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DIGITAL COMPETENCE OF HEALTHCARE PROFESSIONALS - REQUIREMENTS AND IMPACT ON WORK

A Narrative literature review

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THESIS
Abstract

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Abstract

Digitalization of healthcare is creating new competence requirements for healthcare professionals. Professionals' job descriptions are broadening, service processes are changing, and new legislation is executed because of digitalization. The change is happening fast, which creates challenges for healthcare professionals to maintain their professional competence and keep up with the development.

The aim of this thesis was to produce information about the digital competence of healthcare professionals and to find out what digital competence means in a healthcare setting and how it affects the work of healthcare professionals. The research material was gathered from several scientific databases through different searches. A narrative literature review was used as a research method and inductive content analysis was used as an analysis method in this thesis.

Digitalization creates many competence requirements for healthcare professionals as results of this thesis showed. According to this literature review, these requirements are information management in digital healthcare, professional competence in digital healthcare, knowledge of digital technology in digital healthcare, interaction competence in digital healthcare, ethical competence in digital healthcare and knowledge of digital services and development in digital healthcare. The impact of these digital competence requirements on the work of healthcare professional is the change of the work environment to digital environment and the impact on the management and manageability of a professional's work in healthcare.

This thesis offers information to healthcare professionals, but also to working communities and healthcare managers. Employers should invest in employees' regular digital training and the effects of digital requirements should be actively considered in work communities.

Keywords

Digitalization, digital competence, healthcare professional, digital health

CONTENTS

1 INTRODUCTION

Digitalization is changing the way work is done in healthcare. The change is also happening in such a way that the change in the need for healthcare services requires the utilization of digitalization. Such large-scale changes, which can be considered to affect the need to promote the digitalization of healthcare, are described by the Ministry of Social Affairs and Health of Finland, but also in the Megatrends 2023 report. The Megatrend report describes the effects of global phenomena from Finland's perspective. The aging of the population and the increase in mental health problems affect both the need for services and the number of working-aged people; more services are needed, but the number of people of working age is decreasing. When the birth rate decreases at the same time, the result is a deterioration of dependency ratio. (Ministry of Social Affairs and Health 2022, 12; Dufva & Rekola 2023, 28-29, 34.) The centralization of the population in growth centers and cities, which occurs in Finland and globally, is described as one effective trend. Not only migration and lifestyles, but also climate change, epidemics and pandemics affect the spread and number of illnesses and diseases. (Dufva & Rekola 2023, 29-30, 34.)

According to the literature, the COVID-19 pandemic has affected the operation of the healthcare environment and also the use of digitalization in healthcare. In Finland, during the pandemic, there have been changes in the implementation of services and the use of social and healthcare digital services has increased. At least the use of remote services and communication channels such as chat has increased. However, the report states that the possibilities of using digital services vary not only by area of operation, but also by user base. For example, those in a vulnerable position may be completely excluded from digital services. (Rissanen et al. 2020, 11-12.)

Changes in operations and services have also affected the personnel, when work tasks and work environments of healthcare professionals changed rapidly (Rissanen et al. 2020, 11). The Swedish study states that the COVID-19 pandemic has required healthcare professionals to quickly change to digital ways of working, something they were not prepared for (Carlsson, Kjällman Alm & Holmström Rising 2022, 6). In Finland, the pandemic has affected the adequacy and availability of personnel and weakened the ability of personnel to cope. This has brought Finland to a situation that there is not enough social and healthcare workforce. (Ministry of Social Affairs and Health 2022, 13-14.) The availability of workforce in healthcare will be a challenge also in the future, since digitalization and the increasing use of technology creates new competence need for professionals (Tevameri 2021, 5).

As the World Health Organization (WHO) states in its report Digital Health 2020-2025, the goal of digitalization is to secure health for everyone and everywhere and strengthen the healthcare service system (World Health Organization 2021, 10-11). It could therefore be said that digitalization aims for the same things as the social and healthcare reform carried out in Finland, the aim of which is to secure equal access to services (see Ministry of Social Affairs and Health 2022, 12). However, digitalization does not realize itself. Competent healthcare personnel are needed for the digital transformation of the work environment (Finnish Government 2020a, 19-20), the use of digital work tools and understanding of technology (Ilomäki, Kantosalo & Lakkala 2011, 8). Since digitalization has increased significantly and rapidly in healthcare in recent years, digital services have become an

important and irreplaceable part of professionals' work. For instance, in 2014 only 16 percent of Finland´s citizens used the Omakanta-service, while in 2020 there were already 64 percent of users. (Kyytsönen, Aalto & Vehko 2021, 5, 58). For these reasons, the topic of the thesis is current.

The research method of the thesis is a literature review and the method of analyzing the results is inductive content analysis. The aim of the thesis is to describe existing information about the digital competence of healthcare professionals and the purpose is to find out what digital competence means in healthcare and how it affects on the work of professionals.

2 DIGITALIZATION IN HEALTHCARE

2.1 The concept of digitalization in healthcare

There is no unambiguous definition for the concept of digitalization. Digitalization is seen rather as a phenomenon and a change, which, contrary to the previous perception, is not only about using computers or digitizing things, but a comprehensive change in the environment, behavior and operations, where digitizing and technology are the enablers. (Ilmarinen & Koskela 2015, 22-23; Lindgren, Mokka, Neuvonen, Toponen 2019, chapter 1.) Digitalization is also described as a concept that includes the reformation of procedures, the digitalization of internal processes, and the digitalization of services (Ministry of Social Affairs and Health 2016, 5; Neittaanmäki, Lehto & Savonen 2021, 11). Alasoini (2015, 26), on the other hand, defines digitalization as the integration of digital technology into operations using digitizing. Digitizing is the conversion of information in analog form into digital form, which increases the possibilities of information management.

On a large scale, digitalization has an impact on the social level, for example, as the economy and markets change. Digitalization also causes change at the micro level, when talking about the change of an individual actor or organization. In this case, the change is focused on, for example, strategy, operations, services and expertise. The organization can react to the change caused by digitalization passively, in which case the operations are only adapted to the changed situation. Reaction can also be active; in which case the organization tries to change its operations by utilizing digitalization. Digitalization should be seen as an opportunity and a tool to change operations for the better or even create new operations. (Ilmarinen & Koskela 2015, 23-25, 32.) To survive the change brought by digitalization, the organization must have a clear vision of how digitalization affects the organization in question and its operations (Neittaanmäki et al. 2021, 60). Digitalization challenges to question the existing procedures and processes and to think about how processes could be done more effectively (Ministry of Finance s.a.a.). At best, digitalization can be used to make operations more efficient and improve their quality, when the result is a better customer experience of the services (Ilmarinen & Koskela 2015, 32).

In addition, in healthcare the digitalization of services should be seen as an opportunity to change operating methods. Digitalization is the basis of service production when the integration of services and practices related to services guide appropriate change. (Virtanen, Smedberg, Nykänen & Stenvall 2017, 29-30.) Digitalization enables better and more flexible healthcare services and service chains for citizens of all ages in varying life situations (Ministry of Finance s.a.a.). Developing services from the customer's point of view and considering user-centeredness is essential in digitalization of healthcare services (Ministry of Social Affairs and Health 2016, 5; Neittaanmäki et al. 2021, 11).

2.2 Healthcare as an operating environment for digitalization

The Finnish healthcare services are based on legislation. According to the Constitution of Finland (731/1999, 19 §), every citizen has the right to receive sufficient social and health services, the organization of which is regulated by the Act on Organising Healthcare and Social Welfare Services (612/2021). The Act on the Status and Rights of the Patient (785/1992, 3 §) on the other hand,

determines that every person permanently residing in Finland must receive the good health and medical care required by their health condition. In Finland, the Ministry of Social Affairs and Health is responsible for organizing Finnish healthcare services and its legislation and health and social policy. Finnish healthcare aims to promote the wellbeing, health, working performance and social security of citizens and also to reduce the inequality in health services among citizens. (Ministry of Social Affairs and Health 2023.)

In Finland, public healthcare services can be divided into primary and specialized healthcare. Primary healthcare services are usually provided in social and health centres, these services are for example dental care, maternity and child health clinics and rehabilitation. Specialized healthcare services are mainly arranged in hospitals and policlinics, and medical referral to treatment is usually needed. In addition to these services, there is also occupational health and private health services in use. (Ministry of Social Affairs and Health 2023.)

In the beginning of 2023, the responsibility of organizing public healthcare in Finland transferred from municipalities to the new wellbeing services counties, the city of Helsinki and the HUS group (Ministry of Social Affairs and Health 2023). This change is part of the Finland's health and social services reform, where the organizing of public health and social services were restructured. The reform of social and health services was created since the population of Finland is ageing and therefore the need for social and health services is increasing rapidly. At the same time less people are born in Finland, which will make the tax revenues significantly smaller in the future and in that way weaken the provided services. Another reason for the reform is to make services equally available to everyone and to get services and treatment faster. The reform also aims to integrate social and health services to make services better and smoother for the citizens to use. Digital health services are mentioned in the reform as time-saving services for Finnish citizens. (Finnish Government 2022b.)

Digital services as part of the digital operating environment of healthcare

The law also regulates the provision and implementation of digital services. The Act on the Provision of Digital Services (306/2019, 1 §) regulates the availability, quality, information security and content accessibility of digital services so that digital services are equal for everyone. In addition, the Act on Information Management in Public Administration and Administrative Procedure Act are related to the regulation of the digital operating environment. The purpose of the first of these is to ensure the consistency, quality, efficient and secure processing of data materials and to promote the interoperability of information systems (Act on Information Management in Public Administration 906/2019, 1 §). The second mentioned act, e.g., defines the service provider's obligation to provide free advice related to the services (Administrative Procedure Act 434/2003, 8 §).

Digital services include, for example, services offered online, such as online appointment services and counselling services. (Finnish Government 2022b.) These digital healthcare services are described also by Koivuluoma, Haverinen & Reponen (2022). The services in use are a digital service platform where you can communicate with professionals, send preliminary information and make

appointments, remote appointment implementations, remote disease monitoring systems, chat and chatbot, and solutions for dealing on behalf of others (Koivuluoma et al. 2022, 290).

In addition to services specific to the wellbeing services county and the municipality, there are national digital health services in use in Finland. Most common of these are Omaolo service, Kanta services and Health Village services. Omaolo service is a national social and healthcare online service provided by DigiFinland Oy. The service was launched to promote the health of citizens, to support their self-care and to give them an easy way to contact healthcare professionals if needed. Citizens need to electronically identify themselves in the service, and then the service is free of charge. Omaolo uses a symptom assessment to evaluate the citizen's need for care and guides the citizen to right services. The online service also offers electronic health examination, service assessments and self-care programmes. (DigiFinland Oy 2023.) Omaolo is used for approximately by 80 percent of the Finnish citizens (Hetemaa et al. 2022, 13).

Kanta services are digital services that are provided to professionals and citizens by the Social Insurance Institution of Finland. Services of Kanta are used by both private and public health sectors and services can be used from anywhere in Finland. Services include for example MyKanta, prescriptions, pharmaceutical database, patient data repository and client data storage for social sector. In MyKanta Finnish citizens can view their own health data and prescriptions. All electronic medical prescriptions made in Finland can be seen in Kanta services and this operating model has been in use from the year 2017 in Finland. Professionals benefit from Kanta services by getting up-to-date information about their patient's health situation no matter where the patient has been treated before. (Kanta services 2023.) In 2023 Kanta services will focus on developing tasks concerning the new Client Data Act and Kanta medication list (Kanta services s.a.). 64 percent of Finland's citizens had used Kanta services in 2021. It is estimated that viewing covid-test results and loading covid-certificates increased the number of users in 2020 and 2021. (Hetemaa et al. 2022, 13.)

Health Village is a public digital health service developed by the Finnish university hospitals. Health Village offers self-care programmes, support to long-term illnesses, digital care pathways, guidance to health and social care professionals and tools and education for professionals to develop their work. The services are always open and accessible for everyone no matter their location, only working internet connection and device is required. The wellbeing service counties can use the digital service for their citizens and professionals as a part of their servicescape. (Health Village s.a.) In 2020, Health Village had 7,7 million viewers (Hetemaa et al. 2022, 13). Other signific national public digital services in Finland include for instance OmaKela, Suomi.fi, 112 Suomi and Terveyskirjasto. Digital family service center is also under development at the moment. In addition, private health sector offers their own digital services to their customers. (Hetemaa et al. 2022, 13.)

Use of healthcare digital services in Finland

Finland's ability to promote digitalization emerges at the European level, when in 2022 Finland again ranked first in the European Commission's Digital Economy and Society Index (DESI). The index analyzes the digitalization progress of the European member states compared to the baseline every

year. In the human capital section, Finland ranks first among EU countries, with 79 percent of the population having at least basic digital skills. In the public administration digital services section, Finland ranked second among the EU countries, even though according to the report, 92 percent of Finnish internet users use electronic services when dealing with authorities. (European Commission s.a., 2-3, 6, 13.)

Statistics Finland produces statistics (Official Statistics of Finland (OSF)) on the use of information and communication technology by individuals. According to the 2022 statistics (updated 22.12.2022), Finns aged between 16-89 have good basic skills to utilize digitalization in the use of services and searching for information. Table 1 shows some of the most common ways of use based on data published by Statistics Finland. 73 percent of Finns have used the internet and 88 percent have a mobile phone with a touch screen for their own use. Among the methods of communication, the use of e-mail is the most common, 88 percent of the people, 77 percent have sent instant messages on a phone or other device and 68 percent have made video or internet calls. Information and communication technology is used comprehensively to search for information and services. 76 percent of the people have searched for information about nutrition, diseases and health. The same number of people, 78 percent, have searched for information related to themselves (e.g., taxation, pension, health). In addition, 72 percent have sought information from official or public services. Information and communication technology is used the least in the 75-89 age group and most actively in the 16-44 age group. Smartphones and e-mail are used by almost everyone aged between 16-64. (OSF.)

TABLE 1. Use of information and communications technology by individuals by year, information and age group (adapted from OSF).

Year 2022	Age group							
Type of use of information and communication technology	16-24	25-34	35-44	45-54	55-64	65-74	75-89	Total
Uses the Internet several times a day, %	92	89	90	85	73	52	20	73
Has in use a mobile phone with a touch screen, %	98	98	98	97	95	78	42	88
Has made Internet calls or video calls on the past 3 months, %	82	80	84	77	69	52	25	68
Has used e-mail in the past 3 months, %	97	99	98	98	92	77	46	88
Has used instant messaging with a smart phone or other device in the past 3 months, %	92	94	91	90	78	57	25	77
Has looked for information about sickness, nutrition and health in the past 3 months, %	84	88	86	86	76	65	38	76
Accessed information stored by public authorities or public services about oneself in the past 12 months, %	76	87	87	90	87	70	39	78
Accessed general information about public services or services of authorities, e.g. benefits or opening hours in the past 12 months, %	79	87	81	83	74	57	34	72

In Finland, the Monitoring and Evaluation of Social and Healthcare Information System Services project (STePS project) has been implemented, as part of which the National Health, Welfare and Service Survey (FinSote) was implemented in September 2020 – February 2021. The survey researched the experiences of Finns regarding the digitalization of social and healthcare and digital health services. (Kyytsönen et al. 2021, 4, 25.) Some of the results of the survey are shown in figure 1. According to the study, 83 percent of the population has used the internet for digital services and 9 percent of the population has used digital healthcare services on behalf of another person in Finland in 2020. About half of the population has used the internet and digital services to search for service information, receive test results, view their own information or make an electronic appointment. However, only 7 percent of the Finnish population have provided their own information to professionals using the functionality of the digital services, and 12 percent of the population have received instructions from professionals. (Kyytsönen et al. 2021, 29, 32-35.)

