Kaunas University of Technology

School of Economics and Business

Challenges in Healthcare Sector While Applying Digitalization Tools: The Case of E.Sveikata

Master's Final Degree Project

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Summary

Relevance of the topic. With a rapidly changing society, economy, and living conditions technology is changing to improve inventions and ideas in a way creating ever newer and more innovative solutions. It allowed moving from paper records to the much more complicated and innovative solutions and tools, that are able to complete tasks on their own in a faster way consuming fewer assets. The acceleration of the digitalization process is inevitable and started to grow even more when Covid-19 pandemic emerged, even those countries, that weren't ready to digitize, stepped in, including Lithuania. Various resources base the visible and predicted growth economically. A lot of data about the digitalization process was collected from different resources, but the analysis received of it is poor due to the emergence of the pandemic. Based on the inevitability of digitalization in the health sector, emerging challenges in the application of tools worldwide, promising perspective on value creation, the lack of accurate data and analysis, and the importance of such process internationally, the following question arises to **what challenges the healthcare sector faces by using digitalization tools and how could they be overcome?**

The object of the research. The challenges met while applying digitalization tools in the healthcare sector.

Aim of the research. To analyse challenges the healthcare sector faces by applying digital healthcare tools and applicable solutions to eliminate them in the case of "E.Sveikata".

Research objectives:

1. To identify the main challenges of the healthcare sector in the digital era based on problematic analysis of the research;
2. To conduct a theoretical analysis of the application of digitization tools in the healthcare sector, the tools themselves, their opportunities, challenges, and stakeholders' involvement;
3. To substantiate the methodology for challenges met while applying the digital tool "E.Sveikata" empirical research;
4. Based on the results of the analysis, provide solutions to overcome the challenges met during the digitization process in the Lithuanian healthcare sector.

Results of the final work. After carrying out case analysis research with 2 different groups of overal 14 stakeholders 13 groups of challenges were identified while applying the digitalization tool „E.Sveikata" in doctor and patient practice together. The research showed, that the challenges

stakeholders face are also observed in the cases analyzed in theoretical sources. While applying the theoretical framework to the identified challenges, applicable solutions from both the past and the present perspectives were presented.

Samanta Pukinskytė. Iššūkiai sveikatos priežiūros sektoriuje taikant skaitmeninimo priemones: E.sveikatos atvejis. Magistro baigiamasis projektas / vadovė prof. dr. Jurgita Sekliuckienė; Kauno technologijos universitetas, Ekonomikos ir verslo fakultetas.

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Reikšminiai žodžiai: *skaitmeninimo priemonės, sveikatos priežiūros sektorius, iššūkiai, atvejo analizė.*

Kaunas, 2022. 68 p.

Santrauka

Temos aktualumas: Sparčiai kintant visuomenei, ekonomikai ir gyvenimo sąlygoms, technologijos keičiasi, siekdamos tobulinti išradimus ir idėjas taip, kad sukurtų vis naujesnius ir novatoriškesnius sprendimus. Tai leido nuo popierinių įrašų pereiti prie kur kas sudėtingesnių ir inovatyvesnių sprendimų bei įrankių, kurie gali patys greičiau atlikti užduotis, sunaudodami mažiau išteklių. Skaitmeninimo proceso įsibėgėjimas yra neišvengiamas ir ėmė dar labiau augti kilus Covid-19 pandemijai, skaitmenizuotis pradėjo net tos šalys, kurios nebuvo pasirengusios, tarp jų ir Lietuva. Įvairūs ištekliai grindžia matomą ir prognozuojamą ekonominį augimą. Daug duomenų apie skaitmeninimo procesą buvo surinkta iš įvairių šaltinių, tačiau gauta jų analizė, dėl kilusios pandemijos, yra menka. Atsižveliant į sveikatos sektoriaus skaitmeninimo neišvengiamumą, iškylančius iššūkius, taikant tokias priemones visame pasaulyje, vertės kūrimo perspektyvą, tikslių duomenų ir analizės trūkumą bei tokio proceso svarbą tarptautiniu mastu, kyla klausimas, **su kokiais iššūkiais susiduria sveikatos priežiūros sektorius, taikydamas skaitmeninimo priemones bei kaip juos būtų galima įveikti?**

Baigiamojo darbo tyrimo objektas: iššūkiai sveikatos priežiūros sektoriuje taikant skaitmeninimo priemones.

Baigiamojo darbo tyrimo tikslas: Išanalizuoti iššūkius, su kuriais susiduria sveikatos priežiūros sektorius, taikant skaitmenines sveikatos priežiūros priemones ir taikytinus sprendimus jiems pašalinti E-sveikatos atveju.

Baigiamojo darbo uždaviniai:

1. Remiantis problemos analize, nustatyti pagrindinius sveikatos priežiūros sektoriaus iššūkius skaitmeninėje eroje;
2. Teoriškai išanalizuoti skaitmeninimo priemonių taikymą sveikatos priežiūros sektoriuje, pačias priemones, jų galimybes, iššūkius ir suinteresuotųjų šalių įsitraukimą;
3. Pagrįsti metodologiją siekiant atlikti iššūkių, su kuriais susiduriama taikant skaitmeninimo priemonę “E.Sveikata”, tyrimą;
4. Remiantis atlikta tyrimo analize, pateikti rekomendacijas iššūkiams, su kuriais susiduriama taikant skaitmeninimo priemonę “E.Sveikata”.

Baigiamojo darbo tyrimo rezultatai. Atlikus atvejo analizės tyrimą su 14 atstovų iš 2 skirtingų suinteresuotųjų šalių grupių, buvo nustatyta 13 iššūkių grupių taikant skaitmeninimo įrankį „E.Sveikata“ gydytojo ir paciento praktikoje. Tyrimas parodė, kad iššūkiai, su kuriais susiduria respondentai, pastebimi ir teoriniuose šaltiniuose analizuojamais atvejais. Taikant teorinį modelį identifikuotiems iššūkiams buvo pateikti taikytini sprendimai tiek iš praeities, tiek iš dabarties perspektyvų.

Contents

List of figures

List of tables

INTRODUCTION

Relevance of the topic: Scientific resources reveal that in the next decade it is expected to reach more progress in digitalizing industries than it was during the past 100 years seeing that technology is emerging in a wide range of various industries and domains by reshaping them (McKinsey & Company, 2021). Digitalization as innovation can provide additional economic value (Hendrix et al, 2021) and performance growth (McKinsey & Company, 2021) which could lead to significant achievements.

McKinsey & Company (2021) conducted an analysis outlining the importance of using digitization and what awaits those who will not take the opportunity to digitalize. The analysis predicts that those who would take advantage of this opportunity by 2022 and applies digitalization, would have a significant growth in cash flow, compared with those who didn't by nearly 150 times, in that way becoming the front runners among others in the industry. Besides, the healthcare sector is the one out of the few sectors for which even several research sources not only promise good results in the context of digitalization but also draw the need and inevitability (Hendrix et al, 2021; Hogervorst et al, 2021; Mbunge et al, 2021; McKinsey & Company, 2021; Zahid et al, 2021;).

From a historical perspective, one technology is changing others to improve inventions and ideas and create ever newer and more innovative industries (Mbunge et al, 2021). In the context of the healthcare sector, the evolution and its benefits are clearly visible by a look at existing and forming healthcare industries. Digitalization allowed from time to time to solve many of the security, availability, and accessibility issues in this way granting more successful processes and results.

Digitalization by its nature is a very difficult process requiring a lot of financial, human, and knowledge resources. Several authors (Hogervorst et al, 2021; Mbunge et al, 2021; Zahid et al, 202l), even those exploring the possibilities, notice a big variety of challenges in digitalization of the healthcare.

Since digitalization in the healthcare sector is inevitable and emerging so fast it is crucial to analyze the methods of digitalization and application possibilities to make the future possibilities as fluent as possible. Nowadays, the application of digitalization meets a lot of challenges, namely the practical limitation of information and, increasingly, the processing of knowledge (Aerts and Bogdan-Martin, 2021; Mândricel and Oncioiu, 2022).

As a result, the analysis of the application of digitalization tools in the healthcare sector will we aimed to point out the most common challenges met while applying digitalization tools from the theoretical viewpoint and to develop a theoretical framework oriented to the successful digitalization tool application in the healthcare sector. The theoretical framework will be developed based on the information found from different authors' insights and results. Despite the importance, both the fewer results in the field of the research topic of the scientific literature itself and the statements of the authors examined in the most recent papers (Beaulieu, Bentahar, 2021; Hogervorst et al, 2021; Kyhlstedt, Di Bidino, Wamala, 2021; Mbunge et al, 2021; Popkova, Sergi, 2021; Rezaei, 2021), allows to state that information of the application and challenges of digital healthcare and tools is insufficient. Knowing information stated before the problem arises as to **what challenges the healthcare sector faces by using digitalization tools and how could they be overcome?**

Eventually, an empirical part of the study will be accomplished in which a thematic analysis will be conducted with in-depth interviews to find out the situation of the digitalization tool "E.Sveikata" application stage of identification at The Hospital of Lithuanian University of Health Sciences located in Kaunas and to present conclusions and recommendations related to the research.

The object of the research. The challenges met while applying digitalization tools in the healthcare sector.

Aim of the research. To analyse challenges the healthcare sector faces by applying digital healthcare tools and applicable solutions to eliminate them in the case of E-sveikata.

Research objectives:

1. To identify the main challenges of the healthcare sector in the digital era based on problematic analysis of the research.
2. To conduct a theoretical analysis of the application of digitization tools in the healthcare sector, the tools themselves, their opportunities, challenges, and stakeholders' involvement.
3. To substantiate the methodology for empirical research.
4. Based on the results of the analysis, provide applicable solutions to overcome the challenges met during digitization process in the Lithuanian healthcare sector.

Methods of the research. The research consists of a scientific literature review, comparative analysis, in order to complete case analysis, graphical representation of the data, and qualitative data survey by semi-structured interview method which at the end is analysed in the MAXQDA program.

Results of the research. After carrying out case analysis research with 2 different groups of overal 14 stakeholders 13 groups of challenges were identified while applying the digitalization tool „E.Sveikata" in doctor and patient practice together. The research showed, that the challenges stakeholders face are also observed in the cases analyzed in theoretical sources. While applying the theoretical framework to the identified challenges, possible solutions from both the past and the present perspectives were presented.

Structure of the research. The research consists of 4 parts, 65 pages, 16 tables, 15 figures, and 2 annexes.

Restrictions of the research. The case of The Hospital of the Lithuanian University of Health Sciences was investigated in this study. The results do not reflect the entire sample as a qualitative study was performed and does not reflect all groups of stakeholders. In addition, the study cannot be applied to other Lithuanian clinics due to differences in internal rules and systems, and the results cannot be applied to clinics or cases in other countries due to differences in legal, economic, political and many other environments.

1. Problem analysis

In nowadays's life we barely imagine our routine without technology – smartphones, computers, the internet, and many more - almost everything is based on technological decisions, algorithms, and digital tools. It is not a surprise that with a rapidly changing society, economy, and living conditions there is a growth in demand for change (Gibbings, Wickramasinghe, 2021). For all the sectors including the healthcare possibilities and applications of technological decisions are wide and predictions for the future are promising (Mbunge, Muchemwa, Jiyane, and Batani, 2021). This chapter describes the need for digitalization tools in healthcare, the sequence of its evolution, inevitability, future prospects, and already discovered challenges.

1.1. The inevitability of digitalization in history perspective

Ceaseless evolution and changes are inevitable resulting in emerging changes reshaping all possible areas of industries - the healthcare sector is not an exception. Looking back at history, one technology is changing others to improve inventions and ideas and create ever newer and more innovative industries (Mbunge et al, 2021). In the context of the healthcare sector, the evolution and its benefits are clearly visible by a thorough analysis of existing and forming healthcare 1.0 – 5.0.

If we take a closer look from the beginning, we will notice that back in the second half of the 20th century, healthcare 1.0, all medical data was collected manually and kept in folders of paper documents. Not only did this process complicate the daily tasks of the stakeholders, but it also did not ensure the security of important documents - they were lost or got worn off while in use, as a result, a lot of important information was kept on being lost, stolen or even concealed (Mbunge et al, 2021).

Driven by this challenge, the first innovative and technology-based healthcare industry 2.0 with the e-health system at the forefront emerged in the early 21st century. This innovation inspired several other major inventions and advances, such as computed tomography scan, magnetic resonance imaging, digital tracking devices for the pulse and arterial lines monitoring, chest tubes, and the da Vinci robot - all of whom improved the efficiency of the data capturing, accessibility, sharing and increased service quality (Mbunge et al, 2021). It is important to mention that e-health systems had some differences between country specifics, but this type of innovative system implementation had similar core needs – clear strategy, enough time and resources, suitable legal basis from the governmental position for successful strategy implementation (Neumann, Babitsch, Hubner, 2021).

After almost a decade of great results, telehealth and digital health records appeared, which formed a great start for the establishment of healthcare 3.0 (Mbunge et al, 2021; Kumari, Tanwar, Tyagi, Kumar, 2018). At this stage, digital network services have already brought significant benefits to healthcare professionals in accessing, retrieving, and sharing information, but the age of technology has also evolved in other industries (Mbunge et al, 2021; Kumari et al, 2018), making digital information systems in healthcare less secure and easily accessible for individuals with malicious purposes (Mbunge et al, 2021).

Artificial intelligence and digital technologies such as IoT, blockchain, machine learning, robotics, 3D printing, big data analytics, and smart devices emerged as an approach to mitigate current challenges in 2016 (Awad et al, 2021; Mbunge et al, 2021;). It was the start of the healthcare industry

4.0, which aimed to provide patient-centered healthcare through smart or connected care and personalized medical treatment (2022; Mbunge et al, 2021; Tortorella et al, 2021). Nowadays, we are getting closer and closer to the industry of healthcare 5.0 with even bigger ideas (Mbunge et al, 2021).

Another very important aspect that has in itself accelerated the process of digitalization in the health sector is the COVID-19 pandemic. From the outset of the pandemic, healthcare facilities have had to adopt a variety of digital methodologies to continue provision of safe services to individuals who were exposed to the COVID-19 virus and those who were not to provide the necessary treatment or medical advice. Necessary safety measures were created in accordance with all of the stakeholders' interests and at the same created value by providing accessibility of care, convenience, quicker response, and diagnosis. Scholars identified country-specific values - stakeholders in Lithuania declare that patient engagement in their illness control, the life expectancy rate, quality of life and trust between the patients and physicians increased (Gadeikienė, Pundzienė and Dovalienė, 2021) as a result of implementing a variety of digitalized processes, such as electronic prescriptions release (Kumpunen et al, 2021).

These authors' research in the healthcare industry estimate motives for the importance and inevitability of digitization. It is a relevant process that not only provides opportunities, a strong foundation, and improves processes but also helps in unforeseen circumstances, such as the outbreak of a COVID-19 pandemic. The fact that an industry does not stop moving forward and is forced to follow the innovative example of other industries to achieve the best possible results and to create value is visible but not all countries are able to digitize their health sector and maintain a similar level of digitalization.

1.2. Digitalization trends and predictions

McKinsey & Company (2021) conducted a study on tech trends which reveals that in the next decade it is expected to reach more progress than it was during the past 100 years seeing that technology is emerging in a wide range of various industries and domains by reshaping them. And it seems to be logical since Blandford (2019) also identifies that in the past years a lot of investments were concentrated in favor of innovative technologies, particularly in the healthcare sector. A study conducted by McKinsey & Company (2021) shows promising market valuation growth for those companies, which would decide to apply any of the suggested 40 individual technologies that were carefully selected by technical maturity, industry impact, and momentum. Authors as a result of their research suggest the top ten tech trends, of which seven are applicable in the cross-industry and the other three in the industry-specific areas.

McKinsey & Company (2021) study calculations for up to the year 2050 disclosed possible effects of these ten trends and the results are promising. To specify in more detail, there are a few of them - 50% of nowadays work activities could be automated by the year 2025 if the application of next-level process virtualization and automatization would be successful, up to 80% of all society would have a chance to use 5G connection as a result of future connectivity, the value of more than one trillion dollars from the application of quantum-computing at whole scale by 2035.

The impact of tech trends varies by industry, but it affects all sectors. The healthcare sector is mentioned in expert interview analysis and as a result, it is visualized that the major influence is

visible from applied artificial intelligence, bio revolution, next-generation computing, trust architecture, and future of programming, a moderate influence expected from next-level process automation, future of connectivity and distributed infrastructure (McKinsey & Company, 2021).

Artificial intelligence as a digitalization tool plays one of the biggest roles in the whole digitalization process. Skillfully created algorithms perform an important role while identifying information (Abdulhussen, Turnbull, Dodkin, Mitchell, 2021; Apostolidis, Stamoulis, 2021), improving productivity and outcomes, reducing disparities and costs (Hendrix et al, 2021).

McKinsey & Company's (2021) research also reviews an economic benefit in the context of artificial intelligence application – it used the perspectival counting model to explain the situation by dividing cohorts into groups. The main attention here is brought to those, who would adopt artificial intelligence between the years 2017 and 2022 – the front runners. It is speculated, that this group of cohorts by the year 2030 would gain the most economic benefit which is nearly 150 times bigger compared to others. Meanwhile, other cohorts are stated as followers, the ones who adopt artificial intelligence by the year 2030, and the ones who don't adopt it by the year 2030 would stay in the laggard position. The results presented for the latter group, the laggards, predict an economic downturn.

Twomey (2022) presented a huge analysis in terms of prognosis and European Commission funds of digital health and its tools. It is stated that during the COVID-19 outbreak a lot of investments were made in order to digitize the health care sector and it brought a lot of benefits in non-communicable diseases, prolonged average life expectancy, and innovations. As a result, the expanditures planned to happen between 2020 and 2024 were at 3.9% of compound annual growth rate instead of 2.8% planned. Besides that, the global spending of the health care sector as a share of gross domestic product was expected to increase to 10.4% in 2020, while the estimated growth was only planned to be 10.3% in year range of 2021-2022. Evaluating those numbers, European counterpart and World Health Organization collected a lot of data out of detection, evaluation, and forecasting on actual tool valuation but they are not high in quality, as well as unavailable to correctly analyze and interpret. This condition ends up in a situation where there is enough of the data, but the analysis received out of it is poor.

Topol (2019) presents selected top 10 healthcare technologies (see figure 1) indicating the impact on the workforce by application of each of them in the National Health Service in the perspective between the years 2020 and 2040. It indicates how broadly technologies such as telemedicine, sensors, wearables, artificial intelligence, etc. will affect the healthcare sector's workforce. This shows that the application of technology is also necessary and inevitable.

