health care team. How the cooperation works or how the digital platform is connected to the partner is not visible to the customer, only the training plan. The line of internal interaction separates the main in-house activities from the support and management processes. The marketing management provides support for the execution of marketing and publicity measures.

Creating the service blueprint should simplify the understanding of service process. The customer follows a specific customer journey. First, he chooses the digital platform TTT, which he may have discovered in an online search, through a recommendation or through direct marketing. He can learn about the purpose and offers of the platform. The customer needs to be aware of his goal, needs and requirements. If the platform matches with what he is looking for, he can register either as a private person or as an organization. The newsletter informs the customer about any news on the topic, new services offered and new innovative digital applications regarding the main goal – increasing trust, performance, and patient safety. On the website the customer chooses which information is relevant, filters the selection and downloads the desired forms.

The customer should benefit from a wide range of information, videos, applications, and possibilities. Furthermore, the platform gives an overview of all the trust-building tools, strategies, and best practices. Instructions are offered on how to successfully implement the tools in a company. If a health care facility is interested in an individual training plan and an educational workshop, the platform conveys local consultation companies that can realize the individual requirements. The customer can request support and help in the implementation of the digital and non-digital tools and trainings in the health care teams. Regular customer surveys and feedback sheets give input on how to improve the digital service of the platform. The service blueprint can be developed further, redesigned and improved.

In the following the technical framework of the platform is described. The platform can be placed onto a website. Building a website is easy. First you must register your domain name like www.ttt-buildtrust.com and check if it is available. The domain name should reflect your products or services so that your customers can easily find your business through a search engine like Google. Then find a web hosting company. This can cost a little, depending on the hosting company. When the content as well as visual and brand designs are ready, the website can be built using a website building tool. The website must work with all devices from desktops to mobile phones.

A sitemap is used on the website to describe the existing offer in the form of a menu. Thus, customers can easily go to the desired subpages of the online platform. The most important subpages are represented in the sitemap menu, for example “Homepage”, “Our Services” and “About Us”. A functioning digital platform requires the generation of sales and the development of profitable sources of income. One-off payments and/ or recurring payments (subscriptions) could be ways to generate sales. (Meinhardt & Pflaum 2019, 120.)

5.6 Ideas for Further Innovations and Existing Digital Solutions and Environments

In this course we focused on developing an online trust-building platform called TTT – Team, Trust, Training. One idea for developing the TTT platform further is to create an application and a game using the innovated platform as the basis: the training methods are first adapted to an educational application and then a fun and educational game to promote trust is developed. Gaming is used more and more for purposes such as learning or rehabilitation, as they have been found to promote player motivation. Games in which the main feature is not pure entertainment or fun are called serious games. By introducing elements familiar from entertainment games, such as storytelling, challenging tasks, clear goals, accomplishments, and rewards, to serious games people are attracted to a variety of tasks. Gaming elements maintain interest and motivation. (Valanne 2021.) Our further innovation idea is to develop an application (step 1) and game (step 2) from the same context with the purpose to guide leaders to develop trust in a work community. The application is intended for work communities of about 5-20 people and can be used in English or Finnish, which makes it also an international product. It can be used as an educational element on team-days or well-being days.

According to research, it is good to start a process by first getting acquainted with the existing games and applications that correspond most to the innovation. Accurate planning is a very important part of the process. Simplification is important in the game and application plan. The following figure (Figure 2) describes basic application and game building processes and shows that an application process is much simpler than a game building process; therefore, we suggest that an application is created first. When the application develops and receives attention, the planning of a game is started.

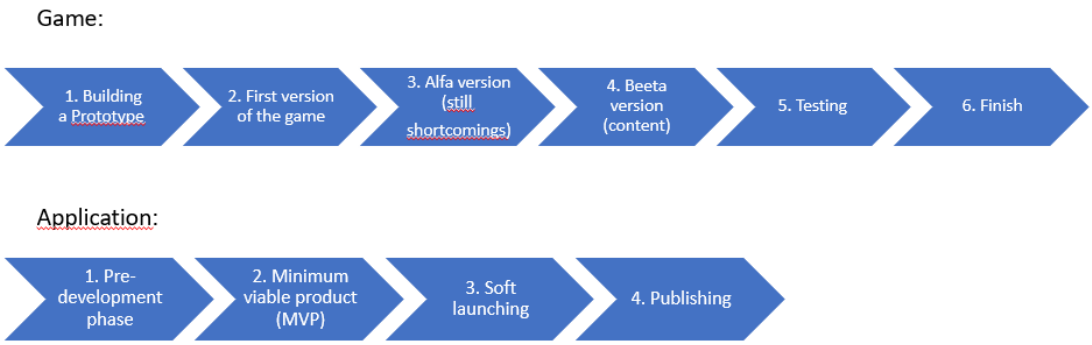


Figure 2. Basic process of game and application building (authors' presentation)