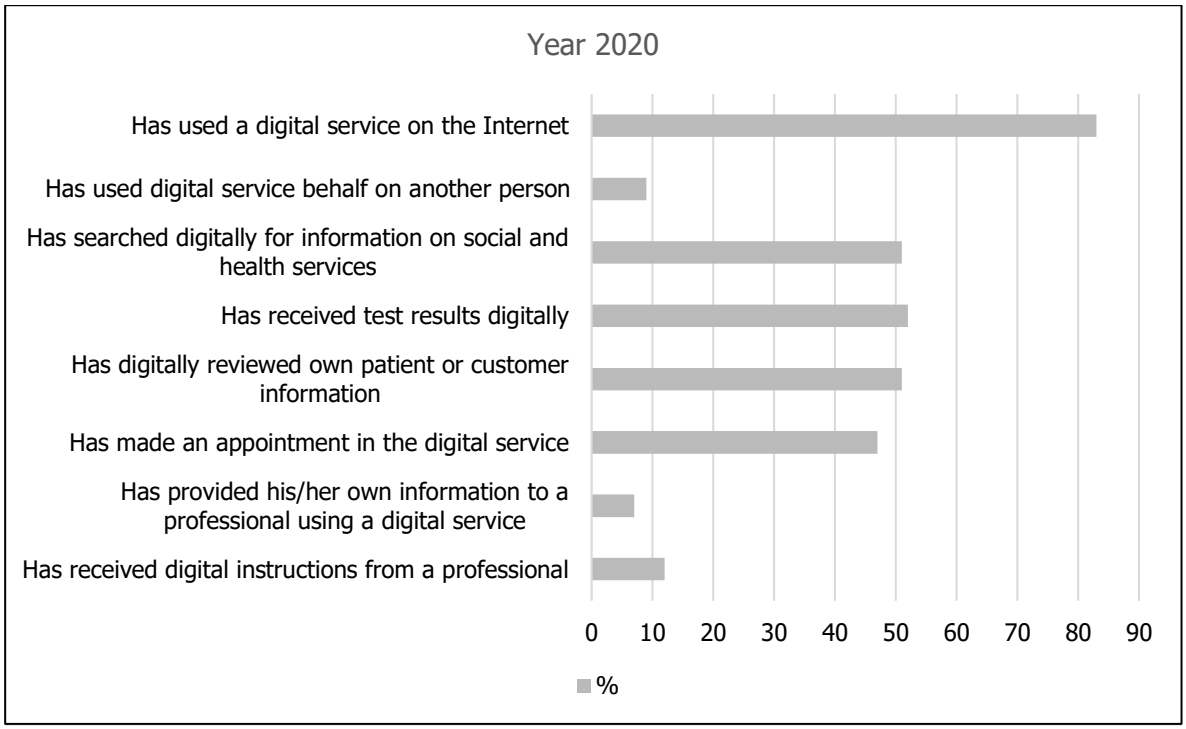

FIGURE 1. Use of digital services in year 2020, excerpts from the FinSote survey.

The digitalization of social and healthcare and the accessibility and use of digital health services has increased in recent years, which has been partly influenced by the need to use remote services during the COVID-19 pandemic. However, remote appointments by different professionals have been used less than the other digital services mentioned above. All in all, 22 percent of the Finnish population has dealt with the remote appointment of a social and healthcare professional at least once during 2020. The survey does not give an answer as to whether the lower utilization rate is due to the lack of provision of services or to the fact that they have not been used. However, according to the results, 66 percent of the Finnish population felt that one of the concerns or obstacles of use of digital services is that contact through a digital service cannot replace a personal meeting. Other concerns experienced by the Finnish population are the security of their own data and the accessibility of services. (Kyytsönen et al. 2021, 5, 35, 39.)

According to the 2020 digital skills survey by the Ministry of Finance and the Digital and Population Information Agency of Finland, the most significant reasons for the non-use of digital devices and services are lack of expertise, unfamiliarity with the services, mistrust in the functionality of the services, safety and data security, and the need for digital support (Ministry of Finance 2020a, 16; Ministry of Finance 2020b, 14). As the most common benefits of digital services (more than 40% of the population), according to the survey of the FinSote study, are the ease of using the services, when the use of the service is not dependent on time or place, the ease of finding services suitable for oneself, the ease of assessing of one's own need of services, and the ease of contacting a professional (Kyytsönen et al. 2021, 50). Nurmela (2016, 2) statement that the Finnish population has a positive attitude towards digital health services supports these results of FinSote study.

2.3 The digitalization of healthcare is guided by national policies and principles

The regional and organizational promotion and utilization of digitalization is guided by national projects and guidelines for the development of digitalization in public governance. WHO has drawn up a digital health strategy for the years 2020-2025, which aims for better health nationally by encouraging international cooperation and supporting countries in their national programs. At the core of the strategy are equal, accessible to all, affordable and sustainable digital health services, which make it possible to respond to e.g., to national health threats both preventively and during them. The goal of the strategy is to strengthen healthcare systems with the help of digital health services for consumers, healthcare personnel and industry and thus achieve the strategy's vision of health for all. The strategy includes four guiding principles for the introduction of health technologies: countries are required to make a decision and commit to include digital health in the national healthcare system, the success of digital health initiatives requires compliance with the strategy, it is important to consider the appropriateness of digital health services, and it is important to remove the biggest obstacles to the implementation of digital health services in the least developed countries. (WHO 2021, 10-11, 13, 15-17.)

At the European level, the European Commission aims to guide the digital development of the member states of the European Union. The latest guidelines are related to the national digital compass and the Digital Decade policy program, which are the basis for the EU member states' own digitalization development programs. The most important goals of the digital compass are increasing the population's digital skills, secure and sustainable digital infrastructures, and developing the digitalization of businesses and public services. The national goals of the Digital Decade policy program are related to the security, equality and accessibility of digitization. (European Commission 2023.) Based on the Digital Decade policy program, in Finland has been approved the Finland's digital vision for 2030: “Building a digitally capable Finland that is attractive, competitive, sustainable and prosperous” (Finnish Government 2022a).

As elsewhere in the public administration, digitalization in the social and healthcare sector has increased significantly in recent years, and the same trend continues as can be deduced from national policies. At the same time, digitalization affects the way of working and the competence requirements of professionals. Finland’s Ministry of Social Affairs and Health's (2016, 3) Digitalization Guidelines 2025 document contains key guidelines and preconditions that must be considered, e.g.,

digitalization of social and healthcare functions and services. The document outlines the development and motivation of competence as one of the aspects of the preconditions for digitalization. Professionals need to have the skills to meet the demands of the digital world, but also the motivation to make a difference. Competence also involves identifying the benefits of digitalization and participating in its development. New competencies include competence in service design, digital information management and agile development. (Ministry of Social Affairs and Health 2016, 25.)

The vision of the digitalization guidelines for the year 2025 mentioned above is that the client is most important and better information, choices and services will be offered to clients. (Ministry of Social Affairs and Health 2016, 8.) Virtanen et al. research supports this vision, stating that digitalization should be used when it improves the service experience and guarantees a more efficient organization and production of services. Purposeful utilization of digitalization release professional resources to where they are needed. (Virtanen et al. 2017, 35.) The publication of the Ministry of Social Affairs and Health of Finland contains key guidelines and preconditions for the development of digital health services for the citizens of Finland, for consideration of the challenges of digitalization and for discussion how to get the best out of digitalization. There are eight common guidelines. Firstly, services will be offered equally to citizens. Digital health services will be made easy to use for everyone and devices and assistance will be offered to those in need. Information from citizens and organizations will be asked only once and the information will be used in all services, with permission, that are offered to citizens. Social and healthcare professionals will have competent digital systems in their use, and they will be educated to use them properly. In addition, organizations' and companies' needs will be taken into consideration when developing new digital health services and Finnish health technology companies will be supported in their work. Permission and supervision actions will also be reformed, and reliable data will be created for the guidance of design and monitoring information. For digitalization to succeed, legislation and terms of legislation will be reformed to meet the new standards and solutions. Lastly, digital health services will be provided in a way that information security can be guaranteed, and the privacy of individuals will be protected. (Ministry of Social Affairs and Health 2016, 8-9.)

Ongoing, the Ministry of Finance's Programme for the Promotion of Digitalization (digitalization programme), implements the objectives of the government's program, which are to make Finland known as a pioneer in promoting digitalization and to increase the digital capacity of public governance. The program is implemented through an annual action plan. (Ministry of Finance s.a.b.) The digitalization programme also implements the public governance strategy (Ministry of Finance 2022). The goal of the public governance strategy for 2030 is: "Public governance builds sustainable wellbeing in the midst of upheaval." In the policies of the strategic promise, digitalization has been recognized as a means of change across the board. (Ministry of Finance s.a.c.) The national goals for social and healthcare for the years 2023-2026 approved by the Government of Finland aim to fulfil the goals of the national policies and the obligations of the law. The goals affecting the healthcare operating environment are at least equal services that secure the rights regulated in the law, strengthening the availability of services, competent personnel, economic, cost-effective and

effective operations, and the development of information management and digitalization to support the achievement of the goals. (Ministry of Social Affairs and Health 2022, 16-23, 28.)

The administrative policies described above regarding the goals of digitalization are supported by Aalto et al. (2016) research, the results of which described Finnish citizens' opinions on the goals of the social and healthcare reform. According to the results, the most important goals are the strengthening of basic services, the smoothness of healthcare operations, sharing and availability of information and equal access to services (Aalto et al. 2016, 7).

The Finnish Institute for Health and Welfare has published recommendations for organizations to manage digitalization. These recommendations also emphasize not only management, ensuring the usability and interoperability of systems, but also the competence of professionals. Digitalization is changing operations, which requires planning, activity and knowledge of digital health services. (Finnish institute for health and welfare s.a.) In addition to clinical competence, healthcare professionals need knowledge of technology and continuous competence development to be able to utilize digitalization effectively. The organization's support is also important, for example when changing working methods. (Öberg et al. 2018, 964-966.)

2.4 The effect of digitalization on healthcare and healthcare professionals

In Europe, digital health technology is an essential part of the future healthcare services (European Health Parliament 2016, chapter Executive summary). Today patients are more demanding and want better quality of care and faster than before. They want to feel empowered to manage their own health and to be able to have an impact on the care given to them. Digital health services might be the answer to this problem. However, to benefit from these, patients and professionals need to understand digital health services and have the knowledge to use them. Healthcare professionals are required to have digital skills and a transformation of work tasks is required. In addition, there is a need to understand and supervise digital health. Therefore, the education of employees needs to change. Healthcare professionals need continuous education on what digital health technology is, how it is used and applied. For this to happen, the European Health Parliament has suggested that member states should organize mandatory digital education for healthcare professionals. In addition, the Parliament highlights that clinical guidelines need to be updated to include digital health services and healthcare professionals need to be taken as part of the development work in those services. (European Health Parliament 2016, 2, 8.)

In Finland, the digitalization and the use of new digital services has changed many things in the field of healthcare during the last few years. Virtual appointments, video consultations and evaluation of the care needed in mobile applications are commonly used healthcare services in daily life. The digitalization of social and healthcare sector aims to secure an equal access to social and health services, to support citizens to manage their own health and wellbeing and to develop services and their usability. (Finnish institute for health and welfare 2020.) Ilmarinen & Koskela (2015) state that digitalization has brought the world closer to Finns with various easy, fast and high-quality digital services. Citizens expect to receive service regardless of time and place. The expectation is also the ease and usability of the services, without having to significantly familiarize yourself with the use of

the service or to see a great deal of effort in order to use the service. (Ilmarinen & Koskela 2015, 53-54.)

The biggest challenge of digital healthcare in Finland is making digital health services user-friendly, encouraging citizens and professionals to use them and proving people that digital services can add true value to healthcare services. Digital health services can build a new and cost-effective service structure and give an equal opportunity for people to promote their health and wellbeing regardless of their location. Digital health services cannot fully replace traditional health services, but they can enable many good services for more people. (Finnish institute for health and welfare 2015, 129.)

A study shows that people living in cities use more digital health services than people living in rural areas in Finland. In addition, working aged people use more digital health services compared to the elderly. (Vehko et al. 2022, 309-310.) In the best case, digitalization makes it easier to share and use information between patients and professionals. This can deepen the care-relationship and lead to a better understanding of the patient's everyday life and habits. However, this requires motivation and the possibility to develop their work processes from the healthcare professionals. Otherwise for instance remote counselling and supporting the patient between the appointments via digital health services become only a burden both for the professional and the patient and not something that increases wellbeing and saves costs of health services. (Metsäniemi 2018, 16.)

While digitalization at some point makes it easier to do work, for some it can replace jobs that are meaningful for them. (Saetra & Fosch-Villaronga 2021). Digitalization changes work tasks and affects the occupational structure, even if it does not directly affect the number of jobs. The key is planning, for which tasks a person is still needed as an operator and which part can be handled with the means or with the help of digitalization. (Alasoini 2018, 75-76.)

The digitalization of the healthcare sector has broadened nurses' job descriptions and changed the skills needed at work. The use of new digital health services at work, such as modern processes and practices in patient care, require adequate IT skills, new equipment, and network connectivity. Although the nursing work received by the patient is no longer carried out purely face-to-face in all situations, meeting and listening to patients is still the basic work of nurses. (Finnish Nurses Association 2021.) In addition, doctors have reacted to the digitalization of healthcare and to the change of operational environment. The Finnish Medical Association has made policies on how to recognize the changes that digitalization requires. The association highlights that there are diagnoses that cannot be done remotely without seeing the patient, and the doctor needs to have the possibility to examine the patient if needed. This needs to be taken into consideration when arranging services. (Finnish Medical Association 2021.) In addition, one important part of good remote appointments is to guide patients to traditional appointments if needed (Metsäniemi 2018, 16).

Healthcare professionals' job descriptions must change because of the current situation, new divisions of work and new models of healthcare services. These current matters involve the change in the patients' roles, the empowerment of patients, the highlighting of patients' own options and the goals of cost-efficiency of services. The new division of work should be based on the expertise

of the professionals, flexible job descriptions and on the possibilities that health technology create. In addition to the above-mentioned matters, collaboration between different sectors and profession groups and professionals' autonomy with their work and providing services to patients are needed if comprehensive and compatible health services are wanted to be provided. (Tolmala et al. 2019, 27.)