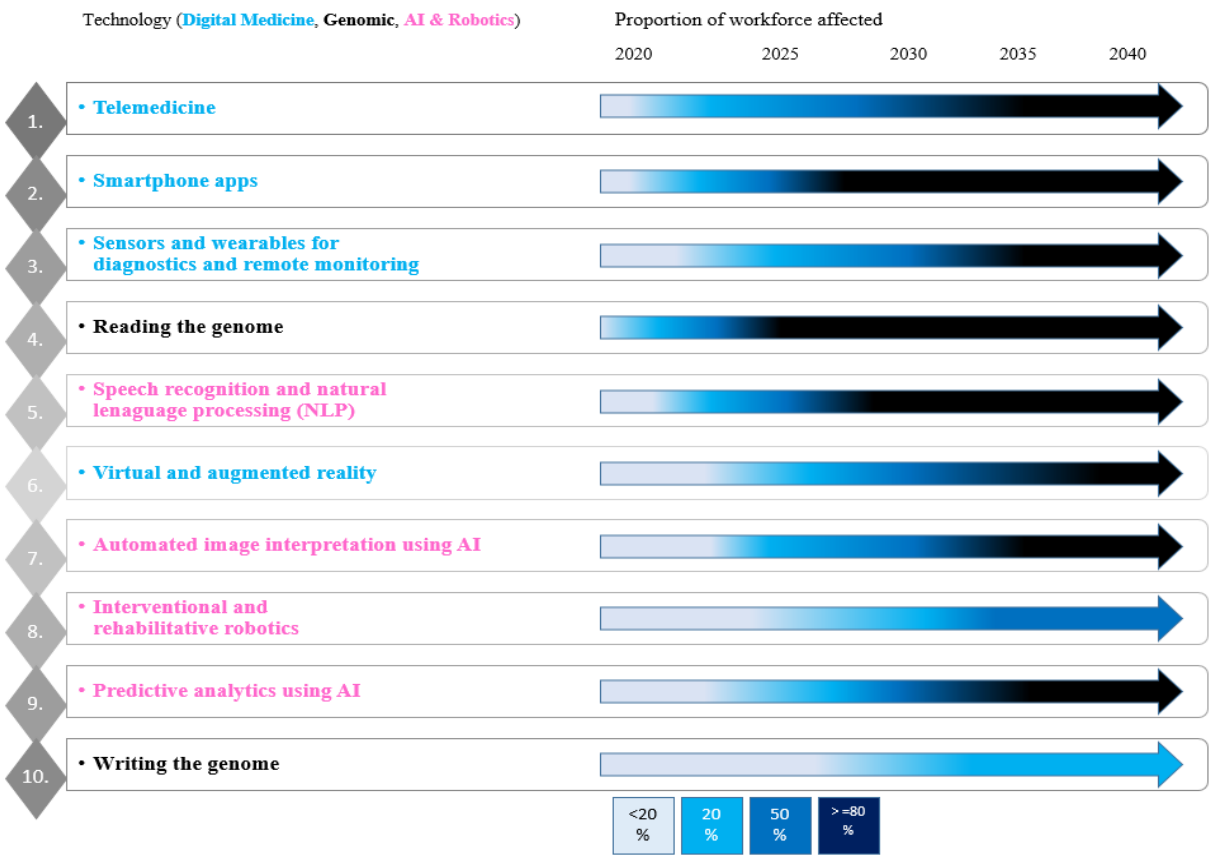

Figure 1. Technological advances impacting healthcare and the magnitude of disruption (Adopted from Topol, 2019). The color intensity of the arrows indicates the magnitude of the technology's affection for the workforce in terms of the year.

Together with a broad opportunity list, the majority of authors draw attention to challenges that technological application brings too. It is encouraged to evaluate the state of the company and its capabilities since applying technologies also has risks that are affected by ethics, laws (Rezaei, Jafari-Sadeghi, Cao, Mahdiraji, 2021), safety (Blandford, 2019), data insufficiencies (Hogervorst, Vreman, Mantel-Teeuwisse, Goettsch, 2021), compliances and overall operational risks (Aerts, Bogdan-Martin, 2021; McKinsey & Company, 2021). Besides that, there is a possibility while applying technology for disruptions that could lead to a lack of knowledge base, change of the business models, cost increase, and as a result, there might be a need for additional expenditure, staff reduction, or big change in the company (McKinsey & Company, 2021).

1.3. Challenges of digital healthcare tools application

Hogervorst et al (2021) interviewed several European HTA organizations. From the responses provided by the 22 organizations surveyed, a question was asked to determine how often the application of certain technologies is complicated (see figure 2). Only on 6 occasions, it was answered, that application of certain technologies in their organization was not complicated. Results reveal that in organizations, where the specified technology is applied, are more or less difficult to use.

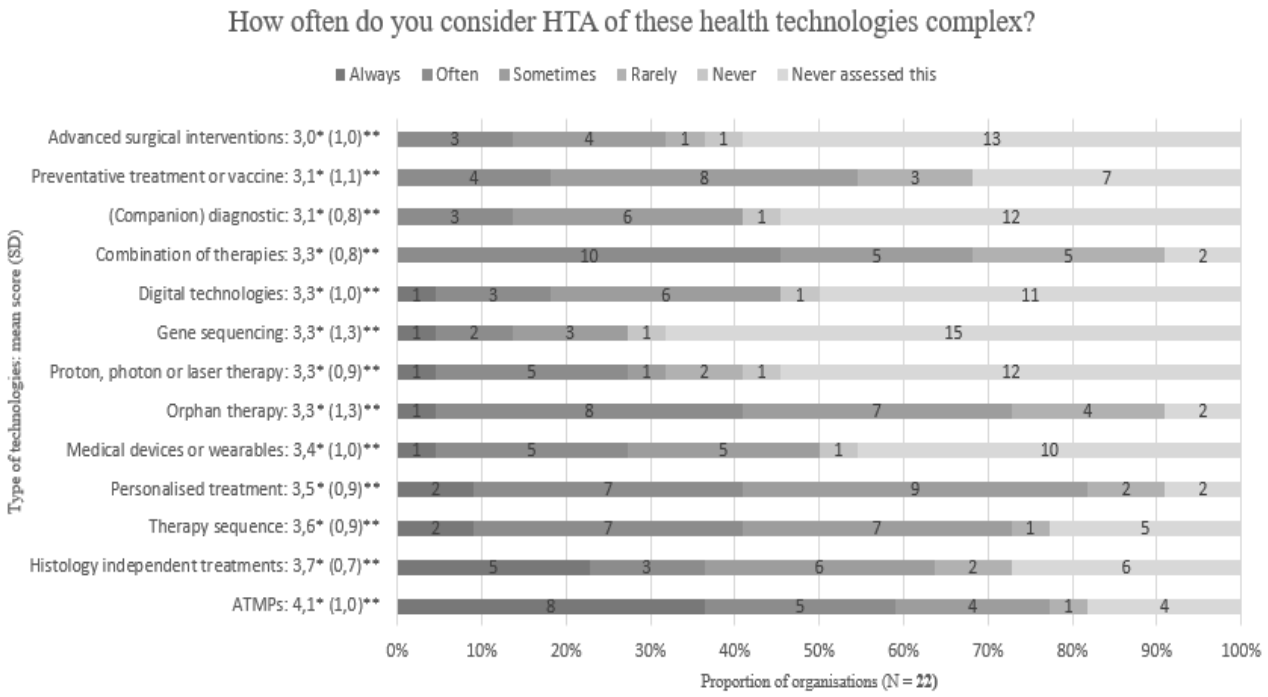

Figure 2. How often types of health technologies are complex (Adopted from Hogervorst et al, 2021).

* Complexity results calculated by the Likert scale 1 to 5.

** Standard deviation, eliminating the organizations that have never applied this type of technology.

Previously discussed results show the inevitability and the necessity (Gadeikienė et al, 2021; Twomey, 2022; Topol, 2019) of technology application in the healthcare sector, however, it also shows that their application is challenging and data collected is far from realistic to analyze and interpret the result and actual value (Hagervorst et al, 2021; Twomney, 2022) and the results depend on the country specifics too (Sermonyte-Baniule, Pundziene, Giménez, Narbón-Perpiñá, 2022), which leads to the thoughts of what are those challenges and where do they come from?

Scholars (Sermonyte-Baniule et al, 2022) conducted a study analyzing the role of country's cultural dimensions and dynamic capabilities in the value-based performance of the services of digital health. Researchers conducted an overall of 66 interviews from countries of Lithuania, the United States, and Spain with different healthcare ecosystem stakeholders. The results revealed a difference between three selected countries. Out of three analyzed areas the strongest results were received from respondents in United States, moderate to strong in Spain, and basic to moderate in Lithuania. Besides that, the study revealed the importance of digitalization process internationally – collaboration allows professionals from around the world to share, consult and observe various changes in environment, provide evidence of the effectiveness of healthcare solutions, and share the knowledge between each other. These results allow acknowledging the influence of existant countries to the results in terms of digitalization application and its importance internationally.

Even though process automation, the future of connectivity, and distributed infrastructure (McKinsey & Company, 2021) is stated as the main factors for future digitalization, Ardielli (2020) conducted a comparative study of eHealth digitalization and process automation for information tool allowing

more qualified and easier information accessibility and sharing in healthcare. In the study, the author evaluated its implementation differences in the international context of different European countries and the result came out very various and differed significantly from country to country. In the contexts of practical usage of the eHealth system tool, Denmark, Estonia, Sweden, and Finland were found at the top of the 12 different countries evaluated. In the context of the best eHealth system tool development, the top countries were Denmark, Finland, Spain, and Sweden. Even though the study showed a lot of positivity and opportunities for the countries of Denmark, Estonia, Finland, Spain, and Sweden in the field of eHealth, there are also countries ranked in the average position among other member states of the European Union. The Czech Republic and Hungary are the countries that meet the challenge of some pivotal shortcomings on the side of public digital services providers led by the difficult attitude of government officials in the terms of eHealth promotion. However, the countries of Luxembourg, Lithuania, and Slovakia were among the worst-rated countries in the study. The study discloses that the differences are appearing as a result of the factors of particular different countries' government approaches and gaps in the European Commission eHealth standardization and harmonization between mentioned countries (Ardielli, 2020).

As was discussed before, digital tools were created upon the need to improve and achieve more. From the very beginning of the application of digital healthcare, many positive results were brought and the future is still promising (Mbunge et al, 2021; McKinsey & Company, 2021, Twomney, 2022). Digital healthcare and tools attract a lot of investors (Blandford, 2019), but some of the research shows, that implementations of these innovations have brought a lot of disrupting weaknesses and challenges:

- Data used by digital healthcare tools is still **insufficient** (Hagervorst et al, 2021)
- Digital healthcare **tools are difficult to use** (Blandford, 2019)
- Telemedicine as a tool **has limitations in** terms of **observation and** accurate **diagnosis** provision (Abdulhussein et al, 2021)
- Medical education is **lacking digital literacy** fundamentals (Abdulhussein et al, 2021)
- Undeveloped **legal base** (Awad et al, 2021; Hendrix, 2021; Mbunge et al, 2021; McKinsey & Company, 2021; Naumann et al, 2021)
- Not sequential digital healthcare **strategy** (Naumann et al, 2021)
- Digital healthcare is still in **the early stage** of development (Rezaei et al, 2021)
- Insufficient patient **privacy** and **data security** (Awad et al, 2021; Mbunge et al, 2021)
- The use of digital tools may **reduce** healthcare specialist's **skills** (Hendrix, 2021)
- **Infrastructural** barriers (Mbunge et al, 2021)
- Lack of **funding** (Mbunge et al, 2021)
- **Cultural and country-specific** barriers (Ardielli, 2020; Sermonyte-Baniule et al, 2022)
- **Religious barriers** limit implementation opportunities (Mbunge et al, 2021)

Sermonyte-Baniule et al (2022) evaluated value-based performance of digital healthcare services in Lithuania, United States and Spain. Lithuania's result came out as the weakest – basic to moderate. Information and communication channels used in the country were specified as basic, deployed serices comparably more advanced since it is started to use remote prescribtions, teleconsultations, but at the very end embeddedness at the country-wide level is comparably low, based on only one project and has a doubtfull and not really a continuous in terms of service assurance. Sudhoff et al

(2020) declaire, in order to move with technologies, there is importance of objective data acquisition and sharing options. Those are the tools and systems used for primary information collection and their further analysis and itegration into more advanced technological decisions.

Lithuania's main database providing such remote prescribtions and other electronic health history for patient and physician is "E.Sveikata" tool (Ministry of Health of the Republic of Lithuania, 2021). This tool allows to connect to the electronic health services in which doctors can provide information related to the health, pharmacists can monitor information about prescribed medicine and patients can view the health data provided by the doctors. According to the tool website main available tasks and information are:

- Diagnosis;
- Information of the treatment;
- Remote prescriptions;
- Laboratory test responses and submissions;
- Referrals of consultations;
- Medical imaging;
- Information related to the vaccinations;
- Certificates for health.

According to the statistics, this tool provides about 7 million medical records per month (Ministry of Health of the Republic of Lithuania, 2022). To sum up, the "E.Sveikata" tool is responsible for many basic and day-to-day functions, collects and stores primary and ongoing information on patient status, diagnoses, prescribed treatments, the tool is widely used in statistical displays, and meets the specification of the base tool for technology application development process for the sector (Sudhoff et al, 2020), but no specific separate Lithuanian hospitals case researches, analysing primary and foundational tool application case was found, what brought the importance to study this field since this tool has a huge impact for further digitalization process implementation in the country and it depends on the preparation for implementation of such tool at oganisational level.

Few authors (Blandford, 2019; Gibbings, Wickramasinghe, 2021; Kyhlstedt, Di Bidino, Wamala, 2021; Tandon et al, 2020) suggest several solutions, or frameworks, to solve, mitigate, or identify some of the presented challenges of digital health care tool application, despite that there are very few practical solutions or implementations for their problem solving and that the discussions regarding them are common. Based on the above information from scientific articles supporting the historical importance and inevitability of digitalization in the health sector, emerging challenges in the application of tools, promising perspective on value creation, the lack of accurate data and analysis, and importance of such process in international, national and organisational levels arises the need and relevance of this study to research the field of digitization tools, their challenges, and how they can be overcome.

2. Theoretical solutions

The application of digitalization tools and their impact on the health sector is widely discussed in the scientific literature. The impact and possible outlines are examined in different ways using different criteria in different sources. Some sources also provide models that describe the smooth application of such tools. Most often, the sources present the current challenges and opportunities, forecasts for the future, and application possibilities in real practice. This section will review the findings from scientific theoretical sources related to the chosen topic.

2.1. Digital healthcare concept

Digital health in abstract terms (see table 1) describes the tools capable of digitalizing information and data that are collected, shared, or analyzed for the health care system, service delivery, and patient health improvement (Sharma et al, 2018; Topol, 2019). Just like any other industry or sector, healthcare has been affected by the inevitable changes of the modern technology era and had to adapt while applying them (Mbunge et al, 2021). By adapting to it, the healthcare sector achieved great outcomes and products helping not only the end-users – patients, but also healthcare system personnel and business itself consequently making a huge impact on the whole healthcare history (Hendrix et al, 2021; Mbunge et al, 2021; McKinsey & Company, 2021). Awad et al (2021) also outline the digital health concept as endless opportunities to lighten the prevention and management process. With the help of digital health and the historical revolution, it is hard to say if nowadays we would have such important tools as oxygen saturation, blood pressure and body temperature scaling sensors, magnetic resonance imaging, scan for computed tomography, electromagnetic cardiogram (Awad et al, 2021; Mbunge et al, 2021).

Table 1. Digital healthcare definitions.

Author	Definition	Features
Awad et al, (2021)	"<…> numerous opportunities to facilitate prevention, early diagnosis of life-threatening diseases, and management of chronic conditions outside of traditional health care settings."	• Opportunities • Prevention • Early diagnosis • Management of conditions
Hendrix et al, (2021)	"<…> methods that predict and potentially interact with the world through rules that the machine itself creates."	• Methods • Prediction • Interaction
Mbunge et al, (2021)	"<…> incorporates digital technologies to navigate health information effortlessly, link individuals, resources, and organizations, and then effectively handle and react to health environment demands intelligently."	• Health information navigation • Linkage • React to demands • Handle demands
McKinsey & Company (2021)	"<…> could reshape the future of markets and industries in the next few decades."	• Reshaping future
Sharma et al, (2018)	"<…> massive amount of unstructured, semi-structured and structured data that has the potential to be mined for information."	• Massive data • Potential
Topol (2019)	"Remarkably powerful set of information technologies providing	• Set of information • Understanding

	the capacity to understand, from a medical standpoint, the uniqueness of each individual – and the promise to deliver healthcare on a far more rational, efficient, and tailored basis."	• Delivery of basis

To sum up, digital health term covers opportunities, tools, methods, data, and set of information, allowing to understand, prevent, navigate and reshape the future of health by managing conditions, early diagnosis, predictions, and demands with interaction in between creating huge potential to move forward in the health care management.

2.2. The importance of digital healthcare application

Given that there are more than 7 billion people in the world, it is fair to assume that each one of them has needed medical care or help in their lives. Following that, it is more than fair to say as well that the healthcare sector is important to all humankind. Twomey (2022) predicts population growth to 8 billion by yar 2023 and with this kind of increasing life expectancy naturally comes higher demand for health care. The Healthcare system itself needs innovation and changes since it has a big enough list of challenges too - huge workload for employees and lack of well-trained specialists and the ones existing are already complaining of poor psychosomatic well-being, difficulties accessing and sharing information between the inside systems, processes requiring a lot of specialist time and many more (Blandford, 2021; Rezaei et al, 2021).

Most of the scientific literature authors which analyze digital healthcare declare rapid improvement for already mentioned challenges that exist in the healthcare system, plus they layout plenty of possibilities and opportunities. Such implementations would help to manage security, storage, and accessibility of the data; facilitate patient monitoring; increase the capabilities in medical care, health parameters, and research and learning capabilities, as well as ensure complete and useful use of time spent on the daily tasks and surgeries which would reduce the number of inaccurate diagnoses (Aerts, Bogdan-Martin, 2021; Beaulieu, Bentahar, 2021; Blandford, 2021; Hendrix et al, 2021; Mbunge et al, 2021). Researchers also pay attention to opportunities for applied digital healthcare that could be received in science and educational areas – rare disease studies, prevention system improvements, personal health tracking, and biological and genetic materials analyses (Aerts, Bogdan-Martin, 2021; Blandford, 2021; Hendrix et al, 2021; Mbunge et al, 2021; McKinsey & Company, 2021).

Besides current challenges in the healthcare system and the promising future of digital healthcare applications, there is also ceaseless technological evolution and changes that are inevitable and emerging changes will reshape the system based on the needs, one way or the other (Mbunge et al, 2021; McKinsey & Company, 2021). A great example of that was the COVID-19 pandemic when an unexpected critical situation in the world forced all medical institutions to fully or partially transfer from contact services to digital telehealth tools. The urge to adapt was stressful as not all countries were well prepared or had a clear strategy regarding the shift but over time the outcomes were positive and even helped to dig deeper for the future possibilities (Shayevitz et al, 2020). Within certain circumstances or without them, digital healthcare will thrive under positive outcomes, thus it is important to examine possibilities for adapting and preparing appropriate strategies (Beaulieu, Bentahar, 2021; Blandford, 2021; Gibbings, Wickramasinghe, 2021; Mbunge et al, 2021; McKinsey & Company, 2021; Shayevitz et al, 2020; Tandon et al, 2020).

2.2.1. Opportunities

The healthcare system is unique and complex by its own nature and it covers a very large number of areas with a clear main purpose – to ensure an accessible public healthcare system by implementing appropriate preventative measures from possible errors. In the era of technological evolution, the healthcare sector is facing pressure to change and the need for a reformed operational system without any exceptions. Together with the technological evolution and possibilities, many opportunities have opened up. Integrated digital tools introduced the healthcare sector stakeholders to a more efficient, rational, and tailored fundamental point (Abdulhussein et al, 2021). Much scientific research brings attention to the spectrum of possibilities that digital tools had brought to the healthcare system in the past, present, and will continue to do so in the future.

For instance, Abdulhussein et al (2021) in research that analyzed artificial intelligence and digital medicine tools, stated that these technologies will allow the stakeholders to monitor and manage incurable diseases, incite health and well-being in a more efficient and qualitative way, beginning from workload process simplification to diagnosis individualisation and accuracy of the diagnosis.

Aerts and Bogdan-Martin (2021) declare that digital technology tools allow the support of treatment systems for dual diseases in a more systematic and low-resource-demanding manner. Authors point out the possibility that patients and health workers have attained in areas of self-monitoring their health, personal self-care, and data observation amongst the healthcare community. The article states that innovation in technology, more specifically on the internet and the fall in the price of these services have accelerated these trends, allowing phones to function as personal digital health tools and platforms. Authors believe in the integration of the technology ecosystem which would allow people to access health tests and their information, pharmacies, and much more with just one tool – the smartphone.

Hendrix et al (2021) reveal the advantages of artificial intelligence application. Compared to human doctors, this type of technology in healthcare continues to massively help the stakeholders – it doesn't need to rest and can make decisions on its own at the same time while monitoring the vitals of the patient. This research declares that economic benefits are visible as well with reduced healthcare costs, as the approach of the marginal cost of producing additional outputs is near 0.