An example using digitalization in education is the Mentimeter application. It is an audience response system which allows presenters to create polls using a variety of multiple choice and open-ended questions, polls based on a point-based system, or use dual axis and scales to collect audience feedback. The audience can cast their votes via a designated URL, which gives them the opportunity to instantly cast their votes by using their mobile phones, tablets, or laptops during a live presentation session. This idea would be implemented in the first phase of building the application.

An example of an educational game is the Mysteeri 24/7 project in which the HAMK Smart Research Unit, in cooperation with Kajaani University of Applied Sciences and Laurea University of Applied Sciences, is developing a virtual escape game to support the vocational rehabilitation of young people (Valanne 2021). Minecraft Education Edition is a game-based learning platform that promotes creativity, collaboration, and problem-solving in an immersive digital environment. Educators in more than 115 countries are using Minecraft Education Edition across their curricula. (Mojang 2021.) Our goal is to create a similar platform to professionals around the world.

5.7 Conclusion

This article describes the importance of trust in a workplace and presents ways to promote trust in health-care teams based on scientific literature. It shows how trust, collaboration and communication is built in virtual teams. The TTT digital platform is a digital innovation that adds value to health care institutions. The many advantages of a harmonized and functioning team can have a great impact on a health care organization as well as other branches of industry. Trust has many benefits for employers and employees including job satisfaction, commitment to goals, better work atmosphere, motivation, and efficiency. Thus, conflicts and miscommunication are reduced. Patient safety, business performance as well as employee well-being increase and improve. The TTT platform offers customers a variety of ways how they achieve these goals.

The initial problem of building trust in virtual teams is addressed in the digital platform. Most organizations already work to a certain extent in virtual teams consisting of two or more members who work together interactively to achieve collaborative goals. Trust is crucial to reap the benefits of virtual teams. It is difficult to build social bonds in virtual teams (Gallenkamp et al. 2010.) Lack of trust severely impairs effective collaboration and has a negative impact on cooperation processes and team members' performance (Colquitt et al. 2007.) Communication includes not only the words of a language, but also non-verbal (posture, gestures and facial expressions) paraverbal (voice characteristics and speech behaviour) and extraverbal (behaviour in the room) language (Watzlawick 1969). Certain gestures and non-verbal subtleties are difficult for other members to grasp because they are particularly complex to convey virtually. For the individual members of a team, this makes collaborative interaction and the process of consensus building more challenging. (Straus 1996.) On the other hand, some research indicate that virtuality can reduce conflicts more than face-to-face contact in traditional teams (Kirkman et al. 2002). Other researchers suggest that trust can be built in a virtual environment, although it is very difficult to build a base of collaboration and trust. Even though interactions between virtual team members are generally much more limited than in traditional teams, technology facilitates the formation of social connections. Because of all these challenges and opportunities, digital platforms are useful and necessary for building virtual teams in organizations. (Gallenkamp et al. 2010.)

This innovation project can be continued in the future: the content can be developed into a simple application or integrated to an already existing platform. This project improved our project management and international cooperation skills and enhanced our knowledge of innovation processes, healthcare digitalization and business management. The project was successful, though

the original innovation plan was not implemented. Better technical expertise would also have been useful in this project. The next steps of this innovation process would be to create a website, start a marketing campaign, and search for partners and customers. The importance of trust and cooperation as well as digitalization should be further addressed. We hope that our innovation will be an inspiration and a basis for further innovation ideas.

Sources

Blomqvist, K. 2006. Luottamus organisaation työhyvinvoinnin ja tehokkuuden taustalla. Työn tuuli aikakausikirja, Henkilöstöjohdon ammattilaiset Henry ry. Retrieval date 6.4.2021. http://www.stat.fi/ajk/tapahtumia/2008-05-21_luottamus_artikkeli.pdf

Colquitt, J. A., Scott, B. A., & LePine, J. A. 2007. Trust, trustworthiness, and trust propensity: A meta-analytic test of their unique relationships with risk taking and job performance. Journal of Applied Psychology, 92(4), 909–927.