The results of Öberg et al. (2018) research state that healthcare professionals feel that digitalization is here to stay and that digital health services enhance the implementation and availability of healthcare services (Öberg et al. 2018, 965). Niemi, Hupli & Koivunen (2016, 207) research also states that healthcare professionals see digital health services as necessary, important and useful tools in their work. Especially when communicating with patients, professionals felt that the use of digital health benefitted both the professionals and the patients.

Digitalization can have effects not only on the work to be done but also on the employee's wellbeing. Digitalization increases communication tools, with which more information is not only available but also required to be considered. This increases the employee's workload, which can affect the employee's wellbeing. In the same way, more information is also available about the employee, e.g., about his job duties, which can increase the feeling of increased work supervision and control. The increase in communication tools also reduces the number of live meetings between employees, which can result in a decreased sense of community and can lead to a weakening of the flow of information. (Alasoini 2018, 76-77.)

Golz et al. (2021) researched the connection between technostress caused by digitalization experienced by healthcare professionals and digital competence. According to their results, professionals with good digital skills experienced less technostress. Technostress was seen to have an effect on the professional's psychological and physical wellbeing and enjoyment at work. (Golz et al. 2021, chapter Discussion.) Also, Niemi et al. (2016, 211) state that nurses should be able to use digital communication tools without the stress caused by a lack of skills or usability.

2.5 The future of digitalization in healthcare

In the future, functional and rational digital health services will increase citizens' wellbeing, regardless of their location. Digital health services will be in a key role in preventive healthcare, acute healthcare, elderly's residential services and rehabilitation. (Jauhiainen, Sihvo, Jääskeläinen, Ojasalo & Hämäläinen 2017, 141.) However, more information about the usability, accessibility and benefits of digital health services is needed since there is not enough knowledge of the differences between locations and user groups. The location of the citizen should not limit the possibility to use services if the person has the motivation, skills and equipment to use them. Therefore, it is extremely important to build functional and wide telecommunication connections even more in the future in Finland. In addition to securing services regardless of place of residence, it is important to strive to remove barriers to digitalization from the use of digital health services by those in a weaker position. In this way, inequality is prevented, and digital health services are ensured to be consistent for everyone. (Hyppönen & Ilmarinen 2016, 9.) The need to increase usability and the integration of the systems was highlighted in another study as well. Healthcare professionals said that the weakness of digital health services was the insufficient technology, which was seen as weak

operational reliability, lack of integration possibilities and lack of usability. (Koivuluoma et al. 2022, 290–291.)

Among the proposals for the development of digital health services recorded in the DigiIN project, the first proposals are related to the equal accessibility of digital health services. The comprehensibility of the services should be improved with the help of plain language criteria and accessibility requirements. The use of the services must also be supported by various means, such as face-to-face service, remote service and written or illustrated instructions. In addition, the services must be advertised in a comprehensible and inspiring tone on several different channels, in which case the information reaches different customer groups. (Virtanen et al. 2022, 1, 3.) Heponiemi et al. (2020) research which factors were considered to have an advantage in using digital health services. The results of their study are in line with study of Hyppönen & Ilmarinen (2016). The risk of digital exclusion and being excluded from services is real for those in a weaker position who do not feel that they benefit from digital services (Heponiemi et al. 2020, chapter Conclusions).

Nowadays, with the help of robotics and artificial intelligence it is possible to replace the work of humans in some nursing tasks and in some parts of care services. (Ventä et al. 2018, 59). The use of artificial intelligence and machine learning can increase the productivity of healthcare providers and also make services more precise for patients. In addition, these technologies make it possible to serve more patients in less time and this way reduce the costs of healthcare. (Akhil, Samreen & Aluvalu 2018, 25.)

In the future it will be important to recognize the working areas where healthcare robotics would be suitable, for instance documenting, statistics, booking appointments and service guidance. In addition, assisting nursing tasks such as ordering meds and bringing/storing supplies can be seen as a job of robotics in the next years. Artificial intelligence is also expected to bring solutions to making diagnoses, following health and giving treatment options. However, a machine cannot replace the presence of humans and human contact, but the use of robotics will release human resources to other tasks, such as demanding healthcare services. The use of technology will furthermore support the empowerment of patients and increase their possibilities to affect their own care. (Tolmala et al. 2019, 36.)

Digitalization and digital health services should be taken into consideration in the education of healthcare professionals since in their work they need to motivate patients to use digital health services. To do this, they need to know about the existing services and the benefits of using them. Therefore, supporting the professional growth and professional identity of healthcare professionals should be taken more into consideration in these educations in the future years. (Juujärvi et al. 2019, 8-9.) In addition, healthcare professionals need more time and possibilities to participate in the development of processes and digital health services (Koivuluoma et al. 2022, 292).

The results of the DigiIN project also highlight the personnel's competence and knowledge of digital services. Digitalization must be taken into account not only in curricula but also as continuous additional training alongside work. Professionals should also have clear instructions on how to

identify patients who benefit from digital health services and how to choose the right service method for the patient. (Virtanen et al. 2022, 5-6.) The healthcare system developers want to co-operate with healthcare professionals and wish that management would give more time to healthcare professionals to do development work (Rytkönen, Kinnunen & Martikainen 2022, 132). Professionals also hope to see a development in managing digital health services, having more technical support given to healthcare units and better communication about the existing and up-coming digital health services. This is important since healthcare professionals wish that the use of digital health services will increase and expand in healthcare in the future. (Koivuluoma et al. 2022, 290, 292.)

3 COMPETENCE IN HEALTHCARE

3.1 Definition of competence

According to the literature, an individual's competence consists of learned knowledge and skills, but also of attitudes, lived experiences and contacts (Sydänmaanlakka 2015, chapter 5.2; Tuomi & Sumkin 2012, 26). These mentioned factors have been defined as competence categories at the European level by the European Commission (2011, 9) and the Finnish National Forum for Skills Anticipation, which is an expert body managed by the Ministry of Education and Culture and the Finnish National Agency for Education (Leveälahti, Nieminen, Nyyssölä, Suominen & Kotipelto 2019, 10). The categories of competences that are independent of the industry designated by the European Commission are soft skills, general hard skills and specific hard skills (European Commission 2011, 25). The Finnish National Forum for Skills Anticipation has used this European Commission classification as the basis of its defined classification. The competence categories named by the Finnish National Forum for Skills Anticipation are generic competence, general working life competence and professional sector-specific competence. (Leveälahti et al. 2019, 15-16).

Soft skills, as defined by the European Commission, are skills that are not related to a specific job, are intangible, often related to attitudes and are difficult to measure. This category corresponds to the generic competence category of the Finnish National Forum for Skills Anticipation 's classification. This kind of competence is the skills related to doing the individual's work, cooperation skills and cognitive skills. On the other hand, the hard skills designated by the European Commission are work-related knowledge skills that are observable, measurable and trainable, such as skills related to legislation and regulation, economics, the basics of technology, society, ICT and international relations. This definition corresponds to the definition of general working life skills made by the Finnish National Forum for Skills Anticipation. The category designated by the European Commission, special hard skills, and the category designated by the Finnish National Forum for Skills Anticipation, sector-specific competence, are technical and sector-specific skills that describe the practice of the profession in practice. (European Commission 2011, 10; Leveälahti et al. 2019, 15-16, 165-169.)

At the organizational level, competence is not only the individual's but also the community's ability to act to fulfil the organization's basic mission. Making competence available requires effective management, in which case the competence becomes an asset of the organization. When managed well, competence promotes the renewal of the organization. (Hasu et al. 2010, 13.) Also, Tuomi & Sumkin (2012) stated that an organization's strategic competence, i.e., core competence, is formed only through the competence of individuals. According to their definition, competence is an active activity and work consists of a combination of competence and activity. (Tuomi & Sumkin 2012, 20, 26-27). Sydänmaanlakka's definition has the same idea as Tuomi & Sumkin. Sydänmaanlakka describes competence as the ability to act effectively. Real competence is a practical activity, to which something learned is applied. (Sydänmaanlakka 2015, chapter 5.2.) Rajalahti, Kallioinen and Saranto (2014) state that e.g., the desire to develop, interest in learning new things and skills to

search for information contribute to competence. Deficiencies in information flow and management weaken competence. (Rajalahti et al 2014, 190, 194.)

3.2 Professional competence in healthcare

A person working in a certain work task has professional competence when she or he has sufficient competence for the task, she or he works goal-oriented and is able to develop at work and develop the work. Professional competence also includes motivation to do work and experiencing work as meaningful. (Sydänmaanlakka 2015, chapter 5.2.) The professional competence of healthcare professionals is based on Finnish legislation. The Act on Health Care Professionals (559/1994, 1 §) determines that healthcare professionals must have the needed education and professional competence to be qualified to work as a healthcare professional in Finland. These competence requirements of the healthcare professionals are stated in the legislation to advance patients' rights to receive good care and treatment (Act on the Status and Rights of Patients 785/1992, 3 §).

Nummela, Juujärvi & Sinervo (2019) researched which general competence requirements healthcare professionals saw as necessary to ensure the integration of care processes related to social and healthcare reform. The results show three main dimensions, which are patient-oriented needs evaluation, comprehensive service guiding and assuring the fluency of services. Of these, patient-oriented needs evaluation and service assurance competence are emphasized in the care of elderly, while service guidance competence are emphasized in primary care. Multiprofessional competence is emphasized in all areas. (Nummela et al. 2019, 43-44.) The competence needs of work with clients also emerge in the results of research of Kangasniemi et al. (2018). In the results of their research generic competences of social and healthcare professionals can be divided into client service competences, competence to develop services and competence to work as an individual and in cooperations with others. Client service competences consist of client-oriented approach, competence to guide clients, competence to guide patients through provided services and the knowledge of healthcare services' ethics and legislation. Competence to develop services and working models includes research and development skills, digital skills, communication skills, knowledge of effectivity, costs and quality of services and taking sustainable development into account in providing healthcare services. (Kangasniemi et al. 2018, 70.) Also, in Nummela et al. (2019, 43) results, IT competence was seen as the single highest competence need, which is needed to ensure e-services and information flow. The last competence area in results of Kangasniemi et al., consists of professionals' own competences, self-management skills, evaluation of skills and the ability to work in networks and in multidisciplinary teams in different environments. (Kangasniemi et al. 2018, 70.)

One of the goals of the Future of Nursing Education project was to determine the EU's minimum competence requirements for nurses working in general care. According to these competence requirements, a nurse must know the following aspects of social and healthcare in their full scope: client-centredness, ethics and professionality, leadership and entrepreneurship, clinical skills, evidence-based method of operation, guidance and teaching skills, promotion of health and functional ability, knowledge of the operating environment and quality and safety issues. (Eriksson, Korhonen, Merasto & Moisio 2015, 3, 60.)

The minimum competence requirements described by Erikson et al. (2015, 3, 60) are explained in more detail below. Client-centredness includes the ability to see clients as experts and active participants in their own health, to support the client's family members' participation in the care and to have professional interaction with clients of different ages. Ethics and professionality include understanding ethics in nursing, understanding the importance of nurse's expertise and professional identity and the ability to work in networks and multidisciplinary teams. Professional competence also includes leadership skills, working community skills and understanding nurse's career development. Clinical nursing consists of the ability to psycho-socially support a patient, to make diagnostic tests, to use nursing interventions, to understand infection control, to plan pharmacological treatment, to understand anatomy and physiology as well as pathophysiology. In addition, a nurse should manage working in different nursing areas such as medical nursing, surgical nursing, mental healthcare, acute care and care for disabled people. Nurses must also have knowledge of working with people of different ages and in different life situations such as child, youth and family care, care for elderly and in home care, maternity care and palliative care. (Eriksson et al. 2015, 60-65.)

The fifth competence area, evidence-based practice and decision-making, includes having the knowledge base of nursing in professional decision-making, managing decision-making process, having research, development and innovation skills and understanding evidence-based practice in social and healthcare. In the area of education and teaching competence, nurses must identify the processes and methods and understand the contexts related to education and teaching. Promotion of health and functional ability consists of understanding health policy and wellbeing of the population, prevention of illnesses, accidents and health problems and understanding key areas and methods of health promotion. Social and healthcare environment competence area encases understanding social and health service structure, the ability to guide patients to use services, the competence to utilize digital services as part of the given care and familiarity with the use of patient record systems. The ninth and the last entity dealing with the quality and safety of social and health services means that a nurse understands the consideration of safety and risks related to healthcare, have knowledge of patient safety, consider quality and confidentiality and security of patient information. (Eriksson et al. 2015, 66-70.)

These minimum competence requirements are consistent with the professional competence model of a nurse presented by Tuomi (2008) in her dissertation. In Tuomi's model, the areas of competence are the common competence of working life, common competence of nursing and special competence of nursing, which in Tuomi's research is children care. All aspects of the model include communication and collaboration competence, research and development competence, development competence, international competence, change and stress management, and motivation. Ethics and competence in health promotion belong to the areas of common competence in nursing and special competence in nursing. The special competence of nursing also includes clinical competence and the special competence of relevant field. (Tuomi 2008, 120, 134.)

3.3 Digital competence in healthcare

There are different ways to define what digital competence is, as well as there are many synonyms for digital competence, for example ICT skills, IT skills, technology skills, digital skills and information technology skills. As a concept, digital competence is connected to technology and its meaning is thought to expand with the development of technology. In addition, the political aims and the knowledge of citizens affect it, therefore according to Ala-Mutka, Punie & Redecker (2008), the approaches on digital competence should be dynamic and continuously rechecked. Since the definitions of digital competence vary, it is difficult to set either international or national standards for it. (Ala-Mutka et al. 2008, 3; Ilomäki et al. 2011, 1.)

In 2018, the Council of the European Union updated a recommendation on key competence for lifelong learning. According to the recommendation, digital competence is needed not only for employment and participation in society, but also for learning and self-development. Digital competence is the versatile management of digital content, such as utilizing information, producing content and filtering information, as well as communication and collaboration skills. An essential part of digital skills also includes critical thinking, problem-solving ability and constant attention to digital security. According to the recommendation, understanding the general principles, basic functions and purposes of digital technology is also part of digital competence. Digital competence includes a reflective, critical and curiously open-minded attitude, but also an attitude that takes into account ethics and responsibility. (Council of the European Union 2018, 9-10.) This Council of the European Union definition is complemented by Ilomäki et al. (2011) definition of digital competence, which they consider to be related to understanding digital technology. Competence is not only technical skills but also the ability to utilize digital technology at work and evaluate it critically. According to them, the motivation to use digitalization and technology is also digital competence. (Ilomäki et al. 2011, 8.) Digital competence is essential for the success of any digital transformation since it enables citizens to be active in society and supports economic growth through the adaptation of new technologies. (EU4Digital 2020.) Therefore, the importance of digital skills should not be underestimated.