A group of researchers from America (Shayevitz et al, 2021) performed a study to find out the opportunities and challenges of newly applied telepsychiatry in local hospitals. The outcome declared major satisfaction from all of the stakeholders. It improves actual augmentation in the quality of patient consultation by shorter waiting and service time, in addition to efficient hospitalization numbers with the help of the centralized telepsychiatry center. The same outcome was declared in the study (De Witte et al, 2021) analyzing telepsychiatry consultations in 13 different European countries including Lithuania.

Another study (Blandford, 2019) analyzed opportunities of human-to-computer interactions and the challenges for health and wellbeing. The author and the study concentrate more on the other results, but also notice a broad opportunity that personal data sharing from the patients' health records and historical health records from hospital databases in the cycle of data life could be beneficial for studies of the population's health whence, later on, would be useful in the creation of new knowledge and

clinical practice. The article also mentions the growing tendency of investing in technologies in healthcare, therefore, creating a base for the materialization of the innovation application.

Extended access to fewer in-between and undersupplied knowledge on the subject of rare connective tissue diseases, greater patient observations, therapy treatments, studies, and broader results is captured. Digital tools could help identify the exact amount of medicine needed individually with the capability of the changed structure of healthcare services based on wearable devices (Bergier et al, 2021). Article approaches the possible idea in the nearest future with the fully digital pathway consisting of complex digital tools, capable of diagnosing, treating, and monitoring by upgrading hard processes and relieving stakeholder's daily life.

A group of scientists (Awad et al, 2021) explored the whole entity of possibilities of digital tools. They assume that the digital era of technology could ameliorate the whole health system by enhancing the ability of the most accurate diagnosing, disease treatment, and personalisation of every single treatment as well as ensuring new and more informative ways for self-care control, leading to an opportunity to access the options of healthcare. The theory also suggests endless possibilities in the prevention system accuracy, early diagnostics of severe diseases, and full control of persistent conditions. The tools in the future might be able to provide patients with constant real-time 24/7 access to their health information and clinical data, increasing their curiosity about their health more than before, calculating the exact dosages of medication requirements by individual demand, speeding up the medication supply by locating it right to the exact needed body part and perform surgery, if required.

Technical solutions can perform repetitive work, solve the issue of medical care accessibility for those living in rural areas or experiencing mobility problems by connecting with them remotely and delivering the services to any place in the world or even collecting a sample of any health indicator thus improving access of medical care and treatment. Automation tools can monitor and manage patients' health information, allowing an increase in the quality and safety of those in stationary care when medical attention and intervention are needed in case of infectious disease. Sensors are available to calculate and record biological, physical, or chemical body signals, easing the diagnostic area in such a manner. 3D printing has already made a huge change in healthcare by providing customised implants and prosthetics, in turn providing major opportunities for new decisions in surgeries and everyday life. The research mentions that robots are already helping with various important everyday tasks such as hospital disinfection and in the future, it is expected to even model them, allowing the ability to lift patients, perform various surgeries, or assist the patients with physical impairment. In the future, digital tools might be able to react and act in an emergency situation. As an example, in big shopping centers, traffic-heavy cities, or other specific and hard-to-reach areas, the gear would fly to the patient in need and would be able to provide first aid or surgical help, if it is needed in a timely manner in case of a crisis. Despite this statement, all these types of inventions are useful not only in an emergency, given that with the use of digital tools there is a wide range of thinking possible – they could also help specialists to communicate with patients and inform them in personal knowledge levels, for example, when there is a need of sugar, water or any other matter related to well-being. To conclude, the authors declared that the overall application of digital tool systems in healthcare is truly beneficial in care, manufacturing, monitoring, logistics, improvement of diagnostics and rehabilitation, as well as process facilitation (Awad et al, 2021).

Mbunge et al (2021) have an opinion stating that emerging technologies and the technological advancement in the digital healthcare systems are opening global opportunities to improve the quality of medical services. The benefits of technological devices in the healthcare sector are already visible, with such medical data as blood sugar levels, body temperature, weight, blood pressure, heart rate, stress rate, and oxygen saturation being recorded by sensing devices, and the information obtained is available for further processing. Before this implementation, there were only mechanical monitoring procedures that were not as accurate, and the ideas of how to improve this process led to higher service quality. Authors in their research analyse and predict the results of virtual care applied through digital healthcare services and products. In terms of products and their applications, the authors reveal an important role of digital tools in rapid and accurate diagnosis, therapy, monitoring, and the development of new personal protective equipment such as vaccines. Technology will be able to detect and administer a large number of different drugs and diseases in their early stages. Digital health tools will be able to connect and organize devices and share data via the internet and smart gadgets, helping the patient adhere to the established treatment plan. Smart devices help to effectively monitor patients remotely, analyse patient behavior, levels of anxiety, pain, stress, and depression, thus realistically assessing the condition and preventing the rooting and recurrence of the disease. In conclusion, the authors declare the belief that apart from the results already achieved, which have brought endless benefits, the development of technology cannot and will not stop with the continued provision of high-quality products and services.

Besides the possibilities, benefits, and promises to the health care stakeholders, there is also an impact on the overall economic base – it would open up new opportunities for businesses. McKinsey & Company (2021) assumed in their analysis that a group of cohorts, which will apply digital technologies by the year 2030 would gain the biggest economic benefit in cash flow, which is nearly 150 times bigger compared to others. In the terms of application possibilities, analysis not only discloses the potential effects but also provides a way for the combinatorial effect of new business models and innovation. It suggests that combining provided cross-industry trends of the future of connectivity, distributed infrastructure, trust architecture, future of programming, next-generation computing, next-level process automation, visualisation, and applied artificial intelligence by three levels of infrastructure and architecture, enabler, and application would accelerate these possibilities (McKinsey & Company, 2021).

After discussing the authors' insights in-depth in the scientific articles, it is safe to say that the theoretical solutions that present the possibilities (see figure 3) of digitalised tools in the field of healthcare, both in the past, present, and future, are enormous. They revealed that the application of technological solutions improves the collection, systematization, sharing, and application of information. This information helps to monitor, predict and prevent many negative factors, including diseases that are still either rare or incurable. As a result, the digitalized healthcare sector could not only provide high-quality devices, products, and services, but also create the conditions for more in-depth medical research possibilities, engage the public in caring for and monitoring their health, and open up opportunities for those who have had limited access to medical care. In addition, these aspects would bring not only physical and moral benefits but also economic benefits.

Figure 3. Digital healthcare tools possibilities found in theoretical research. (Created by the author, 2022).

2.2.2. Challenges

In the previous section, it was quite extensively discussed about the benefits and opportunities that could improve the healthcare system while applying digital tools and decisions. It is very common that if there is a positive side, it is accompanied by another, negative side. Several authors, even those exploring the possibilities, notice an even greater number of challenges while applying digital tools in healthcare.

To begin with, the creation and application of technology starts with the problem and a solution to it. Based on the evolutionary maturity of the technological era, the implementation of solutions to current obstacles in the health sector lay out the framework for the advancement of the overall quality of the healthcare infrastructure. By implementing human, financial, and informational resources, the idea is materialised, tested, and applied, and if the outcome is successful, the innovation is available to use. The process itself is remarkably complex and specific in nature, which makes it even harder to pursue and poses challenges.

Rezaei et al (2021) conducted a study in Iran that explored the most occurring ethical challenges while applying digital tools in healthcare. The results out of 210 samples taken stated that out of the 26 potential challenges presented, the most common were related to issues of security, privacy, responsibility, justice, autonomy, and process values.

Hogervorst et al (2021) researched challenges met while applying complex health technologies. The results were collected in the form of a survey from 22 European organizations that belong to the European Network for HTA and applied digital technologies in their healthcare sector in practice. Answers stated that practitioners mainly face challenges accessing databases. In addition, the application of technology is led by the pressure of society or politics, lack of concise policy, and organisational structure.

The previously mentioned study (Abdulhussein et al, 2021) exploring artificial intelligence and digital medicine tools also found that current healthcare professionals lack knowledge of digital tools usage, prospects, and digital literacy which could lead to lower quality of service provided by implementing technologies.

Aerts and Bogdan-Martin (2021) examined more than 100 world-leading countries' organisations applying various digital tools and identified the most repetitive challenges relating to the digital healthcare system. Findings stated that digital healthcare decisions, projects, and enterprises are commonly unintegrated, resulting in unnecessary information storage, duplication, and data overload. Besides, there is a scarcity of systems and a workforce capacity to manage and develop digital healthcare systems. Results also stated a constant shortage of financing for digital health care system enlargement.

Scientific research on the application of artificial intelligence (Hendrix et al, 2021) stated the potential economic value but marked out that such a tool could cause an increase in workload, overuse, and reduce doctors' skills. Furthermore, the legal base is undeveloped, and it is hard to find a way to solve possible conflicts stemming from such technical errors.

Shayevitz et al (2021) presented a huge list of challenges met while conducting research on telepsychiatry applications. The main challenges were poor quality of internet connectivity, interference caused by audio and video equipment, insufficient program development, and the lack of digital literacy either from the therapist's or the patient's side.

Blandford (2019) in her research is not assured of the possibilities of the application of digital tools in healthcare. The author declares many difficulties and challenges that appear together with the implementation of digital systems in healthcare. She arises concerns in terms of privacy and data availability. Not all information in the healthcare systems, according to legal regulations, should be available for everyone in the terms of the hospital staff, while today's systems are not well prepared for this kind of security and data management level. The author also declares that data visualisations are relatively poor, the design is complex, and the program management is relatively severe and slow. Besides that, program development itself requires a high level of knowledge specialists, long, concentrated and specialised research, and countless analytical skills.

Bergier et al (2021) argue that much research is needed for systems to claim the desired quality result, which is difficult because the results of tools such as AI are difficult to explain and reproduce, and it is difficult to teach AI because it requires a reliable data source. In addition, the application of such innovations is also a matter of legal and political concern, especially in regards to rare diseases, privacy, confidentiality, organizational impact, and justice. The authors also argue that the sensitivity of health data poses a high-security requirement. Challenges are also noticeable on the part of users - systems are difficult to use, they tend to lag or the data they receive is inaccurate.

Awad et al (2021) tooke a great look into the future perspectives. Authors declare that due to today's regulation and law, systems are the main challenges in the context of digital tools applications or inventions in healthcare. The main aspect of that is the ability to safely use digital technologies and ensure the privacy and identity of the users. It is a priority of the supplier to ensure the security of

users without violating the users' privacy and The General Data Protection Regulation, which ensures confidentiality and prevention in the EU.

Another concerning aspect is the quality. Suppliers should ensure the proper operation and effect of such tools, more precisely, to ensure the dosages prescribed or made by tools are not posing the threat or that the actions that robots perform are safe and accurate. In addition, those technologies with the purpose act in healthcare have to be qualified by specific requirements. Authors (Awad et al, 2021) also highlight the challenges based on the dynamics of the fact that technologies are ever-changing and constantly improving. This situation makes it even harder to state and approve the regulations in law since law approval takes a lot of time resulting to be not relevant after some time and raising the need to do recommencements. These circumstances close everything in an endless cycle of action, with technology constantly evolving and laws simply failing to be adopted in time, with the result that consumers are largely unable to use the tools.

Mbunge et al (2021) is another group that takes a deep look into the digital tool application in the healthcare system from the future point of view. According to the authors, the quality of digital health systems depends on the availability of data. However, different healthcare institutions use different types of databases, which makes it difficult to improve tools for data collection and analysis. In developing countries, the improvement of the internet is slower, making the application of technology very difficult or even impossible. This is especially important because without an internet connection these technologies cannot work, and the resulting disruptions would prevent the systems from operating in a targeted manner, would jeopardize information registration problems, and would slow down all processes. Another aspect that causes a lot of concern is the reliability of the sensors. Thanks to them, many key indicators and information are tracked. Potential sensor inaccuracies can have serious consequences, ranging from misdiagnosis to a significant impact on human health if the wrong dose of medication is calculated. Knowing that these technologies collect, systematize, and store vast amounts of sensitive information about patients and research, the security of privacy and confidentiality is at high risk, as malicious individuals or organizations can hack into databases for personal reasons, causing great harm to both the healthcare sector and to the same persons whose data would be leaked. Looking to the future, the authors anticipate that the increasing number of tools in the blockchain-based system would become information-intensive at some point, which would directly affect the speed and quality of system performance, and it is a direct problem since it is still an unsolved and typically mysterious problem of nowadays. The sensors responsible for collecting and transmitting information are sensitive to a number of factors, such as electromagnetic fields, which would require frequent calibration. Potentially, frequent requests would not only inconvenience the constant travel of information to a specialist for a calibration service but would also compromise the accuracy of the information collected. Concerning the characteristics of the sensors, it is worth mentioning that the use of sensors to monitor vital signs requires implantation under the skin, which poses a risk of both physical changes in the human body and possible permanent tool failure due to its specific sensitivity to body factors. The primary source of power for digitized devices is the battery, which means that such devices must either be constantly charged or have the ability to replace batteries, resulting in high maintenance costs for devices that battery can be replaced or recharged, but for example, nano processors are not widely available for subcutaneous use due to placement under the skin.

Mbunge et al (2021) as well as the other authors mentioned above highlight the regulatory framework as one of the biggest challenges facing the digital healthcare system. The authors argue that there is a lack of order for systems to work smoothly under conditions that are not so conducive to emerging innovations. Looking at the overall application of the system in general, it is important to realize that this requires an enormous amount of human, information, and financial resources, with the result that not all countries, especially the slower ones, can afford to integrate this innovation into the country.

All of the mentioned authors above more or less believe in the future with technological innovations in the medical healthcare system and as a result tries to figure out as many of the challenges, barriers, and risks as possible, which is pretty logical since it is easier to reduce or eliminate those risks while implementing a strategy. For some of the big discovered variety challenges (see figure 4), it is clear who is responsible for what and who should take care of them, but for others, it is slightly unclear.

Figure 4. Digital healthcare tools challenges found in theoretical research. (Created by the author, 2022).

McKinsey & Company (2021) presents five main areas – business, society, operational risk, compliance, and legal - in which they express risks in adapting technological solutions and their mitigation recommendations. According to them, the business should take primary care of any problems that arise directly with the application, ethics of the data overall soundness, and all the maintenance related to a data-driven culture. Society should be fully informed of how technologies work by applying awareness actions. Process reliability should be taken care of by minimising possible risks during implementation to guarantee data-driven culture, ruling, and strategy compliance, provide all the information and education if needed, and constantly monitor, collect and manage the situation of activities caused by certain non-compliances. Most importantly, specialists must always stay in touch with experts from the legal area and don't hesitate to consult when planning strategies, new products, or services and even having doubts about the company's internal affairs.

2.3. Digital healthcare tools

In this digital world, there are endless ways and opportunities to digitalize one thing or another. The following information will provide some more detailed background of the most popular digital healthcare tools or their combinatorial systems (figure 5) ever applied in healthcare or the ones available in the future.

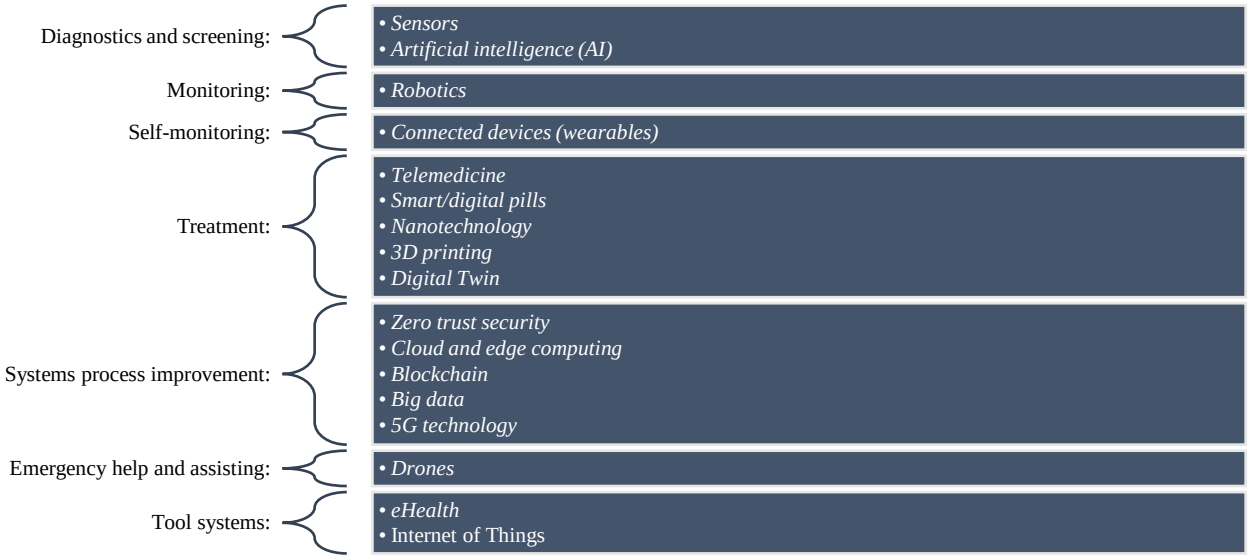

Figure 5. Most popular healthcare tools or their combinatorial systems. (Created by the author, 2022).

Diagnostics and screening

Based on researchers (Awad et al, 2021; Hendrix et al, 2021; Mbunge, 2021), one of the most important factors leading to the need for technological decisions in the healthcare sector is the ability to screen vital indicators and diagnose various diseases by detecting them in early stages of development. There are several tools to achieve this, such as smart or digital pills, robotics, connected devices – "wearables", but the most common and sufficient are the sensors and artificial intelligence.

Sensors have a very wide range of applications. With their help, data can be captured and converted into pulses. They are already used successfully in our daily health care system to monitor heart, brain, and circulatory activity, measure oxygen, radiation, and blood sugar or temperature, assessing limb mobility, nervousness, posture, and muscle activity. The sensor is also available on every smartphone or in recently widespread smart bracelets - *wearables*. Such sensors make it easy to self-monitor and track individual physical activity and some circulatory readings are implemented by it. These devices are gradually becoming a fundamental resource in healthcare improving clinical diagnosis and observation of biological molecules. The resource also states that there are two types of sensors - flexible and non-flexible (Mbunge, 2021).

Artificial intelligence is an algorithm capable to make a decision based on experience and learning. AI innovation is widely used in many other digital healthcare tools that might be needed decision making – robotics, connected devices, drones, and many others. Implementation of the AI could be responsible for nearly all repetitive and predictive tasks and also has the potential to improve and be one of the main diagnostic tools by helping to recognise recurrent symptoms in different fields (Hendrix et al, 2021).

Monitoring

Monitoring is a very important task in healthcare. To provide accurate and qualitative treatment and implement the right decisions, there is always a need to monitor the changes in the vital records. For this task, such technologies as sensors ad nanotechnology could be implemented but at this time it is mostly performed by robotics principles.

Robots are mechanical devices that are programmed to perform a certain function, usually one that performs repetitive actions. Some are able to perform only one task, while others can be controlled by artificial intelligence and make actions and decisions at a set level on their own. There are many types of robots, but the most common in the healthcare sector at the moment are robotic devices capable of performing computed tomography, and magnetic resonance imaging. Looking to the future, nano-robots are already being developed, they are expected to perform interventional functions inside the patient. In addition, robot assistants would be capable of turning, lifting, and assisting the patient. It is expected that in the future, this device will evolve to the point where it will be able to perform operations and treat teeth on its own (Awad et al, 2021; Mbunge et al, 2021).

Self-monitoring

One of the most perspective and emerging ideas in healthcare is self-monitoring. Patients do not regularly follow their health and well-being indicators until it is already too late and the health issue has already caused the unwanted consequences. This paradigm has led the healthcare sector to crowded hospitals and a lack of staff as a result there is also an increase in government or personal expenses. The idea is to allow people to self-monitor and prevent these consequences by applying connected devices such as wearables.

Connected devices, or in other terms, wearables, are gadgets operating with the help of sensors, IoT, and devices like smartphones, smartwatches, and smart bracelets. Usually, it is working with the help of an app connection on the smartphone, as a result providing some of the health parameters like heart rate, blood pressure, or even sugar levels. In the future, it is expected to evolve to the level where this tool will be able to monitor the majority of the vitals, take medical testing and provide statistics (Bergier et al, 2021).