Gallenkamp J., Picot A., Welpe I., Drescher M. 2010. Die Dynamik von Führung, Vertrauen und Konflikt in virtuellen Teams, in: Gruppendynamik und Organisationsberatung 41(4), 289-303.

Gillespie, B. M., Chaboyer, W., & Murray, P. 2010. Enhancing communication in surgery through team training interventions: a systematic literature review. AORN Journal 92(6), 642–657.

Heikkilä-Tammi, K., Nuutinen S., Bordi, L., & Manka, M-L. 2015. Eri-ikäisten työssä jatkamista ja työhyvinvointia tukevat esimiestyön käytännöt. Hallinnon tutkimus 34 (2), 143–161.

Henriksen, K., Battles, J. B., Keyes, M. A., & Grady, M. L. 2008. Advances in patient safety: new directions and alternative approaches. AHRQ Publication (08-0034).

Kantola, J. 2019. Miten kääntää työyhteisön konfliktit oppimiskokemukseksi työyhteisösovitte-lulla? Aikuiskasvatus 39(4), 303–310. Retrieval date 6.4.2021. https://journal.fi/aikuiskasva-tus/arti-cle/view/88083/47269

Kirkman, B. L., Rosen, B., Gibson, C. B., Tesluk, P. E., & McPherson, S. O. 2002. Five challenges to virtual team success: Lessons from Sabre, Inc. Academy of Management Executive 16(3), 67–79.

Kupias, Peltola & Pirinen. 2014. Esimies osaamisen kehittäjänä. Helsinki: Alma Talent.

Laine, K & Rauramo, P. 2017. Luottamuksen rakentaminen työyhteisön vuorovaikutuksessa. Työ-turvallisuuskeskus TTK. Retrieval date 28.4.2021. https://ttk.fi/oppaat_ja_ohjeet/digijulka-isut/luottamuksen_rakentaminen_tyoyhteison_vuorovaikutuksessa

Laine, N. 2008. Trust in Superior-Subordinate Relationship An empirical study in the context of learning. Retrieval date 6.11.2020. https://trepo.tuni.fi/bitstream/handle/10024/66404/978-951-44-7418-7.pdf?sequence=1&isAllowed=y

Mitronen, L. & Raikaslehto, T. 2019. Voittajan strategia. Lyhytjänteisyydestä kestävään kehitykseen. Helsinki: Alma Talent.

Meinhardt, S., & Pflaum, A. 2019. Digitale Geschäftsmodelle–Band 1: Geschäftsmodell-Innovationen, digitale Transformation, digitale Plattformen, Internet der Dinge und Industrie 4.0: Springer-Verlag.

Megatrendit. 2021. Lääkäri 2030. Suomen lääkäriliitto. Retrieval date 27.4.2021. https://laakari2030.fi/megatrendit/

Mojang. 2021. Minecraft education edition. Retrieval date 28.4.2021. https://education.minecraft.net/

Nummelin, T. 2008. Stressi haastaa työkyvyn. Varhainen puuttuminen esimiehen työkaluna. Talentum Media Oy. Retrieval date 19.9.2020 https://kamezproxy01.kamit.fi:2219/teos/CAEBCXJTFF#/kohta:21/piste:b529

Patja, K. 2018. Mitä osaamista tarvitaan matkalla tulevaisuuden terveydenhuoltoon? Lääkäri 2030. Suomen Lääkäriliitto. Retrieval date 27.4.2021. https://laakari2030.fi/blogi/mita-osaamista-tarvitaan-matkalla-tulevaisuuden-terveydenhuoltoon/

Rauramo, P. 2009. Työhyvinvoinnin portaat työkirja. Työturvallisuuskeskus TTK. Edita Prima Oy.

Ropo, S., Ravanti, E. & Pääkkönen, R. 2015. Johda tuottavasti – Opas työhyvinvoinnin ja tuottavuuden lisäämiseksi esimiestyön keinoin. Työterveyslaitos. Retrieval date 20.2.2021. https://www.julkari.fi/bitstream/handle/10024/134834/Johda%20tuottavasti%20%20%20Opas%20ty%C3%B6hyvinvoinnin%20ja%20tuottavuuden%20lis%C3%A4%C3%A4miseksi%20esimiesty%C3%B6n%20keinoin.pdf?sequence=1

Salas, E., Weaver, SJ. & Gregory, ME. 2012. Team training for patient safety. In P. Carayon (eds.) Handbook of human factors and ergonomics in health care and patient safety. Boca Raton, FL: CRC Press, 627–48.