In the digital social and health services strategy of Finnish Nurses Association (2021), nurses' most relevant digital skills are divided into six divisions: "technology to support client involvement, digital services as part of nurse's work, safety, and ethics in the digital environment, digital health services and skills, management of digital health services and research and development of digitalization of health services." (Finnish Nurses Association 2021.) In addition to these competence areas described above, it is important that nurses have both communication and guidance skills. (van Houwelingen, Moerman, Ettema, Kort & Cate 2016, 58).

Jauhiainen et al. (2020) have defined the digital competence areas and requirements of healthcare professionals in their study. These competence areas include technology and data management skills, interaction and communication skills, ethical data protection and safety skills, guidance and training skills, patient-centered service skills, collaboration and networking skills, self-management skills, and the skills to develop patient-centered services and applications. Technology and data management skills include the skills to understand the development of digitalization regionally,

nationally, and internationally and to be able to use appropriate digital health solutions creatively at work. Interaction and communication skills stand for being able to provide digital content and being able to use different digital communication channels for interaction with patients. Ethical data protection and safety skills include the skills to ethical decision-making when using or developing digital solutions and to understand the risks of data protection. Guidance and training skills cover the skills to coordinate and develop the digital competence of other healthcare professionals and patients and to support colleagues to use digital health solutions responsibly. Patient-centered service skills consist of being able to increase the adequate use of digital health solutions among patients and organizations regionally. Collaboration and networking skills include the skills to work together with different organizations to develop digital solutions. Self-management skills stand for being able to continuously learn new things and work to promote digitalization. The skills of developing services cover the ability to notice development issues of digital solutions together with other professionals. (Jauhiainen et al. 2020, 98-99.) According to the definition of the Digital and Population Information Agency (2022, 8), digital competence is also the readiness to learn new digital skills.

The digital competence of healthcare professionals is essential for professionals to be able to participate in global collaboration and utilize the available networks (European Commission 2017). Healthcare professionals' digital competence is at a good level in Finland. In over 66 percent of Finland's hospital districts and healthcare centers over 90 percent of healthcare professionals have the required basic IT skills. (Finnish institute of health and welfare 2015, 135.) According to another Finnish study, computers are used at work every day by nurses, but the result in terms of skills is slightly weaker, when 53 percent of the nurses think their computer skills are quite good, but 36 percent rate their skills as neither good nor poor. (Niemi et al. 2016, 204-205.) IT skills can be promoted through training, having professionals as a part of the development of systems, by increasing knowledge of digital health and by making continuous learning possible for professionals. (Li et al. 2019, 182.) The continuous development of digital skills is necessary because the development of digitalization does not stop at a certain moment but is continuous. Digital competence is needed in working life and it is not guaranteed by good digital skills in free time, which is why working life must offer constant opportunities for learning and include training in the digital skills needed at work, e.g., as part of orientation. (Digital and Population Information Agency 2022, 10, 16, 33.)

In the report describing the guidelines of the parliamentary reform of continuous learning, it is stated that as working life changes and work becomes digitalized, the development and renewal of skills is necessary. One of the visions of the reform is that everyone should be able to proactively develop their own skills during their working career, in such a way that it is possible to develop at work, take on new tasks and advance in the working career. Likewise, it is written into the visions of the reform that a skilled workforce renews the work environment and work communities, in turn, support new learning. (Finnish Government 2020a, 19-20, 32.) The learning of digital skills is supported by a stimulating learning environment and atmosphere (Digital and Population Information Agency 2022, 33).

The social and healthcare professionals work in a continuously changing environment. The work requires multi-professional collaboration and nowadays the patients are more active operators. Adequate training should be provided for professionals, which can be properly targeted through competence mapping. Professionals must also be provided with adequate information about systems and changes and adequate support for the use of new digital equipment. (Finnish institute for health and welfare s.a.)

Professionals should also be involved in every phase of the development of digital health services, from decision-making to testing and implementation. (Finnish institute for health and welfare s.a.; Li et al. 2019, 182.) According to Saranto et al. (2020, 222) research, the training needs of nurses are particularly focused on utilizing the digital environment; how to develop a multi-professional service environment and support the patient to utilize digitalization. When thinking about competence and learning related to digitalization, in addition to adequate training and familiarization, it should be taken into account what is the kind of digital competence that requires creative and social thinking. This kind of competence, where individual competence and digitalization form an effective whole, cannot be replaced by means of digitalization. (Alasoini 2018, 46). Carlsson et al. (2022) studied the effects of a digital competence course on the nursing work carried out by nurses. According to the study, the course increased the nurses' skills, but also increased their understanding of their own profession, strengthening their professional role. After the course, the nurses had the possibility to actively participate in the designing of care processes utilizing technology, utilizing researched knowledge and experience. (Carlsson et al. 2022, 4, 11.)

3.4 Professional competence in digital healthcare in the future

In the COPE project (Ensuring a Skilled Workforce in the Transition of Social and Health Care), competence needs were studied multidisciplinary in 2016-2019. In the results of the project, it is shown that joint competence of social and health professionals will rise alongside professional substantive competence due to the change in the operating culture. The competence development areas proposed by the project are customer-oriented guidance and ethical competence in customer work, understanding of multiculturalism, multidisciplinary cooperation, employee competence, management and competence in the use of digital services. The development areas include familiar areas of professional competence (see Kangasniemi et al. 2018; Nummela et al. 2019), but they must take into account changes in the service structure, the needs of different customer groups, changes in operating methods and the requirements of digital services. (Juujärvi et al. 2019, 1, 5-8, 10-12.)

When comparing the digital competence of healthcare professionals described by the research to what the research suggests professional competence will be in the future, the areas of competence are very similar. Jauhiainen et. al (2017) have made a study, which suggests digital competence requirements for healthcare professionals for the future. According to their study, social and healthcare professionals' general competences consist of technology competences, data management competences, patient-centered service competences, communication and network communication competences, competences to give guidance and an ability to have a positive attitude to learn new things and to develop services. Professionals' specific competences consist of

management and entrepreneurship competences, competence to develop information systems and software and an ability to work in multidisciplinary teams. (Jauhiainen et. al 2017, 143-144.) Kangasniemi et. al (2018, 43-50) also highlighted that professionals need better skills to work in multidisciplinary networks and the skills to maintain professional competence. Lehtoaro, Juujärvi & Sinervo's (2019) research results have similarities to Jauhiainen's research. According to the results, competence related to digital services is needed the most, such as advising the patient on the use of service and guiding the patient through digital services (Lehtoaro et al. 2019, 3).

New competence requirements in healthcare have arisen because of global actors, new legislation, the change in the role of clients and professionals and the expectations of cost-efficiency in healthcare. The change in working environments has affected the role of professionals, who have deepened their competence and knowledge and broadened their work descriptions. (Kangasniemi et al. 2018, 43-50.) During the past years developing competence of healthcare professionals has been focused on the competence of individuals and individual profession groups. According to Kangasniemi et al. (2018), in the future, the focus should be on developing competent organizations instead. Organizations should have mutual goals and work in a more collegial way to appreciate employees' competences. In addition, the optimal competence of healthcare professionals will increase the wellbeing and safety of clients, citizens and professionals and strengthen the identity and dignity of clients and patients. Therefore, healthcare professionals' expertise should be utilized to meet the needs of citizens and to serve them in the best way possible. If this fails to happen, the healthcare services do not benefit from professionals and their expertise and the whole healthcare services, and its operability are at risk. (Kangasniemi et al. 2018, 50-75.)

In addition to other areas, the Finnish National Agency for Education's Osaamisrakenne 2035 -report also examines the changing significance of competence needs in social and health sector. In terms of general working life skills, the importance of competence is growing in the utilization of digital platforms and solutions, as well as in the management of remote and virtual services and mobile applications. According to the report, the most important digital skills will be knowledge assessment skills, digital communication and information sharing skills, and digital collaboration skills. The report also states that the necessary competence varies depending on what is included in the professional's duties. According to social and healthcare professionals, digital devices should be able to be mastered with basic digital skills, as the main part, however, is nursing and patients, their encounter and focus on care. Professionals also feel that digital devices take too much time and attention, especially in problematic situations. (Leveälahti et al. 2019, 5, 71-72.)

The development of future digital competence requires active management. Healthcare managers must not only recognize the possibilities of digitalization and technology, but also act as an example in the use of digital solutions, strive to clarify the benefits of digitalization to employees, communicate employees' thoughts and ideas to upper management, and prioritize learning opportunities as a factor promoting the organization's digitalization. As stated in the digital competence needs of the future described above, competence is required both from the technological solutions themselves and from the organizational change. For this to happen, it is necessary to share expertise in a multi-professional manner and to co-operate not only within a

single unit but also between different units of the organization. Employees' understanding of the necessity of change is increased by involving them in the various stages of development. (Gjellebæk, Svensson, Bjørkquist, Fladeby & Grunden 2020, 6, 8.) A prerequisite for understanding digitalization and learning digital skills is digital courage. Digital courage is the courage to face the digitalizing environment and to overcome the uncertainty caused by the change in the environment. Digital courage is built on successes in the digital environment, which should be remembered when developing digitization and services. (Digital and Population Information Agency 2022, 8, 12, 16.)

In addition, healthcare managers of the future need to have digital competence themselves in order to lead digital health services. Managers have to maintain their competence continuously and be active in learning new digital skills. In order to lead personnel in a digital health working environment, managers must not only have knowledge of their own organization's digital health services. But they must also have the ability to design digital health service processes and be up to date on what is happening with digital health services in their organization. It is also important for managers to participate in the development of digital health services and co-operate with the experts of digital health technology. Healthcare services' future managers should be excited by digitalization and development, be innovative, promote digitalization of healthcare to employees and to be able to anticipate the future of digital health services in their organization. (Ylitalo, Laukka, Heponiemi & Kanste 2022, 5, 7-9.)

4 THE AIM AND PURPOSE OF THE THESIS AND RESEARCH QUESTIONS

The aim of this thesis is to describe information about the digital competence of healthcare professionals. The purpose of this thesis is to describe what digital competence means in a healthcare setting and how it affects the work of healthcare professionals.

According to the literature review:

1. What requirements does digitalization have on the competence of healthcare professionals?
2. What impact do digital competence requirements have on the work of healthcare professionals?

5 METHODOLOGY AND ANALYSIS OF THE THESIS

5.1 Narrative literature review

As a research method, the literature review develops the theoretical understanding and concepts of the discipline in question, develops the theory, and evaluates an existing theory. The literature review enables an overall picture of the chosen topic to be formed. (Kangasniemi et al. 2013, 298; Suhonen, Axelin & Stolt 2016, 7.) As many as 14 different types of literature reviews have been identified, which are divided into three main types based on the purposes for which the literature review is carried out. These main types are narrative reviews, systematic reviews and meta-analyses. (Suhonen et al. 2016, 8.) In this thesis, the method of a narrative literature review is used, which according to Salminen (2011, 6) is one of the most used forms of literature review. This method of literature review was chosen as the method of this thesis because it was wanted to search for and analyze already existing information about the competence requirements of healthcare professionals. When using a narrative literature review, scientific studies are reviewed, and the topic is narrated or described based on them. The set of questions in a narrative literature review is usually broad. (Suhonen et al. 2016, 9.)

Kangasniemi et al. (2013, 294) describes the four stages of a narrative literature review. The first stage is the formation of a research question that guides the entire process. It must be possible to answer the identified research problem based on the literature. At this stage of process, preliminary searches are made of the topic. (Niela-Vilén & Hamari 2016, 24.) In the second stage, the material of the literature review is selected (Kangasniemi et al. 2013, 294). The materials are usually extensive, and the choice of material is not limited by strict rules (Salminen 2011, 6). Databases are used to search the material, but manual searches of scientific publications can also be used (Kangasniemi et al. 2013, 295; Niela-Vilén & Hamari 2016, 25). The key concepts of the research determine the keywords to be used. Inclusion and exclusion criteria are used to select the literature to be included in the review. The criteria are used to keep the review in focus and to manage the size of the data. The literature search process is time consuming part that needs to be described in detail; the reader should be able to repeat the search process. (Niela-Vilén & Hamari 2016, 25-27.)

When enough material is gathered, reading, and organizing all of them will take place. In the third phase, a more general description, a synthesis, of the results is formed (Kangasniemi et al. 2013, 294, 297; Niela-Vilén & Hamari 2016, 31). A qualitative description answers the research questions and draws new conclusions from the data. The material is searched for content that is relevant to the phenomenon under study, which is grouped into entities, for example, by theme or category (Kangasniemi et al. 2013, 296-297.) Similarities and differences are sought from the selected studies, which are then grouped, compared, and interpreted. A summary of the literature is usually provided in tabular form. (Niela-Vilén & Hamari 2016, 30-31.)

The fourth step is to review the result produced, which includes a reflection, an assessment of ethics and reliability, and summarizes the key results (Kangasniemi et al. 2013, 294, 297). All steps of the process should be described as accurately as possible. The reader of the report should be

able to assess the reliability of the report and reproducibility of the study should be possible. (Niela-Vilén & Hamari 2016, 32.)

5.2 Literature search and selection process

As already stated above, the purpose of the literature review is to create an overall picture of the chosen topic. The stages of the review should be systematically described so that the reader can assess the implementation and reliability of the stages of the literature review (Niela-Vilén & Hamari 2016, 23).

The topic for this thesis was carefully chosen after weeks of deliberation. The topic was chosen because it is current since the digitalization of healthcare has increased rapidly, as presented in chapters one and two of this thesis. During the formulation of the subject and research questions of this thesis, preliminary literature searches were made on the digitalization of healthcare and the digital competence of healthcare professionals.

The topic of the study affects the choice of databases to be used in the material search. It is recommended to use more than one database. (Lehtiö & Johansson 2016, 42.) PubMed and EBSCOhost (Cinahl Complete) databases were used in this thesis to search the literature because they contain article references in medicine and nursing sciences and related fields. A manual search supplemented the research search. The manual search was performed using the reference lists of articles found in the database search, but also the traditional Google search. The most recent searches from databases were made June 7, 2022. Used keywords and their combinations were used in searches. In the selection of keywords and their combinations, the informatic services of the library of Savonia University of Applied Sciences were used as help on April 13, 2022.

The research question as such should not be used as a search phrase, but the chosen topic should be divided into entities, based on which keywords can be formed (Lehtiö & Johansson 2016, 36). The entities digitalization or systems, healthcare personnel and competence, were the entities of this thesis from which the English keywords were formed. Boolen operators, which can be used in most of the databases (Lehtiö & Johansson 2016, 35), were used to combine keywords used in the searches. The OR operator was used to combine alternative words, and the AND operator was then used to combine different search entities. The keywords that were used as abbreviations in the search phrase, if necessary, are: digitalisation, digitalization, information system, health information system, digital technology, telemedicine, telenursing, telehealth, medical staff, nursing staff, nurse, health personnel, health care, healthcare, digital competence, digital skills, professional competence, digital capability. The search phrase is described in table 2.

The inclusion and exclusion criteria (table 2) were used to narrow down the search results. Limiting the search is recommended, because the search results can be reduced with the inclusion and exclusion criteria. The results of the search must still be carefully reviewed, choosing sources suitable for the topic. (Lehtiö & Johansson 2016, 51.) The most recent studies were wanted for the results of this literature review, which is why it was decided to use the year limit 2012-2022. Studies older than this were thought to contain already outdated information, because the development of

digitalization has been intense in recent years. Other criteria limiting the search were the language Finnish or English and the free availability of full texts.