Treatment

The evolution of technology allows stepping into the new and improved healthcare system and services. It allows to provide vital help through long distances and smart choices that lead to increased accessibility of healthcare services and less damaging or even new treatment decisions.

Telemedicine offers the possibility to perform the initial stages of health screening, such as consulting and primary diagnosis, using either a telephone conversation or a video call with the help of a computer. This system also allows professionals to safely provide first aid or monitor the course of the disease in a patient with an infectious disease without putting their own safety in danger (Shayevitz et al, 2021).

Future pills differ from the usual ones because they can be used in place of small surgeries to remove an unwanted object from the human gastrointestinal or circulatory system, thus saving specialists time, or can help in an emergency when internal bleeding begins. Several variants of such pill mechanisms have been described in the literature. The digital pill incorporates a nanorobot controlled

by an internet connection and artificial intelligence which can travel to the body and remove a foreign object. The operation of the smart pill is a bit different as it has a sensor with a protective film that releases a mechanism controlled by an internet connection and artificial intelligence when it enters the stomach and travels to a bleeding place and stops bleeding until the first aid is given (Award et al, 2021).

Nanotechnology is ultra-small nanoparticle devices that have the potential to deliver some benefits in areas where larger devices cannot perform the required tasks. These devices cover a very wide array of situations and are still in the development phase. In the healthcare field, this technology, combined with the help of artificial intelligence, is expected to be able to perform microscopic surgeries, successfully performing a procedure on a small area of tissue, which would speed up the healing process and reduce the likelihood of complications (Mbunge et al, 2021).

The digital twin is a combination of a few technologies, allowing to create a possible twin of the possible object or process it virtually. This tool helps in the healthcare system by empowering the ability to as an example take a closer look at the complex future surgery and steps in it or create a visualisation of the object like prosthetics and make a detailed evaluation before implementation (Apostolidis, Stamoulis, 2021).

3D printing is an already established technology that can print out nearly any design provided for the supporting system. It uses lasers and strong materials which makes it even more unique. The tool has been utilised in the creation of prosthetics and implants. In a future perspective, it is expected that with the collaboration of sensors, artificial intelligence, and other digital tools, 3D printers would be capable to create medicinal materials specialised for each person individually, with the idea that it could manufacture medicine for rare or untreatable diseases (Awad et al, 2021).

Rehabilitation

Rehabilitation is an integral part of healthcare. No treatment process can be considered successful if it has not undergone a rehabilitation process. Unfortunately, this process does not always fascinate patients, as well as prescribed rehabilitation, can be a severe ordeal for both children and their parents due to possible pain and lack of motivation.

Virtual reality (VR) is a form of technology in which a virtual representation of a certain space, created with the help of computer modeling, special goggles, and sometimes headphones allow a person to interact in three-dimensional space. This tool is used in healthcare in some countries, as well as in the field of surgery to help predict the course and possibilities of the procedure. Virtual reality technology has the potential in rehabilitation areas by turning the necessary exercises into entertaining activities for the patients and can also help improve and increase physical activity in children and adolescents through means of video games (Bergier et al, 2021).

Systems process improvement

Digitalization is also fascinating in the process of creating new systems that help innovative technologies and their users to use them smoothly, safely, and efficiently.

Zero-trust security is a system designed to support data security by identifying each person wishing to access information without additional intermediary objects. The system helps to protect against

cyber-attacks at a higher level (McKinsey & Company, 2021). This type of tool would allow the healthcare sector to store huge amounts of confidential data, ensuring better conditions for privacy and security.

Cloud computing is an internet-based system storing, analyzing, and providing medical data based on easy, fast, and productive control. It allows doctors and patients to share information and could be beneficial in the future by helping with remote monitoring of the patients. (Mbunge et al, 2021).

Blockchain is an extension of the data basis structure that guarantees the successful and functional exchange of information between users in the healthcare system. Applying this technology improves the fluidity and privacy of information within the health organisation. (Mbunge et al, 2021).

Growth of the information in the healthcare sector has aggravated since the start of the use of tools such as digital health records and telemedicine, and as a result, the whole database is going to be overloaded with the amount of information in the nearest future. This will lead to degraded speed and quality of performed tasks, so big data is a solution to the maintenance of the future information flow arrangement (Mbunge et al, 2021).

5G is a wireless internet connection that ensures and provides high-quality connections globally. This innovation changes the old wireless connection that was physically unable to take care of and provides a proper connection to the emerged technologies (Mbunge et al, 2021; Siriwardhana et al, 2021).

Emergency help and assisting

Another perspective for the future is wider and more affordable access to treatment, diagnosis, and help. The evolution of technology in the future is expected to pave the way for a fast, safe, and targeted healthcare tool - the drone.

Drones are a type of robots, more specifically autonomous machines that are able to move by flying. This invention has a huge perspective on the future of the healthcare sector. It is believed that drones could evolve enough and be used for logistics, for example, accessing rural places or mastering the traffics by delivering medicine, food, transplants, first aid, or even taking the necessary samples of the vital display. To this day drones have already helped during the pandemics of COVID-19 by monitoring streets and disinfecting the buildings during the lockdown (Mbunge et al, 2021).

Tool systems

McKinsey & Company (2021) have revealed in their analysis that the application of several tools and their integration can systematically provide not only an economic benefit, an advantage in the sector but also an even better product or service.

IoT (Internet of Things) is widely used in the healthcare sector. It helps to share, receive and store health system information by connecting various innovative medical devices via the internet. This system works with sensory devices, mobile apps, smartphones, and bracelets. In addition, this system allows remote monitoring of patients and adjustment for the patients' vital index correction (Awad et al, 2021).

E-health is a set of healthcare processes, services, and products that operate through communication by technologies and information databases. It improves primar and main data from people's health care, efficiency, and quality of services. This opens up a wider possibility to collect and maintain data for future improvements of preventional systems (Naumann et al, 2021).

Based on most popular digital healthcare tools, their combinatorial systems applied in healthcare, and the ones to be available in the future it is not surprising that the digitisation solutions described not only create value and bring benefits with diagnostics, screening, monitoring, self-monitoring, treatment, systems process improvement, and emergency help and assisting of tool systems but also that with such potential and variety authors end up naming such a big number of challenges for different levels of healthcare stakeholders.

2.4. Digital healthcare through stakeholders' sight.

The processes of every sector always rely on people, their knowledge, assets, needs, and decisions – the stakeholders. The healthcare sector is not an exception. Wu et al (2019) identified the healthcare sector's ecosystem of stakeholders involved in the whole system. All stakeholders were grouped into ten different groups – medical, rehabilitation, nursing, pension, third-party, supply, medical insurance, payment, regulatory services, and service objects (see figure 6).

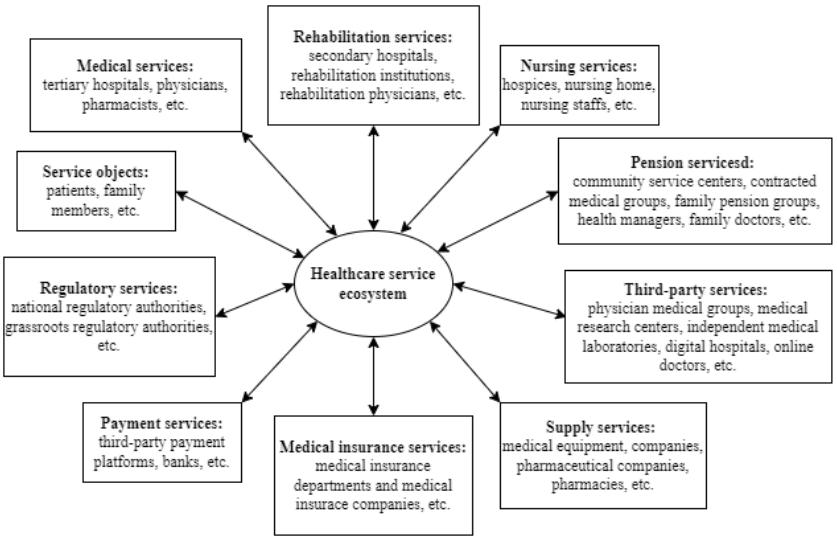

Figure 6. Map of stakeholders in the healthcare service ecosystem (Adopted from Wu et al, 2019).

Authors (Wu et al, 2019) used this healthcare service ecosystem map to create a theoretical healthcare service ecosphere showcasing particular relativity between China's healthcare service stakeholders. Their theory divides all stakeholders' groups into three different populations (micro and meso levels) and a system environment (macro-level) as an external environment that integrates, supports, and shapes together with the populations to form an intricate healthcare service network (see figure 7). The current object - the system environment – or, in other words, digitalisation, reshaped traditional healthcare sector activities by providing a wide spectrum of various innovative decisions for the stakeholders and everyday healthcare sector processes that nowadays can not be separated and has significant importance for the whole population (Wu et al, 2019).

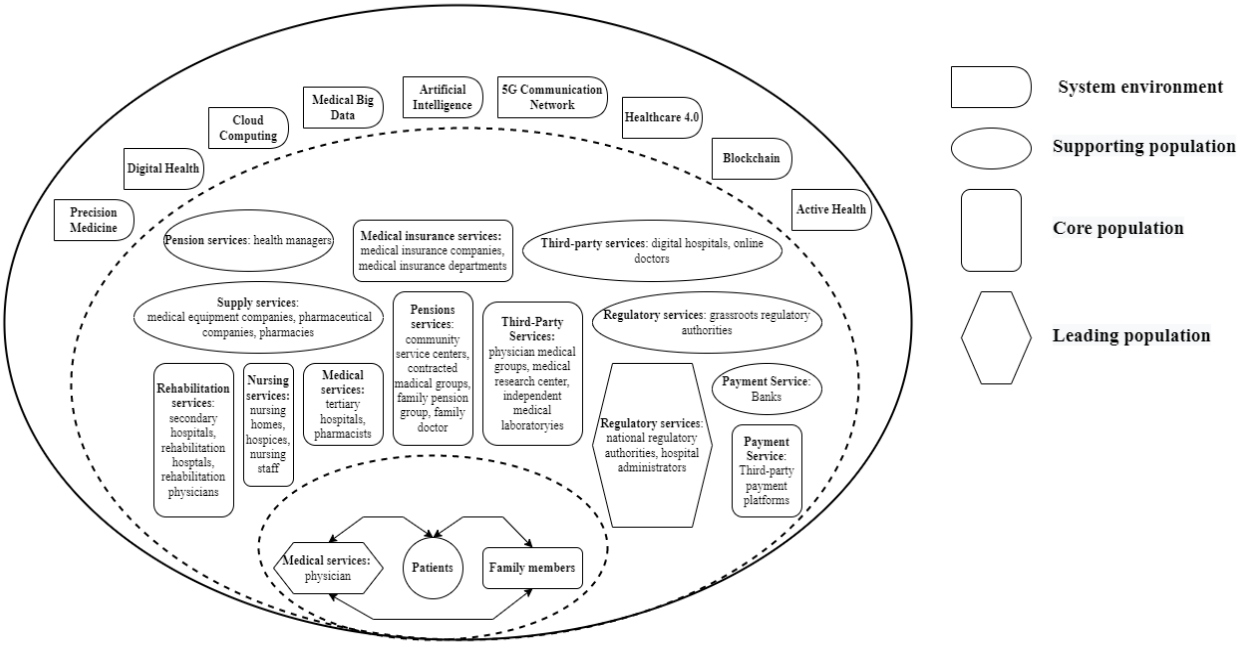

Figure 7. Healthcare service ecosphere (Adopted from Wu et al, 2019).

Bergier et al (2021) in their research analyse the aspect of the stakeholders' involvement in the digital healthcare process. Stakeholders were distributed into 4 groups – doctors, patients, healthcare systems, and the tech industry. The authors stated that each group has at least six areas they are involved. Knowing how much stakeholders are involved in the whole process, it naturally leads to the question, what are the thoughts about digital healthcare applications from their side?

Naumann et al (2021) conducted a study that interviewed 59 stakeholders from Austria, Switzerland, and Germany with the aim to find out their viewpoint on eHealth policy processes. Results stated that all three countries' stakeholders faced difficulties during the implementation of the eHealth in their countries stating that it is not a fit for the actual practice, defined the lack of organisational procedures, and believed that political will was inadequate. Nevertheless, the mentioned difficulties, all participants confirmed the understanding commitment of the political side, ideas, and consciousness of the need for eHealth implementations globally. The final results of the research reveal that stakeholders lack a clear strategy and need help with the clearing of the difficulties in the early stages of implementation of eHealth system policies and that services brought to patients through the governing system don't fit for the practice.

In Shayevitz et al (2021) research, stakeholders' reaction to the implementation of telepsychiatry is mainly positive. None of the patients stated dissatisfaction even though digital tools were creating some difficulties. Psychiatrists were satisfied knowing the outcome improved their performance and that their patients and staff were thankful for this opportunity.

In terms of digital literacy, Abdulhussein et al (2021) shared a part of statistics where more than forty percent of specialists and twenty-three residents and students stated that their studies were not preparing them for digital tools or overall technology in healthcare.

Hogervorst et al (2021) examined the challenges met while applying complex health technologies between organisations of the European Network for HTA. Answers stated that practitioners did meet challenges while applying complex health technologies but only a few out of 22 were most relatable which were difficulties to access databases, technology application is led by the pressure of society or politics, lack of policy and organisational structure.

Based on studies stated above, stakeholders are very closely related to the digitalisation processes and they are experiencing a lot of challenges such as discomfort and uncertainties in strategy (Hogervorst et al, 2021), political and governing points (Naumann et al, 2021), and digital literacy, (Abdulhussein et al, 2021). However, despite the negatives, digitization also offers positive hopes for the whole healthcare sector and stakeholders (Shayevitz et al, 2021; Wu et al, 2019) as much as also understanding of the aim of such implementation of tools (Naumann et al, 2021).

2.5. Digital healthcare application frameworks.

As mentioned before, the application of digital tools in healthcare is a long process that requires vast amounts of knowledge, in addition to financial and human resources but it is vital to prepare for the whole process by creating the strategy for a smooth and successful implementation. The following information provides findings of theoretical frameworks for digital tools' implementation in the healthcare system.

To begin with, Tandon et al (2020) identified the gaps which led to the development of a theoretical framework that they believe could help in the application process of blockchain technology (see figure 8). According to the framework, medical and personal health records (data sources) are generated and supervised at several levels through smart devices of the patients and other reliable sources. They act as elements of the architecture of the blockchain technology system and must be systematised in accordance with legal and ethical rules, and access to their use is restricted to authorities with the appropriate resources. Improving the system architecture requires reciprocal communication with ever-evolving data sources, so the information obtained will help in advanced applications. To apply blockchain technology to their ecosystems, researchers need to find application gaps and close or reduce them as much as possible. The organization needs to anticipate the value expected from the application of this technology. This would prevent additional challenges and help in the further development of the system architecture. The main benefit of blockchain technology is that information is gathered from patients with their consent, which is then used by researchers, doctors, insurance agencies, or pharmacists. It is important to determine who will use the information obtained, as unclear boundaries, especially in the healthcare sector, often pose various risks due to legal and ethical aspects. Both the legal and ethical aspects need special consideration, as the key features of blockchain technology are related to security, authentication, and interoperability, which, according to the authors, are the main obstacles to attempting to apply this technology.

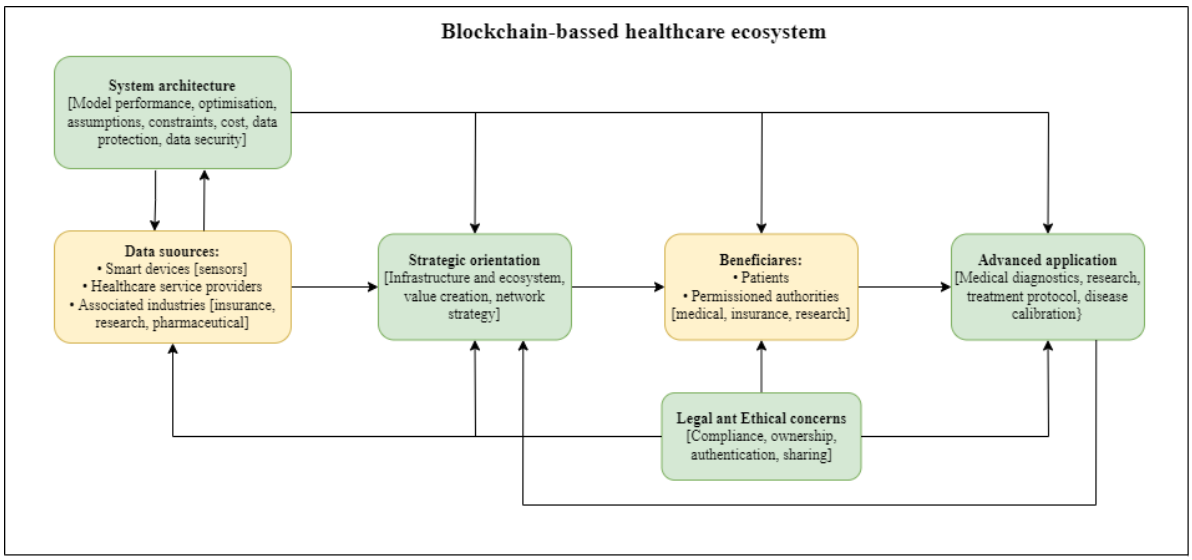

Figure 8. Blockchain-based healthcare ecosystem (Adopted from Tandon et al, 2020).

Blandford (2019) argues that one of the most important aspects of HCI application is the two-way communication and communication between consumers and technology developers. The author presents the entire development path (see figure 9) of such technology and emphasizes that from the beginning to the end, all factors are interrelated and must be constantly monitored and emerging risks should be eliminated too if a quality product is desired. In addition, as other authors have already mentioned, it is very important to clarify what problem the technology will be developed to solve.

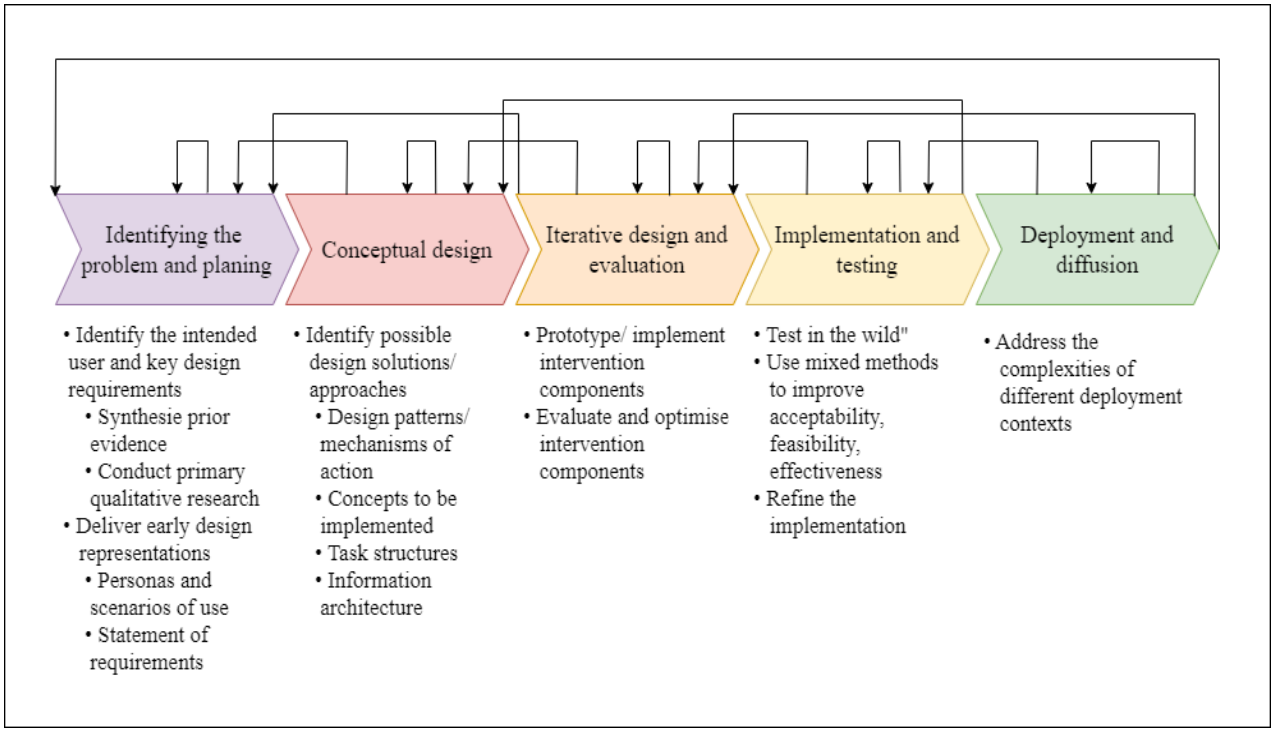

Figure 9. An integrated development lifecycle (Adopted from Blandford, 2019).

