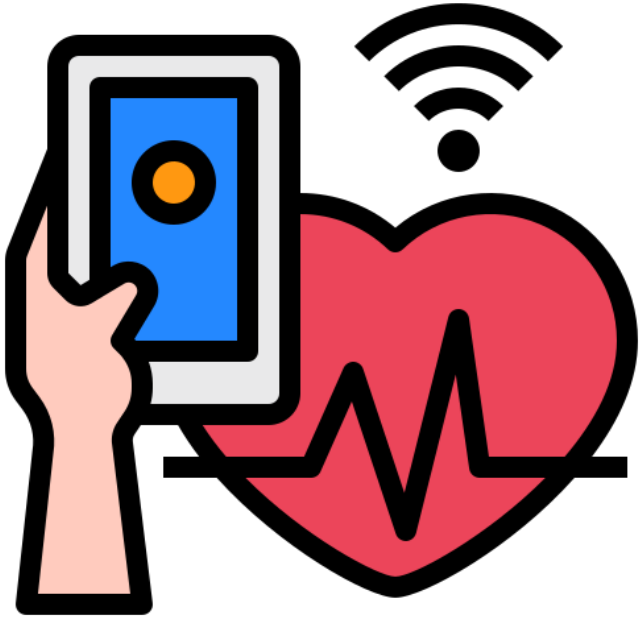
HealthTech ecosystems:
Regional comparison of Italy, Estonia, Finland and the Netherlands.

Care about IT



April 2024

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Content

Introduction

This ecosystem scan is part of the Centre of Vocational Excellence: Care about IT. The HealthTech ecosystem scan plays a crucial role in the establishment of the Care about IT Centre of Vocational Excellence; as such, the regional analysis of the participating countries, Italy, Estonia, Finland and the Netherlands, has been carried out and the comparison has been made, which allows to further assess the strengths and weaknesses of each regional ecosystem, the best practices and skills required have been summarised as a practical means to ensure that appropriate project objectives can be tailored based on the results in relation to HealthTech.

Aim of the scan is to gather extensive knowledge with regard to regional/national IT and healthcare ecosystems (in the participating partner countries), to delve deeper into the existing labour markets concerning healthcare and IT innovation, and to identify the current needs of various types of stakeholders (educational institutions, IT companies and healthcare institutions). By gaining insight into the needs of these ecosystems, these two ecosystems can be integrated into a cross-over HealthTech ecosystem. By executing this scan of the ecosystems, we are able to identify and pursue the points on which we can deliver additional value, inspire and learn from each other's best practices and identify opportunities for collaboration and improvement.

The ecosystem analysis was carried out in two steps: first, a regional analysis was carried out for the specific regions of Piedmont in northern Italy, the Tallinn region of Estonia, southwest region of Finland, and the northern Netherlands. The regional reports can be found in the attachments. The goal of these regional reports was to analyse the current healthcare technology ecosystems in depth, and to identify points of improvement. The input for the report was collected via interviews and a survey amongst stakeholders in education institutions, healthcare organisations and IT companies (see figure 1).

As for the second step, all regional reports were summarised and compared, which was possible due to the similar methodologies. The results of this can be found in this report. By conducting the regional reports and following up with this comparative report, the strengths and weaknesses of each regional ecosystem can be assessed, and appropriate project goals can be tailored based on the results.

Interviews	Italy	Estonia	Finland	Netherlands
IT Companies	3	3	8	6
Healthcare Institutes	8	4	6	9
Education providers	6	3	5	8
Surveys				
IT Companies	4	4	8	8
Healthcare Institutes	12	6	6	10
Education providers	5	9	5	7

***Figure 1**: responses to interviews and surveys*[1]

[1] NB: there is overlap in the respondents to the surveys and the interviews.

What is Care About IT?

This report is part of the Erasmus+ project "Centre of Vocational Excellence - Care about IT". Centres of Vocational Excellence (CoVEs) are formed by networks of partners that develop local "skills ecosystems" to provide high quality vocational skills to young people and adults, and contribute to regional development, innovation, industrial clusters, smart specialisation strategies and social inclusion. While working with CoVEs in other countries through international collaborative networks, they establish a bottom-up approach to vocational excellence involving a wide range of local stakeholders enabling VET institutions to rapidly adapt skills provision to evolving economic and social needs.