TABLE 2. Inclusion and exclusion criteria of database search

Inclusion criteria	Exclusion criteria
Published between 2012-2022.	Published before 2012.
Finnish or English literature.	Non-Finnish or non-English literature.
Free publication.	Paid publication.
The literature was found with the search phrase: (digitalisation OR digitalization OR "Information Systems" OR "Health Information Systems" OR "Digital Technology" OR Telemedicine OR Telenursing OR Telehealth) AND ("Medical Staff" OR "nursing staff" OR nurse* OR "health personnel" OR "health care" OR healthcare) AND ("digital competenc*" OR "digital skills" OR "professional competenc*" OR "digital capabilit*").	Search outside the search phrase.

Access to international databases was made possible by Savonia University of Applied Sciences. The database-specific search results and the selections made from them are presented in table 3. Lehtiö & Johansson (2016, 51-52) state that the appropriate number of references to search results is 100 to 1000, without having to think about expanding the search or further limitations. Based on this, the number of search results was suitable for this literature review. The number of results with limiters from EBSCOhost was 110 and from PubMed 210. The article references obtained as a search result were reviewed by both authors. Based on the title and abstract, the information of suitable articles was collected in excel available to both authors. There were 18 of these articles from EBSCOhost and 15 articles from PubMed that were selected for more detailed reading. Seven of the articles were found in both databases, but they have been counted in the number of articles from EBSCOhost, because the searches in that database were processed first. Both authors read all the articles and comments about the suitability of the articles for the thesis were recorded in a common excel. After reading the entire research material, 7 articles from EBSCOhost and 3 articles from PubMed were selected for the thesis material. Three of the articles were found in both databases and have been counted in the number of articles from EBSCOhost. Two articles that were not freely available via the used databases were selected for the selections made from the search results. However, articles were found for free, one on Google Scholar and the other on Researchgate. One article had to be rejected because the full text was not freely available. The search results were supplemented with a manual search, based on which two studies were selected for the thesis material. The studies were found in the reference lists of articles that were excluded from the results after a closer reading of the articles. In addition, one article was found as a result of a standard Google search.

TABLE 3. Study and article selection process

Database	Results with limiters:	Included by title and abstract:	Included by full text:
EBSCOhost (Chinal Complete)	110	18	7
PubMed	210	15	3
Manual search	-	3	3

Thirteen studies (n=13) were selected for the literature review. It is recommended to evaluate the studies selected based on the application process. The evaluation can be part of the selection process, as in this thesis, or it can be an independent step or part of the analysis. There is no single guideline for making the evaluation because the reviewed method affects the implementation of the evaluation. It is important that the implementation of the evaluation is justified in the literature review report. (Niela-Vilén & Hamari 2016, 28, 30.) The studies used in results of this thesis are presented in annex 1. In the selection of the studies, in addition to the relevance of the content, an evaluation of whether the studies were peer reviewed or otherwise reliable from the research point of view was used. In the selection of the studies, the research method used in the study and the sources used in the study were considered. The studies selected for results are qualitative (n=4) or quantitative (n=4) in method, has used several methods (triphasic approach) (n=1), is a project (n=1), has used Delphi method (n=1) and literature reviews (n=2). The literature reviews were approved for use in the material of this thesis, because the results of the reviews had used scientific studies and evaluation methods in the approval of the studies.

5.3 Analysis of the research data

The purpose of the research and the research questions guide the implementation of the literature review and the selection of the data processing method, i.e., the kind of information that is to be produced. With the literature review, but also with the analysis of its material, answers to research questions are sought by gathering already existing information. (Kangasniemi & Pölkki 2016, 81-82.) As an analysis method, content analysis is a way of making repeatable conclusions, providing new insights and facts (Elo & Kyngäs 2008, 108), and aiming for a concise and broad description of the phenomenon that is the subject of the study (Elo & Kyngäs 2008, 108; Kanste et al. 2022, 245). The use of content analysis in healthcare and nursing studies has increased, state Elo & Kyngäs (2008, 107) in their theory-based article describing content analysis. The same statement is made by Kanste et al. (2022, 253) in their report. In addition, in the studies published in Hoitotiede, the literature review is the second most common research method, where content analysis is used as the analysis method (Kanste et al. 2022, 245-246).

Content analysis can be done in an inductive or deductive way. The inductive method is used when there is not enough previous information about the phenomenon under research or the information is fragmented. (Elo & Kyngäs 2008, 109.) When clarifying the topic of this thesis, it was noticed that the digitalization of healthcare has been studied from many perspectives, but the competence requirements have not been studied comprehensively. At the same time, it was also noticed that the

information describing competence requirements was very scattered among other types of research information. In addition to these factors, the results of the thesis were wanted to be found in the material selected for the literature review without a guiding theoretical basis. Therefore, inductive content analysis was chosen as the analysis method. Elo & Kyngäs (2008, 114) and Kanste et al. (2022, 247) reports state that the inductive method is the most common implementation method of content analysis. Inductive analysis means material-based analysis, in which concrete material is described as concepts or categories by means of analysis, (Latvala & Vanhanen-Nuutinen 2001, 24; Tuomi & Sarajärvi 2018, 107, 122.) and in which special expressions related to the phenomenon are collected and combined into more general, broader entities (Elo & Kyngäs 2008, 109).

The stages of the implementation of the analysis are preparation, organizing and reporting. The content analysis process does not contain strict rules and there is not only one right way to do analysis, but it is important that the content compiled from the material is classified into smaller categories. (Elo & Kyngäs 2008, 109, 113.) The analysis proceeds step by step, starting with defining the analysis unit. The most common unit of analysis can be a word, combination of words, a group of thoughts, part of a sentence or a sentence (Latvala & Vanhanen-Nuutinen 2001, 25-26; Tuomi & Sarajärvi 2018, 107, 122), as in this thesis. The sentence was chosen as the unit of analysis, because when reading the studies, it was found that sentences provide the best coverage of the material, because competence requirements and their effects were described in many words in the studies. The preparation phase also includes the researcher´s careful familiarization with the research material (Elo & Kyngäs 2008, 109). Both authors of the thesis read all the studies selected for the material.

The three actual stages of analysis are reduction, clustering, and abstraction (Latvala & Vanhanen-Nuutinen 2001, 24-26; Tuomi & Sarajärvi 2018, 107, 122.) In the first stage of the analysis, reduction, sentences corresponding to the research questions were searched for from the studies selected for this literature review. The sentences were first collected in a separate file, divided according to whether they answer research question 1 or 2. Both authors made their own selections, wrote them in a common file, after which the selections were reviewed together, ensuring a common understanding of the selected sentences. Elo & Kyngäs (2008, 109) describe the first stage of data organization as 'open coding', where notes and free headings are made while reading the material. A preliminary grouping of the sentences was done according to what kind of headings were considered to be formed from the content of the sentences. With the help of headings and going through it together by the authors, it was ensured whether the sentences were understood in the same way. In this implementation phase, some differences were found in how the sentences were understood. In the necessary parts were returned to the text of the article to verify the context around the sentences. After that, the collected material was condensed by reducing the original sentences to a reduced form, i.e., by extracting the expressions from the sentences that describe the research questions. (See also Tuomi & Sarajärvi 2018, 122–124.) This step was carried out in such a way that one author reduced the sentences of research question one and second author reduced the sentences of research question two. Consensus on the implementation was sought by reading and commenting on each other's outputs.

The next steps of the analysis are clustering and abstraction, of which clustering can be considered a part of the abstraction process. In clustering, reduced expressions are grouped according to similarities and the resulting groups are named with a descriptive concept or term. (Tuomi & Sarajärvi 2018, 124-127.) The grouping is based on the author's interpretation of which things are combined in the same category. The categories aim to describe the phenomenon in question, increase understanding of the subject and produce information on the subject. Abstraction means that a general description of the topic of the research is created using categories. The combining of categories from subcategories is continued as long as it is necessary or possible. (Elo & Kyngäs 2008, 110.) In this way, the material is condensed. As the analysis progresses, it becomes clear how many different categories are formed from the material, i.e., how long it is possible to continue combining the groups. (Tuomi & Sarajärvi 2018, 124-127.) In analysis of this literature review, grouping of the subcategories was carried out in the same way as the reduction of the original sentences, distributing the descriptions to be grouped by question to the authors. The authors went through the subcategories together to form the general categories. After that, were went back to the preliminary headings, from which the main categories of the results of the first question could be formed. Regarding the second question the first thought was to end the grouping into the formed general categories, but in the end, also for second question, the main categories were still formed. Examples of grouping by research questions are in annexes 2 and 3.

In the reporting phase, the research results are described through subcategories. The results are influenced by the author's subjective view of the researched object. The precondition for success is that the data collected in the study can be analyzed in such a way that the results reliably describe the object of the study. (Elo & Kyngäs 2008, 112-113.) The results of this thesis are described by research questions in chapter six and the reliability of the thesis is evaluated in chapter seven.

6 RESULTS

6.1 Healthcare professionals' digital competence requirements

According to this literature review, digitalization creates many competence requirements for healthcare professionals. These following requirements stood out in several selected studies of the literature review and were classified into entities using inductive content analysis. In this way the main categories of competence requirements were obtained. These main categories are information management in digital healthcare, professional competence in digital healthcare, knowledge of digital technology in digital healthcare, interaction competence in digital healthcare, ethical competence in digital healthcare and knowledge of digital services and development in digital healthcare. The main results of digital competence requirements of healthcare professionals are shown in figure 2.

In this thesis, **information management competence in digital healthcare** means professional's health information processing competence, decision-making competence, and information management competence. These three competences are furthermore divided into subcategories. Health information processing competence encases the professional's ability to collect and combine information, to evaluate information, to use data and to document data (Brunner et al. 2018, 4-5; Thye et al. 2018, 204; Vallo Hult, Hansson, Svensson & Gellerstedt 2019, 593; Kinnunen et al. 2019, 6-7; Koivisto et al. 2019, 757; Brown, Pope, Bosco, Mason & Morgan 2020, 7; Koivisto et al. 2020, 27; Jarva et al. 2022, 1388; Zareshahi, Mirzaei & Nasiriani 2022, 6-7). Decision-making competence includes decision-making skills by using IT (Thye et al. 2018, 204; Zareshahi et al. 2022, 6). This encases for instance the professional's ability to review care data for clinical decision-making (Zareshahi et al. 2022, 6). Information management competence includes analytical skills (Brunner et al. 2018, 4; Vallo Hult et al. 2019, 593; Reyes 2019, 8) and research skills (Värri et al. 2020, 1146; Zareshahi et al. 2022, 6). Analytical skills are seen as the professional's ability to analyze data and statistics and being able to explain statistics to patients (Vallo Hult et al. 2019, 593; Reyes 2019, 8). Research skills in the selected studies are described as nursing research skills and the ability to choose right research strategies (Zareshahi et al. 2022, 6).

According to the results of this review, digitalization also sets clear requirements related to professionalism. These **professional competence** requirements **in digital healthcare** consist of co-operation competence, self-development competence and professional competence. Co-operation competence includes the professional's skills to co-operate and participate in different new operating models (Värri et al. 2020, 1146; Zareshahi et al. 2022, 6). The ability to co-operate can for example be seen as collaboration with information technology system planners and developers (Zareshahi et al. 2022, 6). Self-development competence encases the professional's skills to participate in continuous training and education (Brunner et al. 2018, 4-5; Thye et al. 2018, 204; Vallo Hult et al. 2019, 593; Kinnunen et al. 2019, 5; Värri et al. 2020, 1146; Zareshahi et al. 2022, 6). This competence includes also learning skills (Brunner et al. 2018, 5), ability for continuous professional development (Brunner et al. 2018, 4) and sufficiency of training (Kinnunen et al. 2019, 5). Professional competence is the widest category of these three general categories, including professional skills, knowledge of clinical practice, telenursing skills and self-management skills

(Kujala, Rajalahti, Heponiemi & Hilama 2018, 183; Konttila et al. 2019, 756-757; Reyes 2019, 8; Vehko et al. 2019, 5; Koivisto et al. 2020, 28; Jarva et al. 2022, 1389; Zareshahi et al. 2022, 6). Knowledge of clinical practice/clinical expertise/practical skills are mentioned several times in Konttila et al. (2019, 756-757) study. Also, telenursing skills are mentioned as a digital competence in Konttila et al. (2019, 756) study. Self-management skills include for instance the professional's ability to evaluate a professional's own work (Koivisto et al. 2020, 28), time management skills (Konttila et al. 2019, 757), the ability to meet complex demands (Vehko et al. 2019, 5), the ability to integrate ergonomic principles to work (Zareshahi et al. 2022, 6) and redesigning of work tasks (Kujala et al. 2018, 183).

According to this literature review, the competence requirement **knowledge of digital technology in digital healthcare** consists of digital health technology competence and problem-solving competence. Furthermore, digital health technology competence is divided into four subcategories: skills and experience to use IT, competence to use different digital systems, experience in EHR (electronic health record) systems and competence of digital services (Brunner et al. 2018, 4-5; Kujala et al. 2018, 183; Thye et al. 2018, 204; Kinnunen et al. 2019 5-6; Konttila et al. 2019, 756; Reyes 2019, 8; Vehko et al. 2019, 5; Koivisto et al. 2020, 27, 50; Brown et al. 2020, 7; Jarva et al. 2022, 1386, 1388; Zareshahi et al. 2022, 6-7). Competence to use different digital systems include for example the professional's ability to use smartphones, electronic appointment systems and Microsoft Excel (Jarva et al. 2022, 1386), competence to use different applications (Kujala et al. 2018, 183) and the ability to use other information systems such as barcode scanning or pharmacy information system (Zareshahi et al. 2022, 6). Another general category problem-solving skills are seen as technical competence in the selected studies (Brunner et al. 2018, 5; Reyes 2019, 8; Koivisto et al. 2020, 50; Jarva et al. 2022, 1386). Problem-solving skills are for example described as the professional's ability to continue patient contact even when facing technical problems (Koivisto et al. 2020, 50).

Interaction competence in digital healthcare encases social skills (Konttila et al. 2019, 756-757) and competence to communicate in digital environment, which is mentioned in seven of the selected studies (Kujala et al. 2018, 184; Vallo Hult et al. 2019, 593; Konttila et al. 2019, 756-757; Reyes 2019, 8; Koivisto et al. 2020, 28; Värri et al. 2020, 1146; Jarva et al. 2022, 1386-1387). Communication skills include professional's competence in verbal guidance and articulation (Jarva et al. 2022, 1387) and using computer and other digital equipment to interact with patients (Kujala et al. 2018, 184; Koivisto et al. 2020, 28; Värri et al. 2020, 1146; Jarva et al. 2022, 1386).