Gibbings and Wickramasinghe (2021) state in their framework (see figure 10) that there are three main groups of factors and the beginning of everything should be the purification of these groups of factors. This should be done by comparing clinical factors with the most influential non-clinical factors as they are making the majority of the impact, according to the authors. This requires a consistent examination of what non-clinical factors this could be, depending on what outcome is desired. In this way, three main groups of factors are obtained - structure, process, and outcome. All these groups of factors must continue to be monitored and compared with each other in terms of non-clinical patient care factors in order to ensure the quality of the application of the technology.

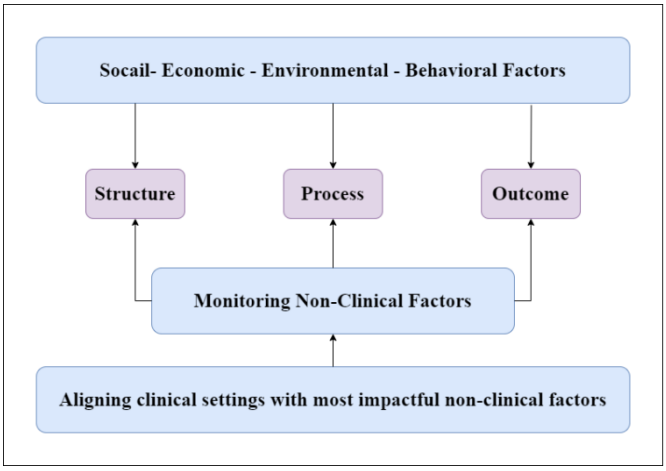

Figure 10. Theoretical framework capturing the impact of non-clinical determinants' impact on the link between care outcome, process and structure (Adopted from Gibbings, Wickramasinghe, 2021).

A framework (see figure 11) provided by Kyhlstedt, Di Bidino, and Wamala (2021) reveals that it is the decisions that are made through creation and implementation that are important. The authors argue that good governance and leadership allows to define the technology implementation objectives. Following that it is time to define outcomes and measure the performance. After evaluation of performance, it is crucial to determine and assign for the second time to the headquarters for advice and possible improvement for the areas where the process or tool should be failing. After this, the evaluation process passes to another designing stage where it is already applied and the possible failures are already known. All framework is mainly based on never-ending measures, evaluations, and improvements, since the healthcare sector and technology evolutions are evolving and changing faster than being applied, that high-quality result is achieved accordingly.

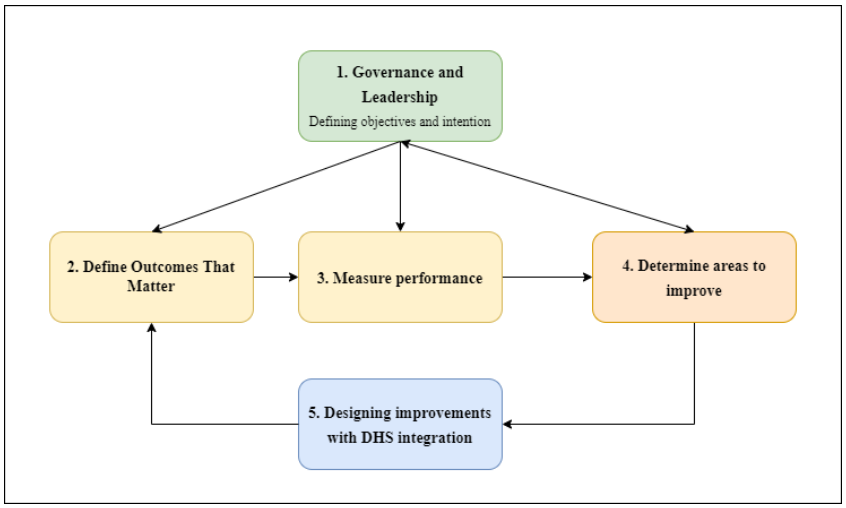

Figure 11. Decision maker framework for I-DHS (Adopted from Kyhlstedt, Di Bidino, Wamala, 2021).

Some of the analysed frameworks in this chapter are created in order to analyse, integrate, capture, or provide implementors with the decision making in various digitalization application stages in the healthcare sector. The differences between them are visible and they are meant to be but what is most important is that each of them turns to some similar specific arguments and suggestions. Scholars emphasize the importance to analyse the decision, stategy, gaps, and key aspects of digital healthcare tools' application. They state that without clarifying the main basics of who will be the users, what solution is needed, and how to adjust to legal system, no tool, system, or decision would be qualified enough to provide the result needed. The development of the tool for its success depends on the deep research, preparation, and continuous evaluation. Implementors should also consider preparing risk management plans and keep on improving and eliminating the errors encountered since innovations and technologies are changing even faster these days.

2.6. Successful application of the framework in healthcare

After a detailed analysis of frameworks provided by other authors (Blandford, 2019; Gibbings, Wickramasinghe, 2021; Kyhlstedt, Di Bidino, Wamala, 2021; Tandon et al, 2020) and theoretical analysis (Mbunge et al, 2021; Neumann et al, 2021; Kumari et al, 2018) it can be stated that majority tend to highlight the importance of several aspects' accuracy in the digitalization tool application process:

- Identification of problem;
- Identification of organisation needs and abilities;
- Identification of the correct tool and its design to apply;
- Identification of target audience;
- Stakeholders' inclusion;
- Consistent analysis;
- Testing and measuring the outcome;
- Risk management plan;
- Continuous monitoring;
- Continuous improvement.

Previously analysed researches brought the attention to the core aspect – as fluent as possible strategy and digitalization implementation beginning success. As mentioned before, this type of base could be identified as electronic health service systems, in other words, eHealth tools, that all hospitals use worldwide. These systems allow the doctor to provide and the patient to view the health data, such as diagnoses, treatment information, electronic prescriptions, laboratory test submissions and responses, referrals for consultation, medical images, information on vaccinations, health certificates, and similar. It also provides more efficiency regarding the share of information between medical establishments when the patient is moved to another hospital. Such a system holds a lot of information and is a crucial tool in the terms of fast and qualitative work. Based on this importance, a theoretical framework was developed (see figure 12).

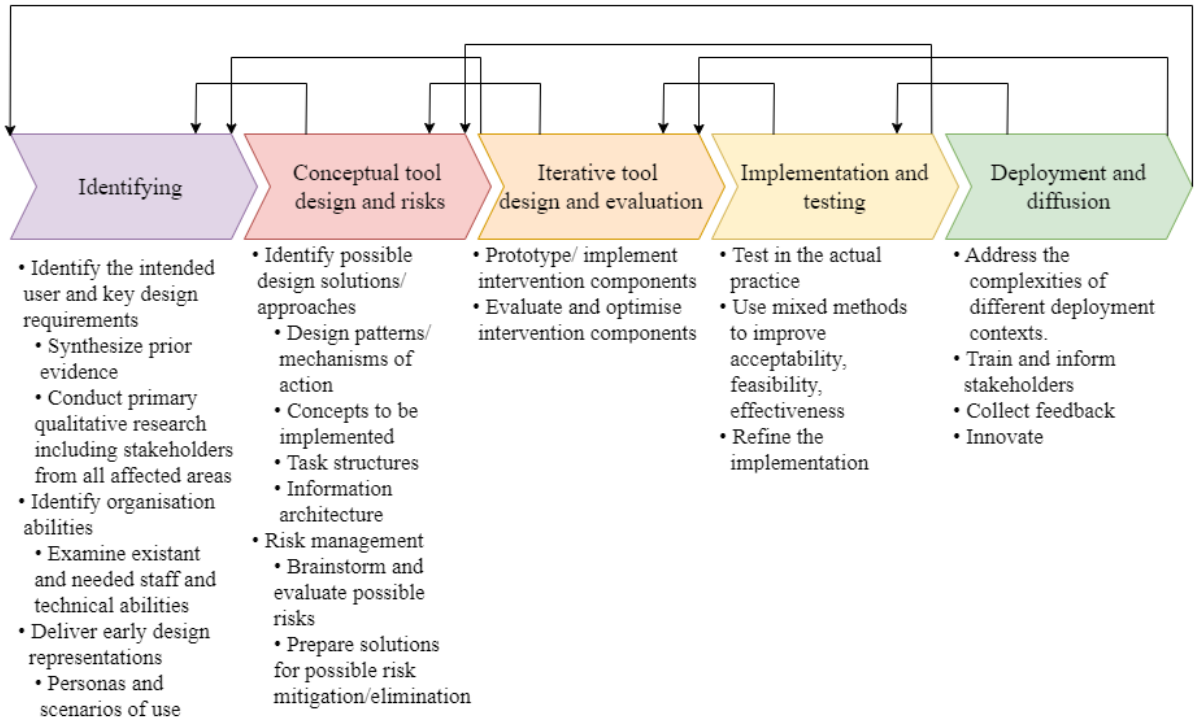

Figure 12. Framework for successful digital tool application in the healthcare sector (Created by the author, 2022).

The framework provided above presents the five stages for successful digital tool application in the healthcare sector. In order to implement electronic service in the healthcare sector, it is important to clarify the problem to which service will be applied, conduct primary qualitative research including all stakeholders, define the possibilities of the organisation and the staff, currently applied systems, and the result that is expected while applying the innovation. After the first stage of identifying the necessary requirements, a conceptual design of possible solutions to the requirements is drafted. The conceptual design is made with help from technology field professionals as well as insights from stakeholders and members of the organization. In addition, a strong risk management plan is created to fully secure the conceptual solution design from a legal standpoint. The third stage of the framework allows to take a look at the pre-finished system and implement minor changes if needed. After the initial development cycle of the design is completed, the testing, safety measures, and threats should be identified in actual practise, and, if some of them were found, previous processes should be reviewed and implemented again until the successful launch of the tool. Lastly, an everlasting monitoring of the system, dissemination of information for all the stakeholders and users, and feedback collection are needed for further improvements and high-quality processes.

3. METHODOLOGY OF THE RESEARCH

Research problem: By analysing the challenges met while applying digitalization tools in healthcare sector it was found that different countries face different challenges. Several reseaches was found examining the digitalization tool application in healthcare sector and their challenges between different countries. Neverthless, there is a lack of practical analysis of the challenges impact on the individual country's cases alone. **Following that the problem of empirical research is formulated as:** What challenges dotors and patients of The Hospital of Lithuanian University of Health Sciences met while applying digitalization tool "E.Sveikata" and how could they be overcome?

Empirical research object – challenges doctors and patients met while applying digitalization tool "E.Sveikata".

Aim of the empirical research - to identify what challenges do The Hospital of Lithuanian University of Health Sciences doctors and patients faces by applying digital healthcare tools and provide solutions to them.

Empirical research objectives:

1. To identify challenges doctors met while applying digitalization tool "esveikata.lt".
2. To explore challenges patients met while applying digitalization tool "esveikata.lt".
3. To provide possible solutions to overcome the challenges doctors and patients met during the application of the digitalization tool "E.sveikata" based by the theoretical framework.

Research methods and tools: The method of research selected is **case analysis**. This research method was selected in order to collect a wider range of data which allows to answer the research question by applying the information of the theoretical part and to define the research problem, object, aim, and objectives since the field of the research by its own nature is very specific. The case study aims to deliver a comprehensive understanding of the particular study and at the same time allows to develop more general theoretical statements about homogeneity in the observed topic (Fidel, 1984). Case study helps to direct insight into consenquential connections that can be filled out in different ways (Hammersley and Foster, 2000). The research is conducted using **qualitative research method** in order to identify the fundamental and in-depth data. Qualitative research method provides an advantage for the exploratorial capability that is needed to identify or explore in the research study (Alase, 2017). Besides that, Silverman (2020) declaire that when there is an analysis of processes in management or decision making, researcher should choose a qualitative data collection method.

The research is conducted by using a **semi-structured individual interviews**. While conducting such interviews there is a possibility to adjust the questions according to the topic together with the questions prepared in advance. Parralely, there is also an availability to adjust to the specific respondent, his experience or situation. This allows more relevant information to be gathered, thus enriching the study with more detailed, in-depth data. The interview takes place between the respondent and the interviewer alone, ensuring a quiet and confidential environment. Equipment capable of recording sound is used during the interview. In this way, data is collected during the interviews, which makes it easier to translate them into a structure suitable for analysis – transcripts (Saunders, Lewis and Thornhill, 2009). Some interviews are made over the phone or using remote

video call platforms due to existing interference that prevents the parties from meeting live - different locations, pandemic situations, and others.

Data collection methods and tools: Based on the semi-structured interview method mentioned above, two separate questionnaires were developed, one for the patients (see appendix 2), and another one for the doctors (see appendix 1). Both questionnaires consist of nine questions that gather information on the experiences, insights and skills of stakeholders while applying digitalization tool "E.Sveikata". At the beginning of the questionnaire, general information is provided to acquaint the respondent with the purpose of the interview, the course of the interview itself, and aspects of collecting, using and storing information, their terms.

Information collected in a semi-structured individual way, in Lithuanian. The language was translated into English without changing the substance of the answers. The Lithuanian language of the interview was chosen to make it easier for the respondents to express their thoughts, and it was also taken into account that not all respondents were able to communicate in English. Collected interviews were further systemized by the MAXQDA program in the form of transcripts. With the help of the MAXQDA program, all the necessary information was coded into categories and subcategories (see Appendix 3). After the coding process, the information obtained was presented visually and the results analyzed to answer the research question and objectives.

Characteristics of analyzed digitalization tool: Lithuania's main tool providing remote prescribtions and other electronic health history for patient and physician is "E.Sveikata". It allows to connect to the electronic health services in which doctors can provide information related to the health, pharmacists can monitor information about prescribed medicine and patients can view the health data provided by the doctors. To sum up, the tool is responsible for many basic and day-to-day functions, collects and stores primary and ongoing information on patient status, diagnoses, prescribed treatments, the tool is widely used in statistical displays, and meets the specification of the base tool for technology application development process for the sector (Sudhoff et al, 2020). This tool has a huge impact for further digitalization process implementation, as a result it was chosen to be analyzed.

Sample of the research: the aim of the research is to identify what challenges do The Hospital of Lithuanian University of Health Sciences stakeholders faces by applying digitalization tool "E.Sveikata". Stakeholders were chosen since it is the most relevant group of informants based on the questions and situations (Abdulhussein et al, 2021; Hogervorst et al, 2021; Naumann et al, 2021; Wu et al, 2019) analyzed in the theoretical part of the research. Alase (2017) reveals that a sample of the research can consist of 2 to 25 respondents, and a more accurate number can be determined by conducting a survey and collecting interviews until "saturation" (Žydžiūnaitė and Sabaliauskas, 2017), or in other words until information collected doesn't provide with additional new information. In the case of this study, the respondent was of two groups - doctors and patients. Respondents in this group were selected because of the designation of the tool under which application challenges as key users. As the clinic where the interviews were conducted employs about 2,000 doctors in different specializations, in order to gather as accurate an experience as possible based on the same tasks in practice, only one group of doctors was chosen to be interviewed - family physicians - because of their importance in the healthcare sector. Family physicians are the primary health care chain that faces the use of "E.Sveikata" to prescribe medications, referrals for testing, or to other health levels on a daily basis. The clinic currently employs 16 family physicians, an invitation to participate in the interview was sent to everyone, but there were 7 who agreed to attend, all of whom were interviewed.

While maintaining homogeneity, it was also selected to interview the same number of patients - 7. Based on the above facts and criteria, a total of 14 interviews were collected from 7 physicians and 7 patients.

Characteristics of respondents: The study analyzes information collected from two groups of respondents, patients and physicians. Respondents in both groups were selected according to outlined criteria (see table 2).

Table 2. Outlined criteria for respondent groups of doctors and patients (Created by the author, 2022).

Doctors		Patients
Family doctor (not a resident) at the clinic where the research is being performed		Adult, who visits a family doctor at the clinic where the research is being performed
Uses or used "E.Sveikata" tool to perform work tasks		Uses or had used "E.Sveikata" tool

The main criteria for doctors' eligibility to participate in the study was that the physician should be licensed with a specialization to be a family physician, work in a clinic where an empirical study is being conducted, and use or have had to use tool "E.Sveikata" at least once to perform work tasks. The main criteria for patients' eligibility to participate in the study was that the patient should be adult, who visits a family doctor at the clinic where the research is being performed and use or have had to use tool "E.Sveikata" at least once. As mentioned before, overal 14 of respondents were interviewed, 7 of each group.

Characteristics of questionaires: Both groups of respondents received 9 questions with an aim to receive their opininion and experience. Questions were similar but adapted for situations of either doctor-specific (see Appendix 1) or patient-specific (see Appendix 2). The aim of the questions was to identify possible challenges in areas of knowledge of the intended users, the purpose, its fufillment, the skills and knowledge required to operate the tool, and the suitability of its design in relation to stakeholders' skills, benefits, value and impact of the tool in day-to-day operations or health information management and risk management.

Ethics of the research: Confidentiality-based principles were applied in the semi-structured interviews. Prior to the interview, all of the respondents were informed about the use of the collected information for scientific purposes only, and about the destruction of the records after their analysis. All respondents interviewed voluntarily participated in the process, they were not forced to answer questions that they felt were not appropriate for them and could identify them or their specific work or life features.

Process of research activity: 5 steps were applied to obtain the results of the study.

1 step - Questionnaires were created based on the framework developed in the theoretical part.

2 step – Author contacted all 16 doctors of family practise aiming to invite them to participate in the research.

3 step - Whe the questionnaires were provided, the interviews with stakeholders of The Hospital of Lithuanian University of Health Sciences took place from the start of April of 2022 till the end of April of 2022. With the practitioniers interviews were planned, while patients' interviews were collected nearby the family clinics live.

4 step – 7 interviews of doctors and 7 interviews of patients was conducted and transcripted.

5 step – After collecting all the data, transcripts were translated from Lithuanian to English language and processed with MAXQDA data analysis system

Restrictions of the research: The case of The Hospital of the Lithuanian University of Health Sciences was investigated in this study. The results do not reflect the entire sample as a qualitative study was performed and does not reflect all stakeldoers groups insights. In order to apply the results of the study to the whole sample, it is necessary to carry out more extensive studies, such as a quantitative study. In addition, the study cannot be applied to other Lithuanian clinics due to differences in internal rules and systems, and the results cannot be applied to clinics or cases in other countries due to differences in legal, economic, political and many other environments.

4. RESULTS OF THE DIGITALISATION TOOL APPLICATION IN THE HEALTHCARE SECTOR EMPIRICAL RESEARCH

Not all questions provided for respondents in the semi-structured interviews were focused on the results of this study, that is, a broader questionnaire was provided, but further analysis will be provided only with those groups of questions and answers that correspond directly to the objectives, tasks, and issues of this study.

4.1. Results of empirical research

Based on the framework developed in the theoretical part, important 5 steps have been identified that should be performed for the successful application of the digitization tool. According to them questions were created and the challenges identified coded based to the stage specifics.

Eventually, the collected data from semi-structured individual interviews will be analysed according to separated 2 groups, doctors and patients. The research results will be presented visually and analysed in 4.1.1. and 4.1.2. subsections.