In this project, fifteen educational institutions, healthcare institutions and IT companies (with an affinity for healthcare) from Italy, Finland, Estonia and the Netherlands are jointly working on:

- Improved (international) cooperation between industry, healthcare institutions and educational institutions (both teachers and students) in the field of healthcare technology.
- Improving the attractiveness of careers in healthcare technology.
- Improving knowledge and skills around healthcare technology for all stakeholders involved.

The regional partners are:

- Italy
  - Apro Formazione
  - T4MED
  - ASL CN2
- Estonia
  - Tallinn Health Care College
  - Tehnopol
  - East-Viru Central Hospital (IVKH)
  - TNP Consultations
  - Kood/Jõhvi
- Finland
  - City of Turku (project carried out in Turku Vocational Institute)
  - Turku City Data Ltd.
- The Netherlands
  - Noorderpoort
  - Drenthe College

- Netwerk ZON
- Bossers & Cnossen BV
  Katapult

Regional backgrounds

According to the Digital Decade Country Report 2023 (conducted by the European Union), Italy has 'untapped' potential in the field of HealthTech – realising this potential would allow it to contribute to EU targets. Currently Italy is below average for digital literacy, infrastructure, and delivery of public services digitally.

However, there are/have been initiatives to improve the HealthTech landscape, particularly in Piedmont. The first significant progress in Italian digital healthcare landscape was the electronic health record. It allows citizens to track, consult and share their health record. It is activated per region. It is mostly managed by professionals, but individuals can add their own health records in some cases.

Implementation of this system is uneven. Piedmont has 99% access for citizens and 28.5% of professionals able to access data, but given the average access is 40% for citizens and 10% of professionals. This indicates other regions are much lower performing. The problems stem from digital literacy and a lack of uniformity/interoperability of systems. This data gives insight into a general picture of the Italian HealthTech landscape: implementation and coordination of HealthTech has been ambitious but flawed, and leaves Italy lagging behind in terms of digital literacy (of both professionals and patients) and infrastructure.

This is in contrast to Estonia and Finland. In both surveyed regions of these countries, the levels of integration between IT companies, education and healthcare are stronger, and as such the self-reflected digital literacy and strength of equipment/facilities is higher.

Italy has only VET pathways for Health Assistant: a completely different target in terms of students: no young people, but adults, often with a migration background and difficulties in understanding the language. In contrast to the vocational training pathways for nurses in the Netherlands, Estonia, and Finland, since 1996 the training of nurses in Italy has been fully transferred to the universities, which have introduced the University Diploma in Nursing Sciences (EQF 6 and 7). The Netherlands, Estonia, and Finland[2] all provide some courses at EQF 3-4 and above.

The Netherlands has already a strong track record in partnerships concerning health technology. This is supported by the many partnerships focused on healthcare technology. An example of this is the Northern Platform for Healthcare Technology (NPZ), a knowledge network and a partnership between ZorgpleinNoord, Hanze University of Applied Sciences (Digital Health professorship and Center of Expertise Healthy Aging), NHL Stenden (Digital Innovation in

[2] Finland does not really provide health care courses at EQF 3. Our vocational upper secondary qualification is EQF level 4. There are some health care students who do EQF 3 level courses, because they do not have the study skills required at EQF 4.

Healthcare and Welfare professorship, FAITH), Working Differently in de Zorg Fryslân, TZA Drenthe and Groningen, Healthcare and Technology Practoraat, the Health Hub Roden, Healthcare Innovation Forum and programme leaders of regional collaborative projects around healthcare technology at healthcare and welfare organisations.

Strong partnerships also exist in Estonia, where the strategy and action plan for the development of the field of health technologies and services for the years 2023–2028 have been completed. The strategy represents a vision that aims to significantly promote medical innovation and entrepreneurial activity in Estonia. The strategy and action plan were prepared in the framework of the project "Services for the creation and development of knowledge-based startups and the development of the ecosystem of knowledge-based entrepreneurship in Estonia". The project includes the University of Tartu, Tallinn University of Technology, Tartu Science Park and Tehnopol research and business campus.