Main category **ethical competence in digital healthcare** includes professional's ethical and legal competence (Brunner et al. 2018, 4-5; Kujala et al. 2018, 184; Thye et al. 2018, 204; Vallo Hult et al. 2019, 593; Konttila et al. 2019, 756-757; Reyes 2019, 8; Koivisto et al. 2020, 27-28; Värri et al. 2020, 1146; Zareshahi et al. 2022, 7). According to selected studies, ethical competence includes for instance ethical knowledge, ethical use of information, ethical decision-making, information security, legal issues, risk management in IT, confidentiality, privacy and safety issues (Brunner et al. 2018, 4-5; Kujala et al. 2018, 184; Thye et al. 2018, 204; Vallo Hult et al. 2019, 593; Konttila et al. 2019, 756-757; Reyes 2019, 8; Koivisto et al. 2020, 28; Värri et al. 2020, 1146; Zareshahi et al. 2022,7).

Legal competence includes professional's awareness of legal issues (Zareshahi et al. 2022, 7), legal knowledge of information security (Vallo Hult et al. 2019, 593) and understanding of legal issues in health information technology (Thye et al. 2018, 204).

According to the studies analyzed in this literature review **knowledge of digital services and development in digital healthcare** includes competence of patient-oriented practice, digital health service competence and digital health development competence. Competence of patient-oriented practice consists of digital care planning skills, patient guidance skills, competence to support patient and ability to evaluate patient's skills and needs (Brunner et al. 2018, 4-5; Kujala et al. 2018, 184; Vallo Hult et al. 2019, 593; Kinnunen et al. 2019, 6; Värri et al. 2020, 1146; Jarva et al. 2022, 1383, 1387). The professional's ability to evaluate patient's skills means for instance assessing patient's skills in recollecting written information (Jarva et al. 2022, 1387) and assessing patient's information technology skills (Värri et al. 2020, 1146). Digital health service competence encases digital service competence and the ability to understand digital health (Brunner et al. 2018, 5; Kinnunen et al. 2019, 8; Koivisto et al. 2020, 27-28; Värri et al. 2020, 1146; Jarva et al. 2022, 1383, 1388). Digital service competences of healthcare professional include for example competence to provide equal services (Jarva et al. 2022, 1383), competence to evaluate when to use digital health with patients (Koivisto et al. 2020, 27; Jarva et al. 2022, 1388), using digital health creatively and effectively (Jarva et al. 2022, 1388) and the ability to combine traditional methods with digital health services (Jarva et al. 2022, 1388). Understanding digital health is described as understanding the purpose of systems (Brunner et al. 2018, 5), understanding the interoperability of digital systems (Värri et al. 2020, 1146), understanding digital health at a local and national level (Brunner et al. 2018, 5), understanding digital health as a part of health services (Koivisto et al. 2020, 28) and understanding digital health and its possibilities (Jarva et al. 2022, 1387). The third general category digital health development competence includes subcategories competence to implement new services and to develop digital health (Brunner et al. 2018, 5; Kujala et al. 2018, 183; Kinnunen et al. 2019, 8; Koivisto et al. 2020, 28; Värri et al. 2020, 1146; Zareshahi et al. 2022, 6). The ability to implement new services and operating models (Kujala et al. 2018, 183; Värri et al. 2020, 1146) and to participate in changing information systems (Zareshahi et al. 2022, 6) are a part of the competence to implement new services. The development of digital solutions is mentioned in five of the thirteen selected studies. The development skills are skills to develop digital solutions and to participate in the development (Brunner et al. 2018, 5; Kinnunen et al. 2019, 8; Koivisto et al. 2020, 28; Värri et al. 2020, 1146; Zareshahi et al. 2022, 6).

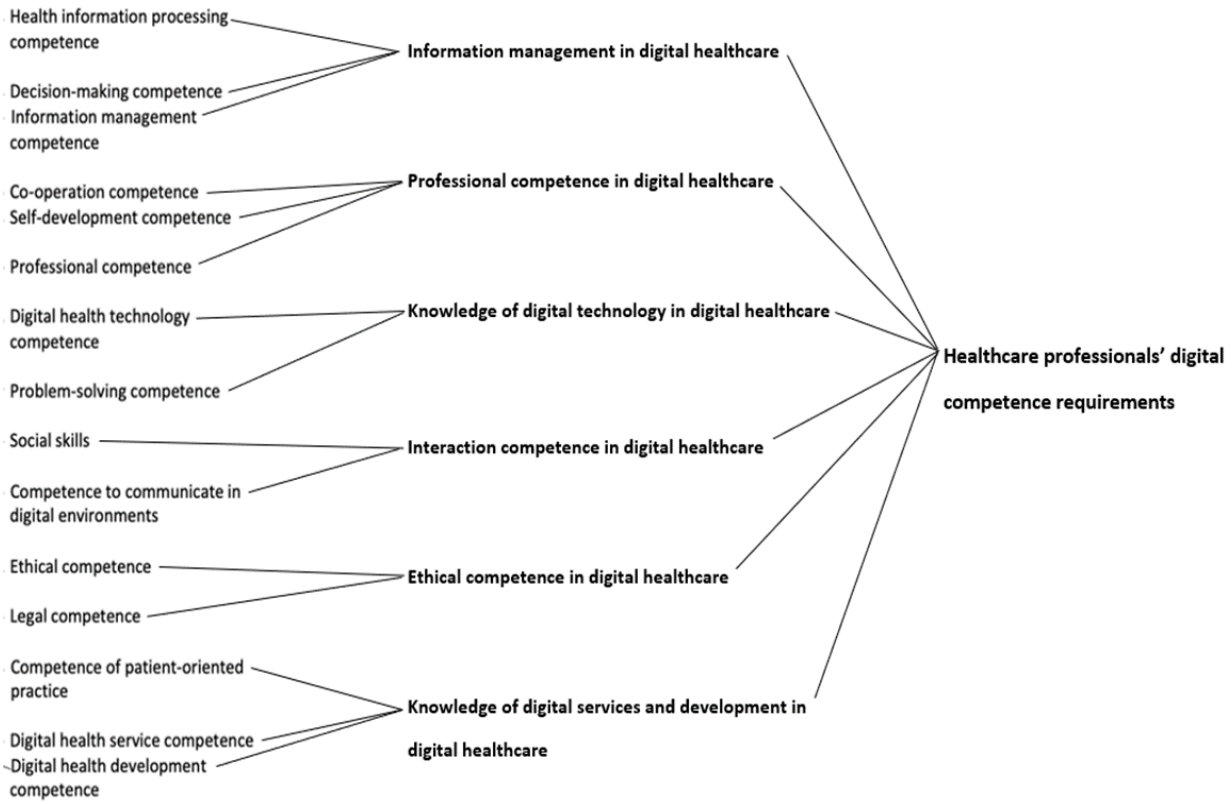

FIGURE 2. The main and general categories of digital competence requirements of healthcare professionals

6.2 The impact of digital competence requirements on the work of a healthcare professional

The second research question of this thesis sought answers to how the requirements of digital competence impact on the work of the healthcare professional. The results were compiled from the same studies as the result of question one by means of inductive content analysis. The results are condensed into two main categories, which are the change of the work environment to a digital environment in healthcare and the impact on work management and manageability in healthcare (figure 3).

As a result of the requirements of digital competence, the healthcare professional's work environment becomes digital. Factors related to the concrete implementation of the professional's daily work are combined into this main category, **the change of the work environment to digital environment in healthcare**. These factors include changes in the patient's participation and care relationship, the impact on the quality of care, the impact on planning and implementation of care, changes in work methods and tasks in healthcare, ethical decision making in healthcare and the change of the role of healthcare professional.

The change in patient involvement and care relationship are discussed in five studies. In the digital environment of healthcare, the patient's participation in care increases with the availability of information (Vallo Hult et al. 2019, 591; Jarva et al. 2022, 1385), and improves (Brown et al. 2020, 2815), but may also require motivation (Kujala et al. 2018, 184). The effect on the care relationship is found to be that the care relationship improves when the use of technology increases the value of care relationship (Konttila et al. 2019, 757) and the professional's knowledge of technology

increases trust (Jarva et al. 2022, 1388) in the care relationship. On the other hand, digital environment can harm the care relationship by taking professional's time away from patients (Konttila et al. 2019, 757; Brown et al. 2020, 2817). According to research, the requirements of digital competence also affect the communication between professional and patient. Vallo Hult et al. (2019, 590) state that the ways to communicate with patients increases. However, professionals also experience uncertainty when communicating with patients in a digital environment (Kujala et al. 2018, 184). The digital environment enables the use of various methods for patient guidance (Jarva et al. 2022, 1388) and makes guidance easier (Brown et al. 2020, 2815).

Three studies deal with the effects of digital competence on the quality of care. Jarva et al. (2022, 1385) note the need to secure equality in the digital environment. Brown et al. (2020, 2815) and Zareshahi et al. (2022, 8-9) studies show an effect of improving the quality of care, which is related to professional's digital skills. On the other hand, Zareshahi et al. (2022, 10) also state that the demands of digital competence can reduce the quality of care if there are deficiencies in the professional's digital competence.

The impact of digital competence requirements on the professional's work also applies to planning and implementation of care. This can be seen in the way that there is requirement to manage the different phases of treatment processes in digital working environment (Konttila et al. 2019, 757), to enhance the treatment processes with help of alternative services (see Brown et al. 2020, 2815; Jarva et al. 2022, 1388) and to enable continuity of patient care outside appointments (Vallo Hult et al. 2019, 592). The professional must consider patient-oriented care in the digital environment as well and consider the patient's starting points to use digitalization (Jarva et al. 2022, 1383).

In the digital operating environment, working methods and tasks also change. These are discussed as different entities in seven different studies. Vallo Hult et al. (2019, 589, 592) study generally states that work practices change, and new tasks arise. A professional's digital competence is needed for promoting and marketing the use of digital services (Jarva et al. 2022, 1388), to guide and help the patient to use and find digital services (Kujala et al. 2018, 184; Vehko et al. 2019, 6; Jarva et al. 2022, 1387) and to use of digitalization and technology at work (Vallo Hult et al. 2019, 590, 593; Brown et al. 2020, 2817; Jarva et al. 2022, 1388). In a digital environment, there are more opportunities to use information and the use of information, as well as decision-making, is more efficient (Brunner et al. 2018, 5; Brown et al. 2020, 2807; Zareshahi et al. 2022, 9). A professional with digital competence is also expected to participate in changing working methods (Brunner et al. 2018, 5; Kujala et al. 2018, 184; Brown et al. 2020, 2816) and in the development and implementation of technology (Brunner et al. 2018, 5; Brown et al. 2020, 2816-2817).

Ethical questions are an essential part of working in a digital environment. Konttila et al. (2019, 757) simply state that professionals need to solve ethical problems. Brown et al. (2020, 2815) and Vallo Hult et al. (2019, 590) bring out in their studies that it is necessary to consider information security and data protection. The previously noted increase in patient participation also affects the amount of information produced by the patient. Studies have identified the need to evaluate the information that the patient produces during the care relationship (Vallo Hult et al. 2019, 591; Jarva et al. 2022,

1389). Jarva et al. (2022, 1383) also state that the patient's motivation to use digital services should also be evaluated.

In this thesis, changes in the professional's role are combined with changes in the work environment. In the study of Vallo Hult et al. (2019, 592) it is mentioned that professionals have new roles related to the use of information. The role of a professional can be shifting (Brunner et al. 2018, 5), but a professional must act competently regardless of the work environment (Vallo Hult et al. 2019, 592; Jarva et al. 2022, 1389).

Digital competence requirements also have **an impact on the management and manageability of a professional's work in healthcare**. The effects on the experience of work and the maintenance of competence can be found as clear entities from selected studies. The use of technology and digitalization at work causes various negative feelings (Kujala et al. 2018, 184; Konttila et al. 2019, 757; Vallo Hult et al. 2019, 589; Brown et al. 2020, 2815; Jarva et al. 2022, 1389). Positive emotional expressions are not mentioned at all, although the positive effects of the digital environment are described, as stated in the previous chapters. The negative feelings described are insecurity, stress, frustration, anxiety, concern, and fear. The effects on the professional's workload and time use vary. Three studies describe negative effects, in the form of an increase in the workload and a decrease in the use of time (Vallo Hult et al. 2019, 592; Brown et al. 2020, 2817; Koivisto et al. 2020, 51). On the other hand, Brown et al. (2020, 2815) also highlights the opposite effects, i.e. decrease in the workload and improvement of time use. Zareshahi et al. (2022, 8-9) state in their results that the use of time has become more efficient.

As clear result of the review is the impact of digital competence requirements on the continuous need for competence maintenance. The expressions used in the studies are regular education and training. (Kujala et al. 2018, 184; Kinnunen et al. 2019, 8; Konttila et al. 2019, 757; Vehko et al. 2019, 5; Brown et al. 2020, 2816.) Konttila et al. (2019, 758) also state as the result of their literature review that continuous maintenance of skills can dispel the feeling of fear towards technology.

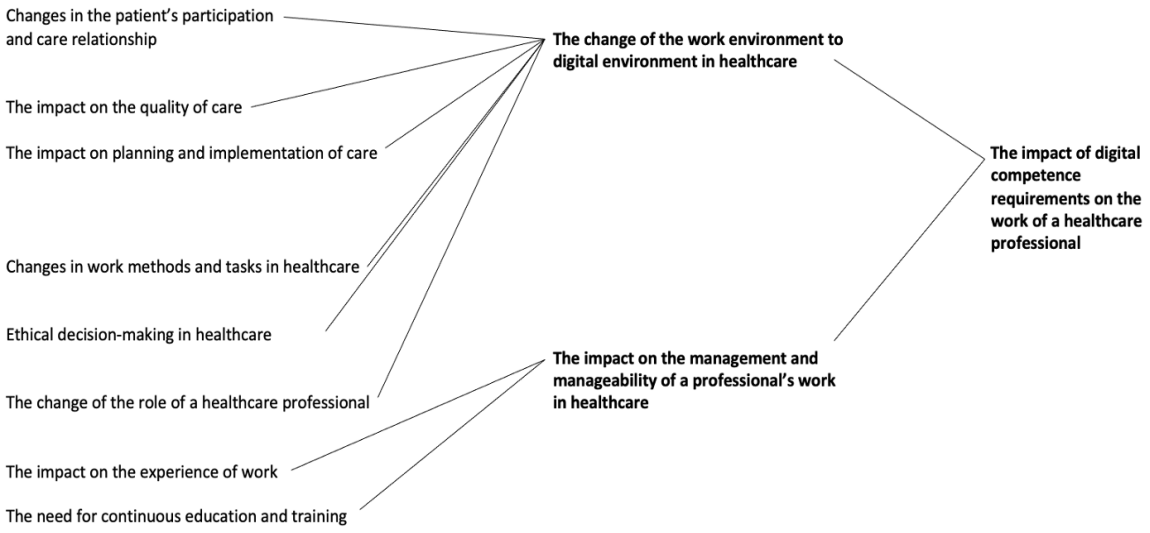

FIGURE 3. The main and general categories on the impact of digital competence requirements on the work of a healthcare professional

The following factors are also presented as single results of this literature review, which are not combined to the categories presented above, but wanted to present them in connection with the results. Jarva et al. (2022, 1389) find that digital competence makes it easy to learn new aspects of digital health. Working in a digital environment requires willingness and motivation but can also increase a professional's motivation (Konttila et al. 2019, 756-757). The ability of professionals to use the English language when using digital devices is also one of the preconditions for working in a digital environment. (Zareshahi et al. 2022, 8). Professionals also repeatedly need the help of IT experts in their work (Jarva et al. 2022, 1386).