4.1.1. Challenges faced by doctors

After analyzing the challenges faced by doctors using the digitization tool (see figure 13), it can be stated that the challenges faced by doctors are also broadly analyzed in theory. The data revealed that physicians face poor tool functionality, task inefficiency, data inaccessibility, lack of trainings, lack of support, connectivity isssues, poor organizational system management, and unawareness of risk management plans. This is confirmed by the number of encoded segments in the "SUM" column. The circles shown indicate the actual visualisation where the bigger the size is, the more identifications of relevant codes are identified separately in the information provided by each respondent. Further analysis of the results will be based on the frequency of challenges faced by doctors' identification from highest to lowest.

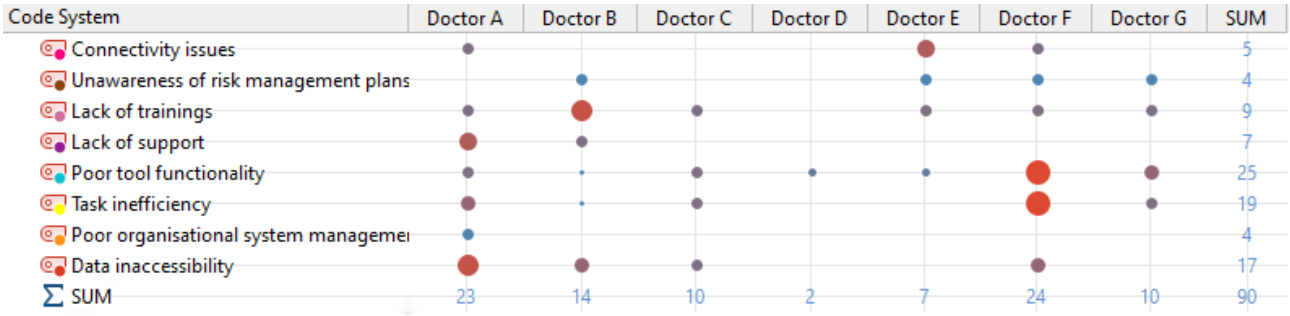

Figure 13. Distribution of challenges frequencies across different doctors (Created by the author, 2022).

Analysis of doctors' responses identified that the most challenging in the application of the digitalization tool "E.Sveikata" was the functionality of it (see table 3).

Table 3. Poor tool functionality challenge faced by doctors (Created by the author, 2022).

Doctor	Category	Subcategory	Coded Segments
Doctor A	Challenges	Poor tool functionality	"<…>many essential features that are still missing."
			"Absolutely everything is different from both procedural things to both the same user interface to which you need to get used to and know somewhere, at what square and what to look for in it."
			"Patient registration is also complicated because not all institutions succeed to register through "E.Sveikata"."

Doctor B	Challenges	Poor tool functionality	"It depends on what I can find there and whether it works at all. Because, for example, the last time I was unable to connect to „E.Sveikata" for some reason. I didn't even have a chance to see if I have that information at all or if it exists somewhere in „E.Sveikata"."
Doctor C	Challenges	Poor tool functionality	"The tool meets the design but will still need to work hard to the perfection of functionality for saying that it fulfils its purpose."
			"<…> if an electronic prescription is issued and it is not completed or there is an error, the patient simply cannot obtain the medicine immediately after leaving the treatment facility."
			"<…> the system needs a lot of improvements for design, management and making it handy."
Doctor D	Challenges	Poor tool functionality	"There comes a time when you have to write a lot of certificates to schools, educational institutions, and that system broke down, it was then more complicated, but maybe just when there was a heavy load and when it is very often necessary to do particular actions from time to time"
			"<…> something wasn't working for a quite a long time, it broke down and I was unable to complete particular tasks <…>"
Doctor E	Challenges	Poor tool functionality	"It is probably even less convenient than the one that is still in our clinics."
			"<…> by then everything was just sorted out and left with minimum lags. But it is a technology, aren't they supposed to lag?"
Doctor F	Challenges	Poor tool functionality	"It is usually replaced by other hospital systems that are more convenient and functional for the doctor."
			"I wouldn't say the tool itself is intuitive and very easy to use."
			"An unstable system that often does not work on its own or does not integrate with other patient systems <…>"
			"<…> even a young person which may be frequently used systems in this system certainly might get lost."
			"As mentioned, no matter how old are you, it is difficult to apply it sometimes"
			"<…> due to a technical failure, it does not work or works slowly"
			"<…> the system sometimes doesn't work at all, sometimes it works."
			"In this case, am... Certain features am...It is not possible to perform at all <…>"
			"In the text, form falls into the descriptions of visits, but view them in some convenient form am... It is not possible and much easier to do with hospital systems if the patient visits the same hospital all the time and that hospital uses one system."
Doctor G	Challenges	Poor tool functionality	"<…> probably one of the main things that it's not a very user-friendly tool."
			"<…> not convenient to watch previous visits and extract information from them."
			"It is usually necessary to work again after opening several windows in order to transfer that information from one window to another because there is no convenient triggering."
			"After conducting tests in laboratories, which also do not have a convenient upload to "E.Sveikata", to make it really convenient to view those tests, compare those tests."
			"<…> it gets stuck often <…>"

One of the main goals of the tool is to perform certain new functions or improve existing ones, to make them user-friendly. In this case, all of the interviewed respondents had negative experiences. Doctors declaire this tool can't be used due to some of the essential features deficienfy (*many essential features that are still missing*), it is complicated to register patients since not everyone can and know how to use the tool (*patient registration is also complicated because not all institutions succeed to register through "E.Sveikata"*). Most of the digital systems and tools perform in a way so the information would be saved in the situations of error, but respondents bring out this tool otherwise (*if*

an electronic prescription is issued and it is not completed or there is an error, the patient simply cannot obtain the medicine immediately after leaving the treatment facility). As already mentioned, tools are created to lighten up the processes, make them easyer to use, but doctors state "E.Sveikata" design make it even harder (*the system needs a lot of improvements for design, management and making it handy; absolutely everything is different from both procedural things to both the same user interface to which you need to get used to and know somewhere, at what square and what to look for in it*). Another aspect of making it more user-friendly friendly is to make sure repetitive tasks are easier and less stressful, allowing to impose more time for a patient, not tools, which is also not possible at all times *(there comes a time when you have to write a lot of certificates to schools, educational institutions, and that system broke down, it was then more complicated, but maybe just when there was a heavy load and when it is very often necessary to do particular actions from time to time*). It is slightly surprising some respondents are even so accustomed to disturbances that think this is normal and evaluates it quite positively (*by then everything was just sorted out and left with minimum lags. But it is a technology, aren't they supposed to lag?*). On the other hand, the majority of respondents evaluate the tool not convenient and even choose to use primary internal systems and tools to manage their tasks (*it is usually replaced by other hospital systems that are more convenient and functional for the doctor; It is probably even less convenient than the one that is still in our clinics*). Besides that doctor note that the tool complicates work by lacking the function of information transfer because of the need to open several windows (*it is probably even less convenient than the one that is still in our clinics*) and the overall extraction of information from the tool systems is challenging (*not convenient to watch previous visits and extract information from them*). Based on these facts, it can be assumed that the developers did not fully consider or analyze what functions and how the applied tool will be able to perform.

The second most common challenge subcategory found was task inefficiency (see table 4). As well as functionality, the efficiency of the tool is a very important criterion for the successful application of a digital device. This challenge was identified by 5 different respondents.

Table 4. Task inneficiency challenge faced by doctors (Created by the author, 2022).

Doctor	**Category**	**Subcategory**	**Justifying statements**
Doctor A	Challenges	Task inefficiency	"<…> there is still double filling of documents, both paper, and electronic system, instead of having a handy tool alone <…>"
			"We could move to one electronic system of some sort, but that is not the case. This is such an extra, unnecessary, bureaucratic, systemic thing that takes up our time."
			"I learn to adapt to those systems, but not the system is adapted to me, it poses additional challenges to adapt to and all sorts of additional things over and over again."
			"The most important thing is that it is inconvenient for the person to use the additional paper there, it is always possible to give the patient a paper version there and send those recommendations and extracts."
Doctor B	Challenges	Task inefficiency	"<…> if I don't find the information I need there, it can even slow down the whole process and make it even more difficult."
Doctor C	Challenges	Task inefficiency	"<…>there is no quick access and if the operation is not used daily, the entire data entry takes a long time."

			"<…> even with the system, data entry is time-consuming."
			"<…> all the data entry is very time-consuming, it takes time to sign the documents, and the information does not travel to other institutions on time if the doctor does not perform all the necessary functions properly and does not close the forms in time."
Doctor F	Challenges	Task inefficiency	"Usually slows down everything."
			"<…> if it does not work all day, which means that it will not be possible to prescribe that day, the next day it is also not possible to prescribe medication in the electronic system without an outpatient visit, which means that you will not be able to prescribe it anyway."
			"And then the patient has to either buy the medicine by paying out of his own pocket because it is still possible to write a paper prescription, but in some cases cannot get the medicine at all that day <…>"
			"Somehow stepping around the system, the next day, through another system, in another place, you have to re-write that recipe <…>"
			"In most cases, certain functions are not performed <…>"
			"<…> the functions are often delayed for a while <…>"
			"<…> those tasks are delayed for some time before the system is operational, which is often unknown when it will work exactly."
			"<…> sometimes it is very difficult to analyse medical records <…>"
Doctor G	Challenges	Task inefficiency	"<…> we are still duplicating that work, which means that we are leading everything into "E.Sveikata", but at the same time we still have to lead it into our systems, which is why that work is not speeding up for us."
			"It is difficult enough to open visits to another doctor. It is usually necessary to open a few more windows after entering the patient's data, the records or prescriptions of other doctors are not loaded immediately and it is slow enough, there are days when it is completely stuck and does not work at all."
			"<…> complicates and slows down the work, which is why we have to duplicate or print paper cards."

As important as it is, the main factor of effectivity is to complete task using as less time as possible, but respondents pointed out, that due lack of functionality, tasks often need to be perfomed in a double (*there is still double filling of documents, both paper, and electronic system, instead of having a handy tool alone*) way consuming a lot of valuable time and resources (*we could move to one electronic system of some sort, but that is not the case. This is such an extra, unnecessary, bureaucratic, systemic thing that takes up our time*). Another thing is finding the information you need, that is not always in the tool, slows down the process too, making it harder to complete the same and another tasks (*all the data entry is very time-consuming, it takes time to sign the documents, and the information does not travel to other institutions on time if the doctor does not perform all the necessary functions properly and does not close the forms in time*). Filling in the information in the tool is not efficient, sometimes the task requires filling in several forms, they even take a long time to load. Day-to-day tasks are also hampered by the way the systems themselves work, in cases where the system is down for some

reason, the doctor cannot prescribe medication or fill in the required information, but it is not possible to complete it in the system the next day (*if it does not work all day, which means that it will not be possible to prescribe that day, the next day it is also not possible to prescribe medication in the electronic system without an outpatient visit, which means that you will not be able to prescribe it anyway*). In this way, doctors are forced to break internal order and find a way to prescribe the medication that a patient needs and belongs to (*somehow stepping around the system, the next day, through another system, in another place, you have to re-write that recipe*), and such tasks are certainly not efficient. Respondent also declares, that usually, the system takes a long time to access patient information, multiple windows need to be opened, and sometimes it does not load the required information at all (*it is difficult enough to open visits to another doctor. It is usually necessary to open a few more windows after entering the patient's data, the records or prescriptions of other doctors are not loaded immediately and it is slow enough, there are days when it is completely stuck and does not work at all*), resulting in the use of additional systems or paper versions (*complicates and slows down the work, which is why we have to duplicate or print paper cards*). These identified challenges also confirm the theoretical aspects of the challenges. It is possible that the effectiveness of the tool development process has not been sufficiently analyzed and that the tool has been in use for several years (Ministry of Health of the Republic of Lithuania, 2022), so it is strange that such problems have not been addressed or improved.

Another very pressing challenge highlighted by respondents is data inaccessibility (see table 5). Four out of seven respondents mentioned facing various barriers related to the data and its accessibility. To begin with, the data provided in the system is often incomplete (*the treatment process, the treatment outcome, and the results from which to draw conclusions, and interpretations and turn that data into some "body and soul", because the data itself is neither good nor bad - something needs to be done with it*). Respondents revealed that the dissemination of data itself poses a number of challenges, the "E.Sveikata" tool operates on the principle that the process aims to transfer information from clinics and hospital systems to national domains, a core domain for the "E.Sveikata" tool. During this process, there are problems with years of information simply not reaching either the clinics or the core domain (*as a fact, we are faced with the problem that, say, a code has to be compiled in one way or another, because then the data from the system of the institution goes there to that national health platform, and then the data goes nowhere if some mistakes occur*), with the result that doctors are unable to access or pass on the information they need (*What do doctors know, because they often doubt whether the data they fill in will fall into the "E.Sveikata" system at all, or if they get stuck somewhere because the systems do not integrate with each other well, or if the system is stuck, or a pile of red windows will open up, that data may not fall into the system*). Doctors have also revealed that they cannot access the information that should theoretically be available (Because there is actually a lack of information. Doctors or patients do not find information that should theoretically be available in there), as a result, they find themselves in situations where they have no information at all and are forced to perform tasks without them (*another thing about the data itself is if I see them all, but if I don't have enough data, then it's possible, I don't have where to go at all*). It has also been found that it is difficult and sometimes even impossible to find older information (*as an example if the required data looked for is older. It is hard to find it*), which greatly complicates a significant number of processes and their accuracy. Furthemore, when moving or compiling information, it falls into another form that is extremely difficult to analyze or even read (*data crashes in a very uncomfortable form for reading, or not all data crashes at all, some data disappears during transfer*). The problem with the presentation of the imaging has been revealed by several doctors,

who claim that the visual information is basically not supported by this system (*there are visuals that cannot be shared between one institution and another*), even though there is now a way to trigger the images, it is not the most convenient way (*now there is a bit of such an opportunity to trigger image files, but am... These are very limited options and basically, all am... Image storage is still stored in specific hospitals*) as a result, doctors are unable to share imaging results between hospitals (*Patients who want to go from one hospital to another and... In order for doctors to see any visual documents performed at that hospital, the examinations am... They have to be saved to still disks, to USB, to some other cache, because there is no system to store them and somehow it would be possible to view them there consistently*), and patients incur additional costs if they want to deliver this type of information to another facility or have them for personal use (*it does not belong to the patient, if he wants to have the visual examination with him, he has to pay extra for all the keys and disks*). Given that the purpose of the tool is to share and gather information, these challenges should certainly not exist.

Table 5. Data inaccessibility challenge faced by doctors (Created by the author, 2022).

Doctor	**Category**	**Subcategory**	**Justifying statements**
Doctor A	Challenges	Data inaccessibility	"<...> there are visuals that cannot be shared between one institution and another <…>"
			"It does not belong to the patient, if he wants to have the visual examination with him, he has to pay extra for all the keys and disks <…>"
			"Imagine that there is not enough data on these... Am... How to say here... The treatment process, the treatment outcome and the results from which to draw conclusions, and interpretations and turn that data into some "body and soul", because the data itself is neither good nor bad - something needs to be done with it."
			"It seems to me that data is quite difficult to access."
			"As a fact, we are faced with the problem that, say, a code has to be compiled in one way or another, because then the data from the system of the institution goes there to that national health platform, and then the data goes nowhere if some mistakes occur."
			"The bigger problems are when the institution's systems are no longer working because "E.Sveikata" gives very little compared to the institutional system."
Doctor B	Challenges	Data inaccessibility	"Because there is actually a lack of information. Doctors or patients do not find information that should theoretically be available in there."
			"Another thing about the data itself is if I see them all, but if I don't have enough data, then it's possible, I don't have where to go at all."
			"<…> mostly it is very hard to find it useful due to the lack of information in it."
			"It's either I don't see any data at all or I don't know how to find it."
Doctor C	Challenges	Data inaccessibility	"It is very difficult to search for information <…>"
			"As an example, if the required data looked for is older. It is hard to find it."
			"It is difficult to find the required data"
Doctor F	Challenges	Data inaccessibility	"What do doctors know, because they often doubt whether the data they fill in will fall into the "E.Sveikata" system at all, or if they get stuck somewhere because the systems do not integrate with each other well, or if the system is stuck, or a pile of red windows will open up, that data may not fall into the system."
			"Data crashes in a very uncomfortable form for reading, or not all data crashes at all, some data disappears during transfer."

			"<…> now there is a bit of such an opportunity to trigger image files, but am... These are very limited options and basically, all am... Image storage is still stored in specific hospitals <…>"
			"Patients who want to go from one hospital to another and... In order for doctors to see any visual documents performed at that hospital, the examinations am... They have to be saved to still disks, to USB, to some other cache, because there is no system to store them and somehow it would be possible to view them there consistently."

Additional challenge revealed is lack of trainings (see table 6). Six out of seven respondents declared facing this type of challenge. Two out six doctors straightly declared, they didn't have any of the trainings of how such tool works (*I know how to do as much as I need at work basically, but the fact that I fully understand what functions there are from A to Z - I really don't understand this thing. I was not trained*) and how to manipulate it (*I don't have the knowledge of how to as a doctor, how to extract the maximum information from that system and how to make sure I use all the features. I did not have any training or help in getting acquainted with the "E.Sveikata"*). For this reason, it is not surprising that doctors claim that the management of the tool is complex and that it was necessary to learn to manipulate it on own (*but it all takes a very long time to learn to use it*), consult with senior colleagues or look for information online (*some kinds of specific skills are probably not needed just need to put time there to get acquainted, because every new thing is not clear, maybe, at least in my case, you had to ask colleagues or watch YouTube videos to see how to use this equipment because you don't get any training when you start working*). Respondents acknowledge that training in computer management skills would also be needed to properly manage the tool (*computer literacy is needed because it is really very difficult to use this system without it*). Besides that, the respondents themselves reveal how it would be possible to solve the problem of this challenge simply by sharing the tool management instructions and changing them, showing how to use the tool by just communicating (*to provide information on an ongoing basis. Well, it would be as convenient as possible for professionals and patients to be shown how to use everything there and what is changed and what is not. Just clarification and communication*).

Table 6. Lack of training challenges faced by doctors (Created by the author, 2022).

Doctor	**Category**	**Subcategory**	**Justifying statements**
Doctor A	Challenges	Lack of training	"I know how to do as much as I need at work basically, but the fact that I fully understand what functions there are from A to Z - I really don't understand this thing. I was not trained."
Doctor B	Challenges	Lack of training	"I don't have the knowledge of how to as a doctor, how to extract the maximum information from that system and how to make sure I use all the features. I did not have any training or help in getting acquainted with the "E.Sveikata"."
			"I don't understand how much I can get out of it."
			"The "E.Sveikata" should be introduced at the beginning of the work so that the doctor can manipulate the system as much as possible with its disadvantages, as well as the possible obstacles."
			"To provide information on an ongoing basis. Well, it would be as convenient as possible for professionals and patients to be shown how to use everything there and what is changed and what is not. Just clarification and communication."
Doctor C	Challenges	Lack of training	"But it all takes a very long time to learn to use it."

Doctor E	Challenges	Lack of training	"Some kinds of specific skills are probably not needed just need to put time there to get acquainted, because every new thing is not clear, maybe, at least in my case, you had to ask colleagues or watch YouTube videos to see how to use this equipment, because you don't get any training when you start working."
Doctor F	Challenges	Lack of training	"How to deal with such situations during my work experience I lost sight of."
Doctor G	Challenges	Lack of training	"Computer literacy is needed because it is really very difficult to use this system without it."

Following challenge revealed by the semi-structured individual interviews is a lack of support (see table 7). This challenge was mentioned by two of the respondents. One doctor states that the processing of medical information has always been extremely complicated and that he has not seen any other way to do so than when the information was processed and recorded on paper or during the digitization process, and that this problem has never been resolved (*you fill in one tool with another, you combine the codes into all sorts and into the electronic system and you still write by hand and I just don't see such an excessive thing in it and I haven't even seen it that way, it's been unsolvable for many years*). Another thing stated was that if the doctor meets an individual level of challenge with the tool, the issue solving time is relatively long – something around a week (*IT only solves the issue within a week if the case is individual*). There is also an idea shared of not getting to be heard or asked about how the processes are going with the ones who actually use the system on a daily basis (*I don't know if anyone doesn't want to take responsibility for it or something like that, it's been moving like the "dragon without a head" for many years and we see and feel it in every institution. The biggest problem is that there is no consultation with the people who work with the tool directly*). Another respondent also shares that usually employees have nowhere to turn when challenges arise, so they do not turn (*you don't usually go anywhere because you don't know where to go conveniently*), but this requires a lot of stakeholders' time and other resources (*it requires a lot of resources from doctors and nurses and patients*). Doctors reveal that there is a lack of access and opportunities to seek and get help to solve the challenges in your own institution at least on weekdays, despite the fact that "E.Sveikata" tool is still a state-owned company (*there should be very easy access to a permanent consultation, for example during working days. Also "E.Sveikata" in each institution, although the "E.sveikata" is a governmental system, covering the whole country, I think the responsibility is on each institution to ensure comfort for the use of the system to the doctor*).