The Recovery and Resilience Facility (RRF)[3] is at the heart of NextGenerationEU, a once in a generation opportunity for deep structural transformation in the Member States. The Facility deploys up to €723.8 billion (in current prices) in loans and grants in order to support the reform and investment packages put forward by the Member States in their national Recovery and Resilience Plans (RRPs). In the approved plan of Italy (€194.4b) 25,6% will foster the digital transition of Italy, including improved connectivity and digitalisation of the Italian public administration system. In Estonia, we see similar goals of increasing connectivity and the digitalising of the public administration system, as well as increasing digital skills of the population. 24.1% of the €953m plan will go to the digital transition. Also in the Netherlands, 26% of the €5.4b plan will go towards the digital transition, including the promotion of advanced technologies and digital skills in education. Percentage wise, even more investing into the digital transition will be done in Finland. 28.9% of the €1.95b plan will go to the digital transition. In the plan, it is specifically mentioned that Digital innovations for social welfare and health care services are supported with €100 million, investments in continuous learning with €32 million and investments in accelerating key technologies (microelectronics, 6G, artificial intelligence and quantum computing) with €25 million.

Definition of Ecosystem

A key early task of the reporting was to understand how each region defined a ‘HealthTech ecosystem’. Of immediate note is that in Finland, there was a need to differentiate the terms ‘HeathTech’ and ‘Wellbeing Tech’. This is due to the (widely agreed) substantial difference in what these terms mean in the Finnish language, based on the EU legislation. “HealthTech” is considered to be devices and solutions used by healthcare professionals. These devices are more heavily regulated. In contrast, ‘WellbeingTech’ is for the consumer. These definitions are agreed across the three surveyed sectors.

In Italy, the IT and healthcare sectors are in general agreement the definition should be along the lines of “application of IT & digital technologies, with the aim of enhancing efficiency and streamlining healthcare, diagnosis and systems”. This general description can be seen as quite broad, but these sectors were keen to emphasise that they also considered more advanced daily uses like diagnostics and surgical techniques. Training organisations were more

[3] More information: https://reform-support.ec.europa.eu/what-we-do/recovery-and-resilience-plans_en

limited in their view – they tended to associate HealthTech only with tools used by practitioners. This is similar to the Finnish definition of HealthTech, but without extra consideration of 'Wellbeing tech'.

Estonian respondents generally agreed that there should be a broad definition across IT, education and healthcare. This should be seen to include anything that could be considered healthcare technology, aimed at making healthcare systems more efficient or effective. The definitions from the Netherlands are similar in being broad and open.

Therefore, across Estonia, Italy, and the Netherlands (and the three considered sectors within these countries) there is general agreement that 'HealthTech' can be interpreted quite openly as being any technology that enhances simplicity, efficiency or effectiveness of healthcare. It should be noted that there is a preference toward 'HealthTech' typically being in the hands of practitioners, but it is only from Finnish responses that this was made explicit.

General information on the stakeholders

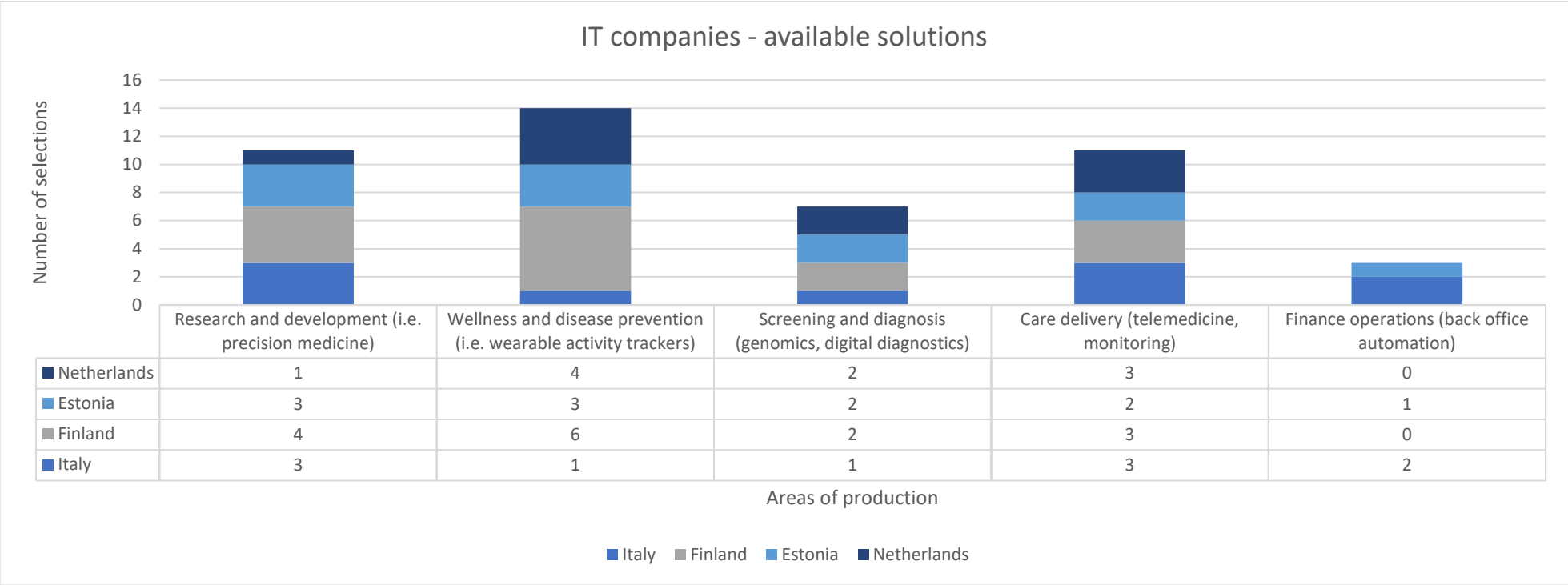
To get a better idea of the different types of stakeholders, in the next sections we will dive deeper into the different types of stakeholders – IT companies, educational institutions and healthcare institutions.