7 SUMMARY AND CONCLUSIONS

7.1 Reflection on the results

The purpose of this thesis was to find out what requirements digitalization has on the competence of healthcare professionals and what impact they have on the work of healthcare professionals. This thesis was implemented as a literature review, because it was wanted to collect the already existing information and analyze it. The assumption in the beginning was that a lot of research had already been done on digital competence, so it was surprising that there was a rather limited number of studies that could be found directly on the requirements of digitalization for the competence of healthcare professionals or on the digital skills of professionals. Factors related to the impact of digital competence requirements were searched for in the same studies dealing with digital competence. Regarding these factors, accuracy was required in that the selections answered the research question and were not, so to speak, beside the point. The studies selected for this review dealt with digital competence in healthcare from different perspectives or related to a concrete entity. Thus, the literature review was well suited to this thesis and the aim of the research to produce information about the requirements of digital competence and their effects on the professional's work was fulfilled. Both competence requirements and the results describing their effects on the professional's work partly highlight same themes such as information management, professionalism, technology management, maintenance of competence, patient orientation and development of work and processes. In the analysis the classification of the results was progressed differently for each research question, and thus the main categories do not correspond to each other even though they partly contain the same themes. The perspective is just different.

The results of this thesis, which describe digital skills, showed many similarities to previous studies, which were described in the beginning. When comparing the results of this thesis with the study of Kangasniemi et al. (2018), the results are surprisingly similar. Kangasniemi et al. (2018, 70) divided the competence categories of healthcare professionals into client service competence, competence to develop services and competence to work as an individual and in cooperation with others. These three main categories are comparable with some of our main competence results: knowledge of digital services and development in digital healthcare and professional competence in digital healthcare. Kangasniemi et al. (2018, 70) did not address the digital competence in their studies, therefore digital technology competence and information management competence were not mentioned. In addition, Nummela et al. (2019, 43-44) highlighted customer-oriented needs assessment and service assurance competencies, which are very similar to our knowledge of digital services and furthermore competence of patient-oriented practice. However, ethical competence was also mentioned in Kangasniemi et al. (2018, 70) study as a part of client service competence. In addition, ethical and legislation competence came up in Tuomi et al. (2008, 120, 134), Eriksson et al. (2015, 3, 60), van Houwelingen et al. (2016, 58), Jauhiainen et al. (2020, 98-99) and Finnish Nurses Association's (2021) studies. Their results were very much alike with the competence requirement ethical competence in digital healthcare of this thesis.

Professional competence was addressed in Kangasniemi et al. (2018, 70) study as stated above, where professional competence was divided into professional's own competence, self-management

skills, evaluation of skills, and the ability to work in multidisciplinary teams. This distribution is very comparable with the results, since professional competence in digital healthcare was divided into co-operation competence, self-management competence and professional competence in this thesis. In addition, European Parliament and the Council (2006, 15-16), Tuomi (2008, 120, 134), Eriksson et al. (2015, 3,60), van Houwelingen et al. (2016, 58), Nummela et al. (2019, 43–44) and Jauhiainen et al. (2020, 98–99) all mentioned professional skills/clinical knowledge, collaboration and networking skills and self-management skills as important competencies for healthcare professionals.

The competence to develop digital health services came up in many studies. For instance, Rajalahti et al. (2014, 190, 194) mentioned desire to develop and interest in learning new things as an important part of competence. Sydänmaanlakka (2015, chapter 5.2), addressed these same subjects highlighting how important it is for professionals to be able to develop at work and develop the work. In addition, Tuomi (2008, 120, 134), Kangasniemi et al. (2018, 70), Jauhiainen et al. (2020, 98-99) and Finnish Nurses Association (2021) mention the competence to develop digital health services and applications as one digital competence requirement for healthcare professionals.

Nummela et al. (2019, 43) saw IT competence as the most important competence need. Ability to use digital technologies was also a digital competence in Ilomäki et al. (2011, 8) study. Basic IT (information technology) and computer skills were also mentioned by European Parliament and the Counsil (2006, 15-16) and Jauhiainen et al. (2020, 98-99). One of the results of the first research question, knowledge of digital technology in digital healthcare as a digital competence requirement was comparable with these studies presented above.

Communication and interaction skills were seen as an important part of digital competence in several studies (European Parliament and the Counsil 2006, 15-16; Tuomi 2008, 120, 134; van Houwelingen at al. 2016, 58; Kangasniemi et al. 2018, 70; Jauhiainen et al. 2020, 98-99). All these studies highlighted the importance of communication and interaction skills and the ability to communicate in a digital environment, as did the writers of this thesis in the results section, when naming interaction competence in digital healthcare as one of digital competence requirements. Information management competence in digital healthcare was also one of the digital competence requirements for healthcare professionals according to the literature review. In addition, information management, management or leadership skills were also mentioned in European Parliament and the Council's (2006, 15-16), Eriksson et al. (2015, 3, 60), Jauhiainen et al. (2020, 98-99) and Finnish Nurses Accociation's (2021) studies.

Motivation to do work and a professional's personal attitude was also mentioned in several studies of the theory (Sydänmaanlakka 2015, chapter 5.2; Tuomi 2008, 120, 134; Ilomäki et al. 2011, 8; Tuomi & Sumkin 2012, 26; van Houwelingen et al. 2016, 58). These features were not mentioned in the results of this thesis; however, similar findings were made from the literature review. These findings were not presented in the results since authors thought that these findings did not answer directly to research questions. Healthcare professional's personal attitudes (Konttila et al. 2019, 756), beliefs (Konttila et al. 2019, 756), will (Kujala et al. 2018, 183), activity (Kujala et al. 2018, 184) and motivation (Kujala et al. 2018, 184; Konttila et al. 2019, 756; Värri et al. 2020, 1146) are

all issues that affect the use of digital health but are not competence requirements. However, for instance it is easier to learn to use different digital applications if you are motivated.

In the results describing the effects of digital competence requirements, the largest category consists of factors related to the digitalization of the professional's work environment in healthcare. Studies and sources dealing with digitalization stated that when digitalizing functions and services, the patient perspective must be taken into account and that professionals are required to have competence related to patient orientation (see Erikson et al. 2015, 3; Ministry of Social Affairs and Health 2016, 8; Kangasniemi et al. 2018, 70). In this case, at best, the professional's digital skills promote patient's participation in care, improve the quality of care and interaction with the patient (communication, guidance), and take into account the starting points of the patient's digital skills, as can be concluded from the results.

Digital competence has a significant impact on the change in professional working practices and tasks. The results also revealed new work tasks, such as guiding the patient in the use of digitalization. The digital environment also enables more efficient ways of working and diversifying services when there are more alternatives available than traditional methods and information is more easily available. The same is stated by Öberg et al. (2018, 965), Aalto et al. (2016, 7) and Virtanen et al. (2017, 35). Digital competence is also mandatory, which was clearly evident from the results. As has been stated, digitalization challenges to think how things could be done better (Virtanen et al. 2017, 29-30; Ministry of Finance s.a.a.). Based on this, the result of the thesis is expected, when there is digital knowledge, it should be used to develop operating methods and work. Saetra & Fosc-Villaronga (2021) study stated that the loss of some working tasks from professionals has been seen as a harmful aspect of digitalization. In contrast to this, this thesis highlighted the effects of digital skills on the professional's role in the form of new and changing roles. It can probably be said that changing tasks is natural and necessary in relation to the effects of digital skills.

Factors related to work management and manageability were clearly repeated the most as consideration of the same type. Negative feelings related to digital skills and digitalization were repeated in several studies as similar images (i.a. Vallo Hult et al. 2019, 589; Brown et al. 2020, 2815; Jarva et al. 2022, 1389). The result is interesting, because digital skills have positive effects on factors related to the actual implementation of work, such as patient participation (Brown et al. 2020, 2815), patient guidance (Jarva et al. 2022, 1388) and information management (Zareshahi et al. 2022, 9), but using digital programs and software and technology itself is frustrating and causes stress (i.a. Vallo Hult et al. 2019, 589; Brown et al. 2020, 2815; Jarva et al. 2022, 1389). It can be concluded from this that, although digitalization makes it possible to make operations more efficient and increase services, there is room for improvement in the usability of digital services. The need for continuous education and training also came out very clearly in the results. This is also stated by European Health Parliament (2016, 2, 8) and Öberg et al. (2018, 964-966). In the results of Saranto et al. (2022, 222) research, deficiencies are noted in the information systems orientation and continuous training offered by the employer. Research has therefore identified the need for continuous training, but is training actually offered sufficiently? Based on the negative result of one

study, clear conclusions cannot yet be drawn, but the result of the study is in line with the author's own experiences.

The previous studies and sources related to digitalization discussed in the theory of this thesis show how extensively a professional needs skills related to digitalization, and the results of this thesis are not different from this. Knowledge is needed not only about technology and digital work tools, but also about how patient care processes and work methods must be designed to function in a digital environment. The professional must also know things related to information security and protection, take care of the level of their own competence and be able to change their competence and increase their skills in accordance with the requirements of digitalization. With the requirements of competence and therefore also digital competence, the professional's work environment is becoming more and more digital. In a digital environment, working methods change, information is available in different ways, and professionals are expected to participate in the development and planning of work. Although digitalization brings lot of good things, it also causes burdens and worry for professionals.

It can be concluded from the results that although the maintenance of competence has always had to be taken care of, with digitalization the competence requirements will only increase and challenge professionals to continue training in addition to their basic work. And as those who use various information systems and digital services know, systems and programs are constantly updated and developed, which only increases the need to constantly adopt new features and functions even for familiar work tools. Fortunately, however, digitalization aims to make work processes more efficient, which should free up professional's time to take care of new tasks and roles.

7.2 Ethics and validity of the thesis

The Academy of Finland (2003, 21-22) has made guidelines on research ethics and for good scientific practice. Good scientific practice includes, for instance, respect for other researchers' work, being accurate in conducting research and presenting results, and reporting the entire process of the research thoroughly, starting from the planning of the research. According to Kankkunen & Vehviläinen-Julkunen (2015, 227), the ethical questions of the research start from the selection of the research topic, continue to the reporting of the results and end to the storing of the research material. Therefore, it is good to remember that the selection of the topic is already an ethical choice. Most importantly, dishonesty must be avoided in every phase of the research. Plagiarism is forbidden and authors must mark the references used correctly. In addition, authors are not allowed to plagiarize their own studies or previous texts. The reporting of the results should not be inadequate or misleading. The results must be presented the way they are and not be twisted. (Hirsjärvi, Remes & Sajavaara 2007, 25-26.)

This thesis was carried out as a narrative literature review and the guidelines of good scientific practice and research ethics has followed. There has been no research done on humans or related to personal data, therefore, there was no need to make an ethical review of this thesis. However, ethical writing guidelines have been strictly followed taking into account e.g., references, text plagiarism check and describing the results as they were found in selected studies. In addition,

references have been marked correctly, which increases transferability as Elo & Kyngäs (2008, 112) states. This increases the possibility of research reproducibility.

Eskola & Suoranta (1998, chapter Arviointi luotettavuutena), state that the most important thing when estimating the reliability of qualitative research is the researcher herself/himself, since the evaluation of the reliability continues throughout the whole research process. Therefore, an unbiased view of the topic was sought to maintain throughout the whole research process. Thesis was made by following the thesis project plan and literature review was made by following the phases of a narrative literature review. The phases of the research process and inductive content analysis were reported carefully. When describing the implementation and progress of the research, every step and choice was written openly and justified, which increases transparency and validity of the research. The description of the analysis, but also the annexes and tables describing the connection between the material and the results increase the reliability of this thesis (see Elo & Kyngäs 2008, 112). Reliability is also increased by the use of peer-reviewed and otherwise reliable studies, as well as help and advice from the information services of the Savonia University of Applied Sciences library.

The validity of the study evaluates if the measurements used in the study truly measure what they are supposed to measure. (Statistics Finland 2022.) However, the validity of the study can furthermore be divided into inner and outer validity. Inner validity describes the harmony of the theoretical definitions of the study and outer validity describes the proficiency between the theoretical base of the study and the conclusions of the study. (Eskola & Suoranta 1998, chapter Luotettavuus ikkunana todellisuuteen.) To improve the validity of this thesis research questions were kept clear in mind throughout the research. The results of this thesis provided answers to the research questions, which indicate the validity of the research. In addition, if the results and conclusions of the study are comparable to other similar studies, the affirmability of the study increases (Eskola & Suoranta 1998, chapter Arviointi luotettavuutena). There are not many other similar studies made about the digital competence of healthcare professionals and its' impact on work, therefore it is difficult to evaluate the affirmability of this thesis.

Since there were two authors of the thesis, consensus on the implementation and outputs of each phase had to be ensured. During the entire process, the authors engaged in active communication and overlapping work was also done to ensure mutual understanding. Efforts were made to divide the work evenly, so that an equal contribution to the implementation was received from both actors.

8 DISCUSSION

Doing a thesis in collaboration with another student was a new way of doing research for both authors. In the different stages of the work, a surprisingly large amount of time was spent on finding common ways of working, but also on securing a common vision of the progress of the implementation and the results. Different life situations also challenged working together, as time for promoting research was not always found at the same pace. Patience and flexibility were required from both, which fortunately care workers seem to have naturally. Collaboration in doing research also has its own advantages when you can think and figure things out together. Both the original material collected from the sources and the results derived from it were considered together and by mirroring each other's views. This can also be considered to increase the reliability of the research when the results have been reviewed by two authors instead of one. It can be said that almost everything was first made by both authors, therefore everything was double-checked.

The topic of the research was found in cooperation through many different exchanges of ideas. Narrowing down the topic to its current form seems to be one of the most challenging phases of research. Digitalization and competence were thought about from many perspectives, which would be topical and also motivating for the authors. After the topic and research questions were clarified, the work began to progress under its own weight. Writing the research report went surprisingly smoothly when the work was shared. There was also an unspoken agreement with authors that the text produced by the other can be corrected and supplemented as needed, depending on who finds more sources. This was important and made writing easier and more transparent for both authors. Gathering information to the theory base was challenging, since digital competences have not been addressed a lot in studies. The gathered information was critically evaluated and decided by both authors what would be relevant for this subject. This phase was difficult, since there was a lot of information about digitalization generally, but not specifically about digital competence. At the end of this thesis project, it was noticed that the Ministry of Social and Health Affairs' digitalization guidelines 2025 was marked as expired. However, it was decided to include the guidelines report as a source because it had been referred to before the report expired and an updated report could not be found to replace it.