Table 7. Lack of support challenges faced by doctors (Created by the author, 2022).

Doctor	**Category**	**Subcategory**	**Justifying statements**
Doctor A	Challenges	Lack of support	"You fill in one tool with another, you combine the codes into all sorts and into the electronic system and you still write by hand and I just don't see such an excessive thing in it and I haven't even seen it that way, it's been unsolvable for many years."
			"<…> IT only solves the issue within a week if the case is individual."
			"<…> I don't know if anyone doesn't want to take responsibility for it or something like that, it's been moving like the "dragon without a head" for many years and we see and feel it in every institution. The biggest problem is that there is no consultation with the people who work with the tool directly."

			"It still isn't improving and you get another tool with great potential, and every time you get nervous because you know you care about it and can't do anything about the situation <…>"
Doctor B	Challenges	Lack of support	"<…> there should be very easy access to a permanent consultation, for example during working days. Also "E.Sveikata" in each institution, although the "E.sveikata" is a governmental system, covering the whole country, I think the responsibility is on each institution to ensure comfort for the use of the system to the doctor."
			"You don't usually go anywhere because you don't know where to go conveniently."
			"It requires a lot of resources from doctors and nurses and patients."

Another common challenge disclosed is connectivity issues (see table 8). Connectivity challenges were identified in three out of seven statements. Doctor A revealed facing a connectivity problem between clinics and state domains which usually leads to unavailability to use a tool (*because that system is double, so it turns out that if this national platform fails, it goes to the institutions, and if the institutions fail, the national "E.Sveikata" system works*). Respondent declares that even in the past when documents were filled by hand and on paper, it was easier and simpler to manage the tasks because you could have saved time and didn't have to log in (*the fact is that in the past it was necessary to fill in the paper card, which was easy and simple, and with "E.Sveikata" you need to connect, it takes time, but knowing the benefits it can be tolerated*). It is also stated that connectivity is the main challenge while applying the digitalization tool "E.Sveikata" – after a while of not actively using the tool, it just logs out and reconnection takes a lot of time (*the main challenge is the connection, because if you do not connect and work with the patient for a long time then you have to reconnect each time*), besides doctors are always obliged to carry some kind of technological device, otherwise, the connection to the tool is unavailable and there is no other way to complete the daily tasks if a human error appears and, for example, doctor forgets his phone (*if you forget your phone, do not take it with you, you will not be able to connect to "E.Sveikata". It's that you really have to always move along with some kind of technology device*). Moreover, the respondent stated that he prefers to use the internal systems of the clinic than the "E.Sveikata" tool because then there is no need to constantly connect and disconnect (*I perform through the hospital system, which is integrated with the "E.Sveikata" system and it is more convenient to use, no need to log in, log out*).

Table 8. Connectivity issues challenges faced by doctors (Created by the author, 2022)

Doctor	**Category**	**Subcategory**	**Justifying statements**
Doctor A	Challenges	Connectivity issues	"Because that system is double, so it turns out that if this national platform fails, it goes to the institutions, and if the institutions fail, the national "E.Sveikata" system works."
Doctor E	Challenges	Connectivity issues	"The fact is that in the past it was necessary to fill in the paper card, which was easy and simple, and with "E.Sveikata" you need to connect, it takes time, but knowing the benefits it can be tolerated."
	Challenges	Connectivity issues	"The main challenge is the connection, because if you do not connect and work with the patient for a long time then you have to reconnect each time."
	Challenges	Connectivity issues	"If you forget your phone, do not take it with you, you will not be able to connect to "E.Sveikata". It's that you really have to always move along with some kind of technology device."

Doctor F	Challenges	Connectivity issues	“I perform through the hospital system, which is integrated with the "E.Sveikata" system and it is more convenient to use, no need to log in, log out <…>”

No less important is the challenge mentioned by four out of seven respondents – unawareness of risk management plans (see table 9). Given that doctors face a number of challenges discussed before, it is important to have some kind of risk management plan or action in place. Unfortunately, however, respondents say they have not seen such a plan (*so far, I haven't seen any risk plan*) or it was not resented to them (*I don’t have any instructions. At least I didn't hear it and no one really told or showed it*). Doctors have revealed that the non-existence of a plan and ignorance of the problem affect their choices - when problems or challenges arise, they simply just stop using the tools (*I don’t know about any risk management plan and it wasn’t presented, when the issue comes, I just don’t use it*). One of the doctors declared, that the only thing that was noticed is that if the tool doesn’t work, sometimes there are error messages in the tool informing about the tool’s failure, but the issues are quite common and usually unsolved (*no such plans am... I haven't seen it even though the system doesn't work very often, sometimes it's informed in red letters in advance*).

Table 9. Unawareness of risk management plans challenges faced by doctors (Created by the author, 2022)

Doctor	**Category**	**Subcategory**	**Challenges**
Doctor B	Challenges	Unawareness of risk management plans	“I don’t know about any risk management plan and it wasn’t presented, when the issue comes, I just don’t use it.”
Doctor E	Challenges	Unawareness of risk management plans	“<…> so far, I haven't seen any risk plan.”
Doctor F	Challenges	Unawareness of risk management plans	“No such plans am... I haven't seen it even though the system doesn't work very often, sometimes it's informed in red letters in advance.”
Doctor G	Challenges	Unawareness of risk management plans	“I don’t have any instructions. At least I didn't hear it and no one really told or showed it.”

The last challenge, but no less important than the others, is poor organizational system management (see table 10). One out of seven respondents pointed out that the hospital, although it uses the “E.Sveikata” tool, also has several other systems that you need to learn to use individually in order to complete daily tasks (*systems that are used in the hospital - we have too many of them, they all are different, with each system you have to learn to work again*). Similarly, other hospitals have multiple different systems for completion of their daily atsks, which complicates patient registration at the organizational level (*some institutions have their own separate registration platforms and you just need to know where to look if you want to register somewhere specifically, it is also nonsense*). Doctor shares that digitization tools provide a great opportunity to have convenient facilities and transparent registration systems at the organizational level that could provide clearier processes for everyone (*there is a possibility to have a very transparent registration platform, where everyone has equal rights, everyone sees when, where there are vacancies and can register wherever they want, or can find a specific specialist, in a specific field*).

Table 10. Poor organizational system management challenges faced by doctors (Created by the author, 2022)

Doctor	Category	Subcategory	Justifying statements
Doctor A	Challenges	Poor organisational system managment	Systems that are used in the hospital - we have too many of them, they all are different, with each system you have to learn to work again Some institutions have their own separate registration platforms and you just need to know where to look if you want to register somewhere specifically, It is also nonsense. There is a possibility to have a very transparent registration platform, where everyone has equal rights, everyone sees when, where there are vacancies and can register wherever they want, or can find a specific specialist, in a specific field. the tool is amazingly good, but we manage it very poorly because if we take the best examples in Europe, in same Estonia as they are engaged in that "E.sveikata" management, we have nothing like it.

Respondent also declare that this idea of the tool is extremely good, but organizations do not know how to manage them, as presented from his own personal experience – it is especially well managed in institutions of Estonia and overall Europe (*the tool is amazingly good, but we manage it very poorly because if we take the best examples in Europe, in same Estonia as they are engaged in that "E.Sveikata" management, we have nothing like it*).

4.1.2. Challenges faced by patients

After analyzing the challenges faced by patients using the digitization tool (see figure 14), it can be stated that the challenges found by patients are also broadly analyzed in theory. The data revealed that patients face challenges of insuffiecient medical information, expectation and their management, lack of main understanding of the tool, and the special skills needed, besides, it was found that it was pretty common among respondents to have user ignorance of the digitalization. This is confirmed by the number of encoded segments in the "SUM" column. The circles shown indicate the actual visualization where the bigger the size is, the more identifications of relevant codes are identified separately in the information provided by each respondent. Further analysis of the results will be based on the frequency of challenges faced by patients' identification from highest to lowest.

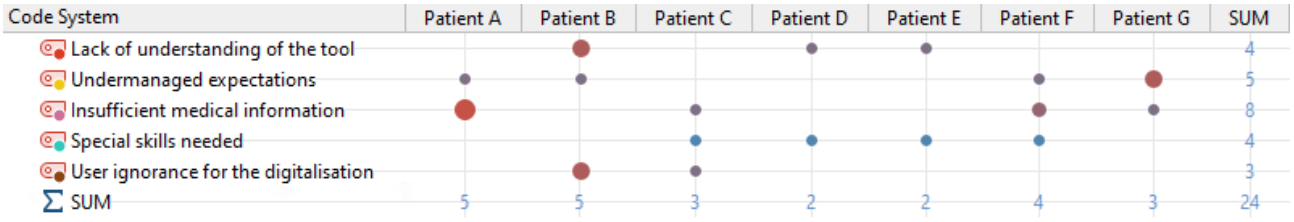

Figure 14. Distribution of challenges frequencies across different patients (Created by the author, 2022).

Many of the respondents declare experiencing a lack of insufficiency of medical information in the "E.Sveikata" tool (see table 11). Four out of seven patients revealed challenges related to medical information insufficiency while applying the tool. Respondent disclosed that the tool itself is relevant to its idea, but it does not contain the entire medical history that was performed both 10 years ago, since birth (*I think the tool would serve that purpose, but maybe it's not completely widespread, because… Um… let's say I can't find the data in my health file… Let us say… Um… 10 years back*

when I was younger). Similar insights were declared from other patients too (*maybe it could be more informative, maybe some possibility to see a whole lifetime history*). Patients are only able to see data from three years back only and it creates challenges while monitoring chronic types of diseases (*I had to log in a few times, maybe more out of such curiosity to see what's written on my name. I was missing…As I mentioned earlier, archival information. Because as far as I've seen this data is about maybe three years old. Um…Although I would like to see the information from that previous year before. Because I had a lot of am…Health issues before, it's just that curiosity that might lead and I would like more data to be seen*). Another information aspect that the tool is missing test and visual information (*at least for me personally there is a great lack of accurate test answers, let's say an accurate blood test answer… How many x-rays were taken or what copy was made so that all the data could be loaded and so that any time I could see and know exactly what…What tests, what answers were received*). Respondent shares, that misses information suitable for himself, not for medical staff (*I really missed such archival information, let's say, which I think would be useful for myself so that patient could see and get acquainted with*). Overall patients state, that all of the information in the tool is either not available (*the main challenge is that not all information is available*), or simply not meant to be visible (*not everything is visible to the patient*).

Table 11. Insufficient medical information challenges faced by patients (Created by the author, 2022).

Patient	Category	Subcategory	Justifying statements
Patient A	Challenges	Insufficient medical information	"I think the tool would serve that purpose, but maybe it's not completely widespread, because… Um… let's say I can't find the data in my health file… Let us say… Um… 10 years back when I was younger."
			"<…> at least for me personally there is a great lack of accurate test answers, let's say an accurate blood test answer… How many x-rays were taken or what copy was made so that all the data could be loaded and so that any time I could see and know exactly what…What tests, what answers were received."
			"The main challenge is that not all information is available."
			"Again, I would like to reiterate that I have repeatedly noticed a lack of health data…"
Patient C	Challenges	Insufficient medical information	"<…> maybe it could be more informative, maybe some possibility to see a whole lifetime history."
Patient F	Challenges	Insufficient medical information	"I really missed such archival information, let's say, which I think would be useful for myself so that patient could see and get acquainted with <…>"
			"I had to log in a few times, maybe more out of such curiosity to see what's written on my name. I was missing…As I mentioned earlier, archival information. Because as far as I've seen this data is about maybe three years old. Um…Although I would like to see the information from that previous year before. Because I had a lot of am…Health issues before, it's just that curiosity that might lead and I would like more data to be seen."
Patient G	Challenges	Insufficient medical information	"<…> not everything is visible to the patient <…>"

Another thing four patients out of seven point out is their expectations regardless of the aim of the tool are undermanaged (see table 12). Respondents point out the difficulty of the registration to the doctors through the "E.Sveikata" tool (*I don't know if it can be considered a challenge when it's*

impossible to find vacancies for some specialists). They meet a situation whee it is hard to find places and hard to manipulate the system in order to achieve favourable task, and at the end there is no explanation of why and how some of the situations happened (*the registration is very difficult. There are lots of doctors to choose from, you have to navigate a lot till you find the information, then at some point it can stop working and no explanation will be provided of what where, and why happened*). Patients expect the tool to be handy and available to perform particular tasks in a more advanced way, but at the very end they end up facing the errors (*there have been some attempts to connect when there have been some system crashes at the time. But if I remember correctly, it was posted in the system itself that there are currently technical hurdles. It's just a wait in that case if it's not an urgent matter, since no other actions were provided to be performed*) and don't feel it being advanced at all (*at least I don't feel like it helps more than it did before it didn't exist*).

Table 12. Undermanaged expextations, challenges faced by patients (Created by the author, 2022).

Patient	Category	Subcategory	Justifying statements
Patient A	Challenges	Undermanaged expectations	"I have never faced any situation when I couldn't access the information somehow… Now if I thought about what I would do… I would just wait until I could re-join. And anyway… In the past, no one had given any plans on what should be done, and how it should be done to make the portal work."
Patient B	Challenges	Undermanaged expectations	"<…> the registration is very difficult. There are lots of doctors to choose from, you have to navigate a lot till you find the information, then at some point it can stop working and no explanation will be provided of what where, and why happened."
Patient F	Challenges	Undermanaged expectations	"There have been some attempts to connect when there have been some system crashes at the time. But if I remember correctly, it was posted in the system itself that there are currently technical hurdles. It's just a wait in that case if it's not an urgent matter, since no other actions were provided to be performed."
Patient G	Challenges	Undermanaged expectations	"At least I don't feel like it helps more than it did before it didn't exist."
			"I don't know if it can be considered a challenge when it's impossible to find vacancies for some specialists."

Furthermore, four out of seven patients declared that in order to apply the tool, there is a need for some special skills (see table 13), while others might don't have them, it becomes to be challenging. To login to the tool you need to verify the identity of the user and for this task there is a need to sign in through some banking systems (*to use that system, because there is a need to log in through some system, still, through that banking, not everyone has taken out those accounts there again, then there are problems with it, and anyway, the elderly in our country don't have such skills even though the state has those projects where they are taught basics of computer literacy, but I think there are still those barriers*). For that person has to have one and also know how to use technological tools such as smartphone or computer (*you need to connect either with a digital card or smart id banking. This should be understood in general besides information technology, not just the ability to use the computer itself*). Respondents reveal, that for the younger generation such process is not quite so challenging, while they brought the attention to the older generation (*let's say we, young people, don't need it, but let's say older people...Since you need to connect with e-banking, um...It's really not very easy for them and they really need help with understanding, so maybe I could say that*). Not all of

them are familiar with the technologies and skills, such as computer literacy that are needed to use such tools and might need training for that (*older people let's say I don't know who aren't very used to being at computers, I think they need some training to use it*) keeping in mind that there is also a need to physically have such technology-based tool at home.

Table 13. Special skills needed, challenges faced by patients (Created by the author, 2022).

Patient	Category	Subcategory	Justifying statements
Patient C	Challenges	Special skills needed	„To use that system, because there is a need to log in through some system, still, through that banking, not everyone has taken out those accounts there again, then there are problems with it, and anyway, the elderly in our country don't have such skills even though the state has those projects where they are taught basics of computer literacy, but I think there are still those barriers.“
Patient D	Challenges	Special skills needed	„Let's say we, young people, don't need it, but let's say older people...Since you need to connect with e-banking, um...It's really not very easy for them and they really need help with understanding, so maybe I could say that.“
Patient E	Challenges	Special skills needed	„Older people let's say I don't know who aren't very used to being at computers, I think they need some training to use it.“
Patient F	Challenges	Special skills needed	„<...> you need to connect either with a digital card or smart id banking. This should be understood in general besides information technology, not just the ability to use the computer itself.“

Another important thing refined during the interviews is a lack of understanding of the main "E.Sveikata" tool (see table 14). Three out of seven patients met challenges because they did not understand the tool, or navigation in it and have not been trained in that. Firstly, they declare that the main login is difficult, there are several ways to do so and in order to find that out, the patient had to look for information about that on the internet to gain the understanding (*I remember you can connect there in two ways and it was in one way not working so I had to look at the internet of how to do it correctly*). Respondent shares an insight that it would be beneficial to have some kind of training in order to understand the main tool and how to use it (*it could actually be at least training in how to use it, because I don't know how to use it myself*). Another thing is to understand how registration for the appointment with the doctor work (*we can register to the doctors through "E.Sveikata", but it's harder to register to them, harder to see free times or the information you need isn't available*). The lack of understanding of the tool even leads back from the technologies to primary processes (*hard to succeed because am... I do not use that for registration with a doctor through "E.Sveikata"...I call the reception directly because it is too difficult to find anything else there*).

Table 14. Lack of understanding of the tool, challenges faced by patients (Created by the author, 2022).

Patient	Category	Subcategory	Justifying statements
Patient B	Challenges	Lack of understanding of the tool	"<…> it could actually be at least training in how to use it, because I don't know how to use it myself."
			"Hard to succeed because am... I do not use that for registration with a doctor through "E.Sveikata"…I call the reception directly because it is too difficult to find anything else there <…>"

Patient D	Challenges	Lack of understanding of the tool	"I remember you can connect there in two ways and it was in one way not working so I had to look at the internet of how to do it correctly."
Patient E	Challenges	Lack of understanding of the tool	"We can register to the doctors through "E.Sveikata", but it's harder to register to them, harder to see free times or the information you need isn't available."

The last challenge, but no less important than the others, is user ignorance for the main digitalization process and the tool "E.Sveikata" (see table 15). Two out of seven interviewed respondents revealed insights of reluctance or ignorance to apply digitalization. One of the patients states that digitization has a major disadvantage: it requires internet access and is completely dependent on it, as a result sometimes he end up in not using the tool at all (*the downside of "E.Sveikata" is that there is complete dependence on an internet connection. I mean, if there are any problems connecting, then no one can find out anything, it's here quite like a strong minus of tecnologies, in my opinion*). With the advent of the tool, paper prescription cards disappeared, which made it quite easy to see when and what medications were prescribed. To find out this information, you now have to connect to the device, confirm your identity, and find the last prescription, which according to the respondent complicates the whole process (*affected by the fact that I no longer have a prescription book and can no longer see in a fast way when I need to go to the doctor, I can't see when the prescription expires. Therefore, I have to connect to "E.Sveikata" and see when the prescription ends*). Habits such as those mentioned, make it clear, that it is either difficult to adapt or a person is unwilling to adapt to the digitization process. In this situation, the person even declares straightly, that he doesn't like digitalization decisions and rather achieve goals the old and hard way (*since I am a person who does not like all sorts of computer things and everything similar, I would rather call the reception 25 times a day until I register than if I log in through the "E.Sveikata" and try to register*).

Table 15. User ignorance for the digitalisation, challenges faced by patients (Created by the author, 2022).

Patient	**Category**	**Subcategory**	**Justifying statements**
Patient B	Challenge	User ignorance for the digitalisation	"Affected by the fact that I no longer have a prescription book and can no longer see in a fast way when I need to go to the doctor, I can't see when the prescription expires. Therefore, I have to connect to "E.Sveikata" and see when the prescription ends."
			"Since I am a person who does not like all sorts of computer things and everything similar, I would rather call the reception 25 times a day until I register than if I log in through the "E.Sveikata" and try to register."
Patient C	Challenge	User ignorance for the digitalisation	"The downside of "E.Sveikata" is that there is complete dependence on an internet connection. I mean, if there are any problems connecting, then no one can find out anything, it's here quite like a strong minus of tecnologies, in my opinion."