Salonen, E. 2017. Intuitio ja tunteet johtamisen ytimessä. Helsinki: Alma Talent.

Sandmann, J.-H. 2015. Integration von Kundenaktivitäten in das Blueprinting von Dienstleistungsprozessen: Springer-Verlag.

Singh, H., Thomas, E. J., Petersen, L. A. & Studdert, D. M. 2007. Medical errors involving trainees: a study of closed malpractice claims from 5 insurers. Archives of internal medicine 167(19), 2030-2036.

Straus, S. G. 1996. Getting a clue: The effects of communication media and information distribution on participation and performance in computer-mediated and face-to-face groups. Small Group Research 27(1), 115–142.

TeamSTEPPS® 2.0. 2021. Retrieval date 25.04.2021. URL: https://www.teamstepps.de/

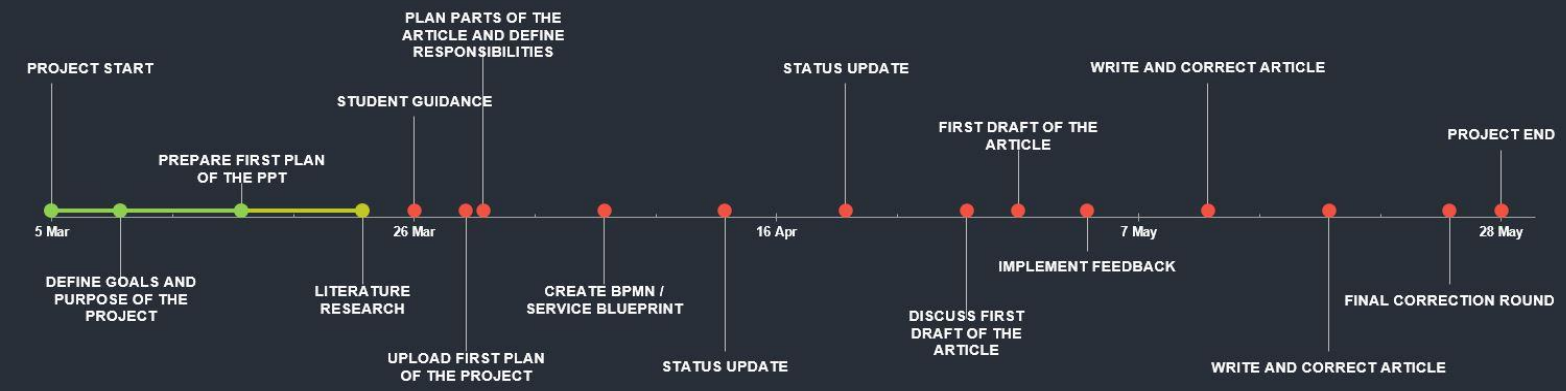
Valanne, L. 2021. Pelisuunnittelu pähkinänkuoressa, Case Mysteeri 24/7. Retrieval date: 28.4.2021. https://blog.hamk.fi/hamk-smart/pelisuunnittelu-pahkinankuoressa-case-mysteeri-24-7/

Walz, S. P. & Deterding, S. 2014. The gameful world: Approaches, issues, applications: Mit Press.

Watzlawick, P. 1969. Menschliche Kommunikation. Bern: Huber.

Weaver, S. J., Dy, S. M. & Rosen, M. A. 2014. Team-training in healthcare: a narrative synthesis of the literature. BMJ quality & safety 23(5), 359-372.

Milestones


PROJECT START
PREPARE FIRST PLAN OF THE PPT
PLAN PARTS OF THE ARTICLE AND DEFINE RESPONSIBILITIES
STUDENT GUIDANCE
STATUS UPDATE
WRITE AND CORRECT ARTICLE
FIRST DRAFT OF THE ARTICLE
PROJECT END
5 Mar
26 Mar
16 Apr
7 May
28 May
DEFINE GOALS AND PURPOSE OF THE PROJECT
LITERATURE RESEARCH
UPLOAD FIRST PLAN OF THE PROJECT
CREATE BPMN / SERVICE BLUEPRINT
STATUS UPDATE
DISCUSS FIRST DRAFT OF THE ARTICLE
IMPLEMENT FEEDBACK
WRITE AND CORRECT ARTICLE
FINAL CORRECTION ROUND