13 studies were selected for the literature review, and to be said, the number could be higher, but it was difficult to find suitable studies according to the limitations in the databases. Inductive content analysis was used to analyze the material gathered for the literature review in this thesis. The implementation of the analysis was thought out together, making sure that both authors had equal information about the content of the material and the progress of the classification at all times. The reasons to use this method are more detailed described in chapter 5.3. However, in the beginning of this thesis project, it was also considered by authors to use deductive content analysis instead. The use of deductive content analysis would have meant describing the competence requirements based on existing theory. However, the results were wanted to be formed without a guiding theory, which is why inductive content analysis was chosen as the analysis method. In addition, it was estimated that the deductive content analysis method would have been less suitable for finding the answers to the second research question of this thesis.

After the analysis, the writing of the results went quickly although the clear and descriptive presentation of the results had to be refined. Completing the report once again took more time than expected. When examining the entirety of the thesis, the authors found themselves wondering whether the topic should have been defined more precisely. However, a more precise delimitation could have weakened the finding of sources and thus narrowed down the results obtained.

Doing the thesis in collaboration remotely went well. The reporting tools and instructions made the writing task smooth. Doing a thesis alongside a day job was already known to be challenging beforehand, but the challenges of time management nevertheless surprised at least one of the authors. In afterwards, it would have been profitable to take advantage of, for example, study leave, when doing research would have been more productive than it was with the day job.

The topic and results of the study gave the authors insight into the competence requirements of digitalization and the impact on the professional's work. Through their own work, both authors have experienced the increased digitalization in nursing work and the effects it has on the work of a healthcare professional. Familiarity with the literature required by the research increases the understanding of international and national digitalization goals, which should also be followed and promoted at the level of a single organization. Completing this thesis will bring plenty of additional information to your own work, but also to be utilized in the work community.

Based on the results, it can be concluded that employers should take care of employees' regular digital training. If the organization does not have the opportunity to take care of the training itself, it could be profitable to use external training and trainers. The costs spent on training will be returned to the organization through more satisfied and proficient personnel. The effects of digital requirements must be actively taken into account in work communities. As in other work, also in the development of digitalization, teamwork and working together bring efficiency and know-how to implementation.

The development of digital competence, as digitalization continues to develop, could be an interesting topic for further research. How to develop a healthcare professional's digital skills to a deeper level, what advantage would it bring from the point of view of healthcare processes. It would also be good from the patient's point of view to find out how the patients experience the effects of the professionals' digital skills during the treatment they receive, how it meets the patients' needs and what the patients hope for from the professionals' digital skills. One point of view could be precisely how patients hope to be able to do business digitally with professionals, and what they expect professionals to know about digital services and how to use them. There were not a lot of studies made on the digital skills of different profession groups, therefore it would be interesting to compare the digital competence of nurses versus doctors for example. Digitalization of healthcare also stirs up many emotions in healthcare professionals, and this could be also studied in the future. For instance, why do some professionals have negative attitudes towards digital health, and can those feelings be reversed somehow?

The goal of the wellbeing services counties which have been operating since the beginning of 2023 is to unify and enhance the operations of their own region, e.g. with the help of digitization. It can

be certainly thought that the success of these actions will be determined by various studies and reports. Also from the point of view of the operations of the wellbeing services counties, it would be interesting to know the results of the actual growth and effects of the digitalization of healthcare, how the operations have actually been managed to be unified and made more efficient. It would also be interesting to get information on how healthcare professionals perceive digital development and the demands on competence, in a situation where operations are being renewed also in other ways than by digitalization.

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ANNEX 1. RESEARCH SUMMARY TABLE

Writer(s) and year	Research article and Place of publication	Research Method	Objective of the study	Results
Jarva, Erika, Oikarinen, Anne, Anderson, Janicke, Tuomikoski, Anna-Maria, Kääriäinen, Maria, Meriläinen, Merja, Mikkonen, Kristina 2022	Healthcare professionals' perceptions of digital health competence: A qualitative descriptive study Nursing Open 9, 1379-1393	A qualitative descriptive study	To provide insight into healthcare professionals' lived experiences of digital health competence with the objective of improving the knowledge of how digital health competence is perceived by healthcare professionals.	Healthcare professionals' perceptions of digital health are connected to competence to provide patient-centric care through digital channels, using technology and digital health systems, interacting with the patient through digital means, evaluating what digital health is and combining digital and traditional methods.
Konttila, Jenni, Siira, Heidi, Kyngäs, Helvi, Lahtinen, Minna, Elo, Satu, Kääriäinen, Maria, Kaakinen, Pirjo, Oikarinen, Anne, Yamakawa, Miyae, Fukui, Sakiko, Utsumi, Momoe, Higami, Yoko, Higuchi, Akari, Mikkonen, Kristina 2019	Healthcare professionals' competence in digitalisation: A systematic review Journal of Clinical Nursing 28, 745-761	A systematic review	To identify key areas of competence for digitalization in healthcare settings, describe healthcare professionals' competencies in these areas and identify factors related to their competence.	Key competence areas regarding digitalization from a healthcare perspective identified encompass knowledge of digital technology and the digital skills required to provide good patient care, including associated social and communication skills, and ethical considerations of digitalization in patient care. Professionals need the motivation and willingness to acquire experience of digitalization in their professional context.
Värri Alpo, Tiainen, Minna, Rajalahti, Elina, Kinnunen, Ulla-Maria, Saarni, Lea,	The Definition of Informatics Competencies in Finnish Healthcare and	The national SotePeda 24/7 project	To identify and define the informatics competencies required for multidisciplinary	Competence areas required for healthcare and social welfare professional education in Finland: basic information and communications technology competencies, online interactive competence, service competence in digital health and the social care sector, person-centred guiding competencies in a digital environment, competence to monitor health and

Ahonen, Outi 2020	Social Welfare Education Studies in Health Technology & Informatics 270, 1143-1147		education of this sector in Finland.	wellbeing in a digital environment, health and social care informatics competencies, multi-stakeholder service co-development competence, ethical competence, service design competence, knowledge management competence, research, development and innovation competencies and societal competence.
Brown, Janie, Pope, Nicole, Bosco, Anna Maria, Mason, Jaci, Morgan, Alani 2020	Issues affecting nurses' capability to use digital technology at work: An integrative review Journal of Clinical Nursing 29, 2801-2819	An integrative review	To evaluate and synthesize the evidence regarding the development of digital capability in nurses and the strategies that support effective integration of digital skills into the workplace.	Integration of digital capability in nurses' workplaces is dependent on user proficiency and competence. Nurses use technology to access data at the point of care, specifically accessing evidence to guide care as well as accessing medical records.
Kinnunen, Ulla-Maria, Heponiemi, Tarja, Rajalahti, Elina, Ahonen, Outi, Korhonen, Teija, Hyppönen, Hannele 2019	Factors Related to Health Informatics Competencies for Nurses—Results of a National Electronic Health Record Survey CIN: Computers, Informatics, Nursing 37(8), 420-429	An electronic questionnaire	To explore the level of nurses' informatics competencies and sufficiency of in-house training regarding technology-induced changes in work practices.	Respondents rated their overall informatics competency relatively high, with the lowest competency scores on terminology-based documentation (Finnish Care Classification) and patient-related digital work. Education, electronic health record system used, experience using electronic health record systems, sufficiency of training, higher levels of technical functionality, ease of use, and usefulness were all associated with competency and remained significant after all adjustments.
Thye, Johannes, Shaw, Toria, Hüsers, Jens, Esdar, Moritz, Ball, Marion, Babitsch, Birgit, Hübner, Ursula 2018	What Are Inter-Professional eHealth Competencies? Studies in Health Technology & Informatics 253, 201-205	A quantitative survey	To investigate which competencies are at the intersection of the individual groups of health professionals.	Communication and leadership proved to be important competencies across all professions. None or very little differences between professions were found between physicians and nurses.
Vallo Hult, Helena, Hansson, Anders,	Flipped healthcare for better or worse	An interpretative qualitative study	To explore how resident physicians view their roles and practices in relation to	There is a need for new professional competencies in everyday data work, along with a change in attitudes, newly defined roles, and better ways to identify and develop

Svensson, Lars, Gellersted, Martin 2019	Health Informatics Journal 25(3), 587-597		informed patients and patient-centric digital technologies and to illustrate how the new role of patients alters physicians' work and use of data to learn and update their professional practice.	reliable online sources. The role of patients is a rather formidable and complex cultural change to be addressed.
Reyes, Jimmy 2019	Competencies for the implementation and provision of telehealth modalities by registered nurses and advanced practice registered nurses in a rural state Iowa Board of Nursing Newsletter 38(4), 8-9	A descriptive qualitative study	To discuss the needed competencies for the implementation and provision of telehealth modalities by registered nurses and advanced practice registered nurses.	Registered nurses and advanced practice registered nurses require both a subset of foundational clinical knowledge and technology-specific competencies and skills to build and enhance telehealth delivery capacity. Sub-themes emerged which included focused assessment, analysis and interpretation of data, communication, privacy and confidentiality, use of technology and software application, sharing information via electronic approaches and troubleshooting issues.
Vehko, Tuulikki, Hyppönen, Hannele, Puttonen, Sampsa, Kujala, Sari, Ketola, Eeva, Tuukkanen, Johanna, Aalto, Anna-Mari, Heponiemi, Tarja 2019	Experienced time pressure and stress: electronic health records usability and information technology competence play a role BMC Medical Informatics & Decision Making 19, 160(2019)	An electronic survey	To explore the associations of EHR usability factors and nurses' informatics competence factors with self-reported time pressure and psychological distress among registered nurses.	The EHR usability factors that were associated with high time pressure were low EHR reliability and poor user-friendliness. Regarding the nurses' informatics competence factors, only low e-Care competence was associated with time pressure. Of the EHR usability factors, low EHR reliability and low support for cooperation were associated with high psychological distress.
Zareshahi, Mahin, Mirzaei, Samaneh, Nasiriani, Khadijeh 2022	Nursing informatics competencies in critical care unit Health Informatics Journal 28(1)	The Delphi method	To define critical care nurses' required competencies for using nursing information services.	Nursing informatics competencies in the intensive care units were classified in three categories including basic computer skills, skills to use information management software, and specific nursing informatics.

Koivisto, Tiina, Ilomäki, Sakari, Kurtti, Elisa, Koskela, Inka, Weiste, Elina, Salo, Sirja, Aalto, Onni, Husman, Päivi, Ruusuvuori, Johanna 2020	Terveydenhuollon työntekijät digimurroksessa. Moniaineistoinen tutkimus asiantuntijuuden ja yhteistyön rakentumisesta. A book	Thematic interviews of healthcare professionals, video recordings of customer meetings and observations that support interaction analysis	To provide new evidence-based information about the changes that digitalization brings to patient meetings, to the role of professionals and interaction and collaboration in health services.	The expert role of professionals is built on managing the patient meetings in a digital environment, ICT competencies, managing the ethical problems of digital healthcare and the development of digital services.
Kujala, Sari, Rajalahti, Elina, Heponiemi, Tarja, Hilama, Pirjo 2018	Health Professionals' Expanding eHealth Competences for Supporting Patients' Self-Management Studies in Health Technology & Informatics 247, 181-185	An online questionnaire	To increase the number of eHealth services provided to patients.	Professionals perceived their basic computer skills as good and they were mostly willing to use eHealth services in patient work. They were less confident about their competence to motivate and advise patients to use eHealth services and how to communicate with patients using eHealth solutions. The results also imply that eHealth competence is not merely about an individual's skills but that organizations need to develop new working processes, work practices and distribution of work.
Brunner, Melissa, McGregor, Deborah, Keep, Melanie, Janssen, Anna, Spallek, Heiko, Quinn, Deleana, Jones, Aaron, Tseris, Emma, Yeung, Wilson, Togher, Leanne, Solman, Annette, Shaw, Tim 2018	An eHealth Capabilities Framework for Graduates and Health Professionals: Mixed-Methods Study Journal of Medical Internet Research 20(5)	Triphasic Approach: a literature review, qualitative studies, Delphi process	To develop a framework that could be used to guide health curriculum design based on current evidence, and stakeholder perceptions of eHealth capabilities expected of tertiary health graduates.	The final framework consisted of 4 higher-level capability statements that describe the learning outcomes expected of university graduates across the domains of (1) digital health technologies, systems, and policies; (2) clinical practice; (3) data analysis and knowledge creation; and (4) technology implementation and codesign. Across the capability statements are 40 performance cues that provide examples of how these capabilities might be demonstrated.

ANNEX 2. EXAMPLE OF INDUCTIVE CONTENT ANALYSIS, RESEARCH QUESTION ONE

Original expression	Reduction	Subcategory	General category	Main category
"According to the professionals, one needs to have mastered basic computer skills, as well as the ability to use smartphones, tablets and headsets, to be competent in providing digital health services."	Basic computer skills	Skills and experience to use IT	Digital health technology competence	Knowledge of digital technology in digital healthcare
"The interviewed HCPs perceived that using information technology and different digital health systems requires versatile competence, for example experience in using various ICT tools and problem-solving when faced by technical problems."	Experience in using ICT tools			
"Introduction to the practical way of working with information software"	Information software skills	Competence to use different electronic systems		
"I can use eHealth applications and services."	Competence to use different electronic systems			
"Lisäksi ammattilaisen tuli pystyä jatkamaan asiakaskontaktia teknisistä ongelmista huolimatta."	Problem-solving (technical)	Problem-solving skills	Problem-solving competence	
"problem-solving"	Problem-solving			

ANNEX 3. EXAMPLE OF INDUCTIVE CONTENT ANALYSIS, RESEARCH QUESTION TWO

Original expression	**Reduction**	**Subcategory**	**General category**	**Main category**
"Technical issues, access to devices, duplication of information and poor implementation of systems all contribute to nurse stress and frustration."	The challenges associated with the use of digitization cause stress and frustration	Use of technology and digitalization cause negative feelings (insecurity, stress, frustration, anxiety, concern, fear)	The impact on the experience of work	The impact on the management and manageability of a professional's work in healthcare
"Technical issues, access to devices, duplication of information and poor implementation of systems all contribute to nurse stress and frustration."	Cause frustration and stress			
"In addition to this, developing necessary digital skills, navigating and becoming familiar with new technology was perceived by nurses as time-consuming and increasing their workload."	Take time and increase the workload	Increase the workload		
"Tämä voi johtaa lisääntyvään kuormitukseen työssä ja työhyvinvoinnin tukemiseksi olisikin ensisijaisen tärkeää tarjota työntekijöille koulutusta ja tukea teknisten ongelmien ratkomisessa ja suhteuttaa tätä tukea kentällä havaittuihin käyttöongelmiin sitä mukaa kun niitä ilmenee."	Increase workload			
"Healthcare professionals need regular education and support for technology use, potentially including individual support through appropriate auditing and monitoring practices."	Need for regular education	The need for continuous education and training	The need for continuous education and training	
"Still, computer skills varied, and many professionals requested training for a specific software or service or wanted to review the basics."	Need for training			