4.1.3. Applicable solutions to overcome the challenges

Analyzing the challenges faced by health sector stakeholders while applying the digitalization tool "E.sveikata", there were a total of 13 subcategories of challenges identified. According to Ensafi and Thabet (2021), the main step of improving digital tool is by analysing its challenges and taking a look back at the stages of its creation and implementation since usually there is a gap in those proceses leading to those challenges. Framework as a theoretical tool, is a reat way for guidance in risk and challenge management (Stepanyan, 2021).

Based on these statements, to provide possible solutions to overcome the challenges stakeholders met during the application of the digitalization tool "E.sveikata", an analysis will be made according to the framework the research author created with the help of theoretical part findings (see figure 12). For a better picture of the situation, all stakeholder challenges are depicted in the theoretical framework steps (see figure 15).

To begin with, according to the theoretical framework, the challenge of the special skills need should have been identified and clarified in the first, identification step. This action would have made it possible to identify what skills are needed and what is available to manage the tool used.

In the second step, four different groups of challenges are visible. According to the framework, this step takes action to create an intuitive, easy-to-use tool design that avoids the challenges of functionality, efficiency, connectivity, and data accessibility that are now occurring. Those challenges also could have been repealed if the tool development process would have been applied step of iterative tool design and evaluation.

In this step, developers could see that the "E.Sveikata" tool was not correlating well between other systems and domains if they had applied.

The implementation and testing step is empty because all the steps had been taken before. Considering the Status Quo of the "E.Sveikata", in the process of this step all security and analysis mechanisms would have shown the challenges identified in the first three steps while testing the tool in actual practice and in order to achieve a high-quality result, eliminate the problems encountered by traveling to previous steps and analyzing the problems encountered.

The last step provides the challenges that are in real-time. Those could be easily managed and eliminated with actions such as sharing a risk management plans and actions with all of the stakeholders, providing them with constant pieces of training, sharing the information of the expected errors, and contacts of help providers thus providing a sense of security when using the tool, educate the stakeholders of the importance of such tool and all the possibilities it can provide. This step should also include listening to stakeholders' insights and expectations and improving the system accordingly.

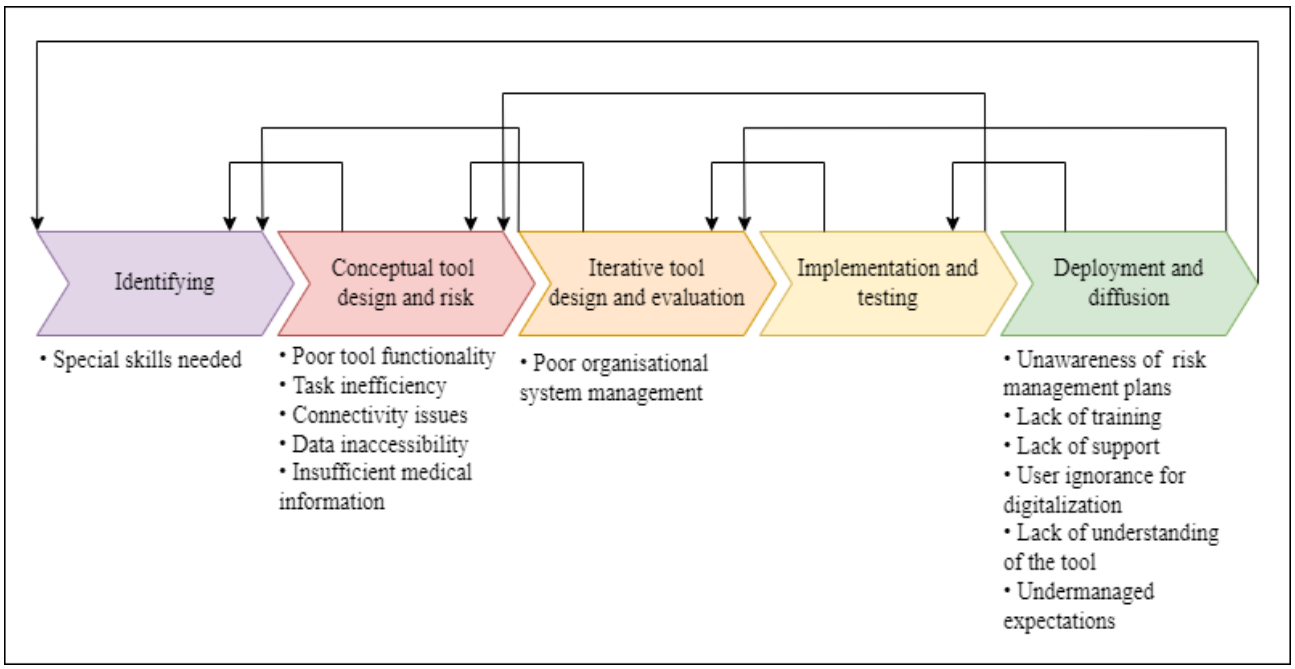

Figure 15. Challenges stakeholders met while applying digitalisation tool "E.Sveikata" divided into theoretical framework steps. (Created by the author, 2022).

Besides, if deployment and diffusion step would be active, it could also provide with the information from stakeholders on what is not working quite well and what is the most challenging, this way together with the help of all the ecosystem, eliminate all the previously mentioned challenges, deliver the best possible tool and be prepared for more innovative and advanced tools.

Based on the analysis of this case, the results obtained and the framework used to provide the solutions of how the challenges at different stages of deployment could have been avoided and what steps could be taken now to solve them (see table 16).

Table 16. Possible solutions to the challenges at different stages of tool "E.Sveikata" deployment (Created by the author, 2022).

Stages	**Challenges**	**Actions missed to take**	**Actions to be taken**
Identifying	Special skills needed*	Examine existant and needed abilities and skills	Provide trainings according to the examined needed abilities and skills
Conceptual tool design and risk	Poor tool functionality*	Design proper mechanisms of action	Examine, identify and improve features, processes, and extraction of the information.
	Task inefficiency*	Create proper task structures	Examine, identify and improve tasks in order to eliminate the majority of manual work.
	Connectivity issues*	Design proper mechanisms of action	Examine, identify and improve login techniques and safety solutions
	Data inaccessibility*	Create proper information infrastructure	Examine, identify and improve internet stability, navigation in the tool, access management, and shared data configuration

	Insufficient medical information*	Create proper information infrastructure	Examine, identify and improve shared data types, their variety, and archives
Iterative tool design and evaluation	Poor organisational system management*	Thorough evaluation and optimisation of intervention components	Examine, identify and correlate internal and external database collaboration
Implementation and testing	Applicable to marked by "*"	Proper refination of the implementation	Monitor, evaluate and if needed upgrade the effect of improvements made in the practical environment
Deployment and diffusion	Unawareness of risk management plans	Train and inform stakeholders	Inform and conduct recurrent trainings on potential risks and their management
	Lack of training	Train and inform stakeholders	Inform and conduct recurrent training on tool management and share a common, always-accessible information document
	Lack of support	Train, inform stakeholders and collect feedback	Inform and conduct recurrent training about the possibilities for resolving errors, provide the contact details of the responsible persons.
	User ignorance for digitalisation	Train, inform stakeholders and collect feedback	Educate and provide information about the benefits and possibilities, provide examples
	Lack of understanding of the tool	Train and inform stakeholders	Provide clear instructions on connection options, usage, and options of the tool
	Undermanaged expectations	Colect feedback	Collect feedback on the experience while applying tool and innovate accordingly

As it is visible, most of the actions were possibly missed at the first three stages, when the tool in creation mode and all the essentials were supposed to be clarified. In first, identification step, it was missed to fully examine existant and needed abilities and skills of the users of the tool. In order to solve this challenge, now it could be helpful to mitigate it while examining the needed abilities and skills of the users and provide specified trainings based on the results.

At second stage there were five challeges identified. Developers missed the possibility of proper designing of mechanisms of actions and as a result two challenges were observed. Possibility to solve them could be achieved while examining, identifing and improving features, processes, extraction of the information, login techniques and safety solutions. Furthemore, it was also missed to create proper imformation infrastructure, resulting in data inaccessibility and insufficient medical information. These challenges could be soled by examining, identifing and improving internet stability, navigation in the tool, access management, shared data configuration, shared data types, their variety, and archives. Also, task inefficiency of tasks was identified, which could appear by missed actions in creation of task structures. This could be solved by examining, identifing and improving tasks in order to eliminate the majority of manual work and double filling of the documentation.

In the third, iterative tool design and evaluation stage, one challenge was identified – poor organisational system management. According to the theoretical framework, if thorough evaluation and optimisation of intervention components in this stage would have been done, possibly such

challenge would not exsist. To possibly mitigate the challenge examining, identifing and improving shared data types, their variety, and archives could be done.

Following, implementation and testing stage does not have any clearly expressed challenge, but since it is a stage of testing, all of the previously metioned challenges fall under this stage name. If developers were fully analyzing, testing, identifying and improving first three stages, fourth stage would be empty and fulfilled, but proper refination of the implementation was missed. In order to succeed at this stage, monitoring, evaluation, and if needed upgrade of the effect of improvements made in the practical environment could be done.

Last, deploymet and diffusion stage, is the most promising, since it is situated on an always ongoing basis. In this stage, challenges of unawareness of risk management plans, lack of training and lack of understanding of the tool was possibly not fully prepared till now. Ther might be a lack of stakeholders training and informing, what could be eliminated by simply informing and conducting recurrent trainings on potential risks, their management, providing clear instructions on connection options, usage, tool options, tool management and by sharing a common, always-accessible information document. Besides those challenges, there is also undermanaged expectations, that could be solved by collecting the feedback of the users experience while applying tool and innovating accordingly, what was possibly not done before. There are also two last challenges, that were both solvable from the beginning by providing trainings, informing stakeholders and collecting feedback. Lack of support could be solved by informing and conducting recurrent trainings about the possibilities for resolving errors and provision of the contact details of the responsible persons. User ignorance for digitalisation could be solved educating and providing information about the benefits, possibilities and positive examples.

All these possible actions would deprive a lot of both financial and human resources, but “E.Sveikata” tool is one of the first and basic steps towards the digitization of the healthcare sector in Lithuania, and in order for this process to be smooth and high in quality, it is necessary to deal with the challenges at this stage.

Future research

This study is more of a source of primary information of the situation regarding to case of “E.Sveikata” tool. In order to analyze the application of the “E.Sveikata” tool and its challenges more widely and accurately, a study involving data from interviews of all ecosystem stakeholders could be conducted. It would also be beneficial to conduct such researches in other Lithuanian hospitals. Further on, with the collected data, quantitative research could be done in order to evaluate all country’s hospitals preparation for the digital future.

CONCLUSIONS

1. After analyzing the theory problematics, it can be stated that with a rapidly changing society, economy, and living conditions technology is changing to improve inventions and ideas in a way creating ever newer and more innovative solutions. The Healthcare sector evolution and its benefits are clearly visible by a thorough analysis of existing and forming healthcare 1.0 – 5.0. It allowed moving from paper records to the much more complicated and innovative solutions and tools, that are able to complete tasks on their own in a faster way consuming fewer assets. It is expected to reach more progress than it was during the past 100 years seeing that technology is emerging in a wide range of various industries and domains by reshaping them. The acceleration of the digitalization process started to grow even more when Covid-19 pandemics emerged, even those countries, that weren't ready to digitize, stepped in, including Lithuania. Those, who would adopt artificial intelligence between the years 2017 and 2022, would gain the most economic benefit, which is nearly 150 times bigger compared to ones adopting later on. A lot of data about the digitalization process was collected by European counterparts and World Health Organization but they are not high in quality due to pandemics emergence that exceeded the forecasts of expenditures. This condition ends up in a situation where there is enough data, but the analysis received out of it is poor. Based on the information from scientific articles supporting the historical importance and inevitability of digitalization in the health sector, emerging challenges in the application of tools worldwide, promising perspective on value creation, the lack of accurate data and analysis, and the importance of such process internationally, it arises the need of this study to research the field of digitization tools, their challenges, and how they can be overcome.
2. The possibilities of digitalized tools in the field of healthcare, both in the past, present, and future, are enormous. It provides opportunities, methods, data, and a set of information, allowing to understand, prevent, navigate and reshape the future of health by managing conditions, early diagnosis, predictions, and demands with interaction in between creating the huge potential to move forward in the heal care management. It is already identified more than 17 different healthcare tools and their combinatorial systems. All these inventions impact each of the stakeholders in the healthcare ecosystem. The analyzed literature distinguishes 10 main stakeholder groups - medical, rehabilitation, nursing, pension, third-party, supply, medical insurance, payment, regulatory services, and service objects. This stakeholder's ecosystem was reshaped by the healthcare sector activities by providing a wide spectrum of various innovative decisions for the stakeholders and everyday healthcare sector processes that nowadays cannot be separated and has significant importance for the whole population. On the other hand, it is noticed an even greater number of challenges while applying digital tools in healthcare, such as tools are still insufficient, difficult to use, having limitations, legal base, besides, it is revealed that the strategy of digital healthcare is not sequential, still in an early stage, lacks privacy and data security as well as funding. Resources revealed the negative impact on physicians' practical skills and challenges arising between different religions and countries. Since the application of digital tools in healthcare is a long process that requires vast amounts of knowledge, in addition to financial and human resources, for a smooth and successful implementation of its resources suggests various frameworks. Frameworks are created in order to analyze, integrate, capture, or provide implementors with the decision-making in various digitalization application stages in the healthcare sector. The differences between them are visible and they are meant to be but what is most important is that each of them turns to some similar specific arguments and suggestions.

Scholars emphasize the importance to analyse the decision, strategy, gaps, and key aspects of digital healthcare tools' application. They state that without clarifying the main basics of who will be the users, what solution is needed, and how to adjust to the legal system, no tool, system, or decision would be qualified enough to provide the result needed. Based on all this theoretical information, a framework has been developed to facilitate the application process of the digitization tool.

3. Methodology of the empirical research was created. The research was conducted as a case study by applying semi-structured individual interviews in order to achieve in-depth results of healthcare challenges met while applying the digital tool "E.Sveikata". Two groups of stakeholders were interviewed, with 7 respondents from each. Each group of respondents had two main criteria. Because of the specifics of the case, selected method, and the number of respondents interviewed, the results of the research are not applicable neither for the whole sample nor for other institutions or countries. Interviews were conducted based on confidential principles and the main study was performed in five steps sequence.
4. During analysis of the results of the empirical part, it was found:
    1) All seven doctors had faced at least one type of challenge while applying the digitalization tool "E.Sveikata". Overall, it was found eight different coded groups of challenges. The most frequently declared was poor tool functionality, mainly addressing the inconvenience of the tool, constant lags and instabilities, underperforming on heavy load days, and overall inability to find information that is sometimes not even in the tool. The next most frequent challenge was that tasks completed through the tool are inefficient, require double filling, is time consuming resulting in slowing down all the processes, besides that, errors tend to create situations in which doctors can no longer prescribe medication belonging to a patient and have to violate internal rules in order to do so the next day. Also, respondents face challenges, which were less frequent, that affect data accessibility and sharing. Doctors declared not having any type of training, resulting in not knowing how to manipulate the tool, what can be found in it, and how much and what actions can be performed, so the tool is often replaced by primary internal systems. Furthermore, in case of error, respondents have no idea how to solve it, where to seek help, or if they know, they don't since the process for it being solved takes up to a week and at that moment, they can use internal systems. Less frequent challenges were mentioned as connectivity issues, unawareness of risk management plan, and poor organizational system management.
    2) All seven patients had faced at least one type of challenge while applying the digitalization tool "E.Sveikata". Overall, it was found five different coded groups of challenges. The most frequently declared was, that medical information, provided in the tool is insufficient, patients miss information of their medical records, miss health history, its archives, also not all information is visible or available. The next following most frequent challenge was that their expectations were undermanaged – the tool was not providing the services as expected, poses difficulty in reaching data and receiving services, which that tool actually should be able to do. Besides that, respondents declared having a lack of understanding of the tool, also, in order to perform particular tasks, they need some specific skills that they haven't received training for. Furthermore, login to the systems sometimes confusing due to several unexplained options, which, together with recurrent jamming, for some of the patients brought up ignorance of the digitalization overall.
    3) Analyzing the challenges faced by health sector stakeholders while applying the digitalization tool "E.sveikata", there was a total of 13 subcategories of challenges identified. To provide

possible solutions to overcome the challenges stakeholders met during the application of the digitalization tool "E.sveikata", an analysis was made according to the framework the research author created with the help of theoretical part findings, all stakeholder challenges are depicted in the theoretical framework steps. All challenges, according to the theoretical framework could have been avoided, if one would have been applied. Challenges mainly accrue due to incomplete analysis, superficial testing, lack of communication, training, and disregard for the needs of key users. Such challenges could be avoided if such or similar framework would have been applied while applying the tool in the hospital. Besides, if the institution would decide to apply such a framework and at least refine the current challenges, there is an opportunity to improve the application of this tool this way creating the possibility for other, more innovative digitalization tools and systems.

Future research could analyze the application of the "E.Sveikata" tool and its challenges more widely and accurately with a study involving data from interviews of all ecosystem stakeholders. It would also be beneficial to conduct such researches in other Lithuanian hospitals. Further on, with the collected data, quantitative research could be done in order to evaluate all country's hospitals preparation for the digital future.

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APPENDICES

Appendix 1. Questionnaire of the research for doctors

Introduction:

• Hello, I am very glad that you have agreed to participate in this interview. The goal of this interview is to get a better understanding of the digitalization tool “E.sveikata” application in the hospital you are working in based on your personal experience as a doctor. I would rather choose not to give any of the examples related to the questions in order to receive the unique answers, but feel free to ask for clarification if you don’t understand the question given.

• Before we start, I would like to inform you that the interview is recorded. The interview is going to be used for study purposes only and your identity will be known only to me. This means that once I finish analyzing your answers, the recording of this interview is going to be deleted, and no one will be able to identify you.

1. Whom could you identify as the intended users of the digitalization tool "E.sveikata"?

2. Describe the purpose of the digitalization tool "E.sveikata". Do you believe this tool fulfills this purpose?

3. Do you think you need any additional or specific skills to use this tool? If yes, what kind?

4. Describe your ability and knowledge to use this tool "E.sveikata".

5. How do you manage to apply the „E.sveikata“ tool in your daily activities?

6. How does the digitization tool "E.sveikata" affect your daily activities?

7. What kind of challenges are you familiar with while applying the digitization tool "E.sveikata"?

8. Tell us what you did if you ever encountered a problem with the tool when you could not use it in full or in part. Were you presented with any risk management plan or action?

9. Is there something you would like to add or mention related to this topic?

Appendix 2. Questionnaire of the research for patients

Introduction:

• Hello, I am very glad that you have agreed to participate in this interview. The goal of this interview is to get a better understanding of the digitalization tool “E.sveikata” application in the hospital you are visiting based on your personal experience as a patient. I would rather choose not to give any of the examples related to the questions in order to receive the unique answers, but feel free to ask for clarification if you don’t understand the question given.

• Before we start, I would like to inform you that the interview is recorded. The interview is going to be used for study purposes only and your identity will be known only to me. This means that once I finish analyzing your answers, the recording of this interview is going to be deleted, and no one will be able to identify you.

1. Whom could you identify as the intended users of the digitalization tool "E.sveikata"?

2. Describe the purpose of the digitalization tool "E.sveikata". Do you believe this tool fulfills this purpose?

3. Do you think you need any additional or specific skills to use this tool? If yes, what kind?

4. Describe your ability and knowledge to use this tool "E.sveikata".

5. How do you manage to apply the „E.sveikata“ tool in your health information management?

6. How does the digitization tool "E.sveikata" affect your health information management?

7. What kind of challenges are you familiar with while applying the digitization tool "E.sveikata"?

8. Tell us what you did if you ever encountered a problem with the tool when you could not use it in full or in part. Were you presented with any risk management plan or action?

9. Is there something you would like to add or mention related to this topic?