General Information – IT companies

The surveyed regions are considered to all contain advanced, if not leading IT sectors. Italy contains several world leading IT companies focused on HealthTech, including Dedalus, considered to be the leading provider of diagnostic equipment in Europe. Estonia too, is considered to be a leader and is focused primarily on wellness, disease prevention, healthcare delivery and diagnosis. Northern Netherlands, like Estonia is considered strong in HealthTech with similar focusses. Finnish IT companies include several HealthTech related companies, and it has risen to be one of the most prominent export businesses of Finnish higher technology companies. Turku and the south-west region are one the leading regions in Finland with regards to Health Technology, including several HealthTech startups. HealthTech solutions also include apps for social care.

Surveyed IT companies were asked to present the areas that their HealthTech solutions addressed. This is presented in the tables below.

It is important to note that the number of surveyed companies is relatively small – this study can therefore not be considered an in depth/entirely accurate report on the regional landscape, but it serves as a useful indication.



	Research and development (i.e. precision medicine)	Wellness and disease prevention (i.e. wearable activity trackers)	Screening and diagnosis (genomics, digital diagnostics)	Care delivery (telemedicine, monitoring)	Finance operations (back office automation)
Netherlands	1	4	2	3	0
Estonia	3	3	2	2	1
Finland	4	6	2	3	0
Italy	3	1	1	3	2

***Figure 2**: IT companies – available solutions*

Figure 2 shows that IT companies across the surveyed regions have a broad range of focus. The majority of focus is clearly on wellness and disease prevention, but there is also strong interest in research and development, and care delivery.

Estonia, Finland, and Italy have the most even distribution of interest. This means a lower number of interested companies per focus, but a higher number of sectors of interest. This is clearly the case when considering that these companies added 'other'. This could mean that there is a broader range of specialisation than in the northern Netherlands, where IT companies could have a narrower set of specialisations.

There appears to be limited interest in back-office automation, including HR or finance systems, with only two companies in Italy and one in Estonia indicating an interest.

General Info - Educational Institutions

When looking at the context of HealthTech education, Italy can be seen as an outlier for several reasons. First, in contrast to the vocational training pathways for nurses in the Netherlands, Estonia and Finland, since 1996 the training of nurses in Italy has been fully transferred to the universities, which have introduced the University Diploma in Nursing Sciences (EQF 6-7). This is indicative of the state of HealthTech education in Italy, which is not typically taught at EQF levels 3-5. Further, digital health devices do exist for training in this sector, but not sufficiently.

Finland, like Italy, does offer university of applied science level & university level (EQF6-8) training for nurses, but also has a wider range of healthcare, IT and technology courses available at EQF 4-5. In northern Netherlands too, in the three major VET educational institutes. In both Estonia and the Netherlands, vocational schools are well equipped with HealthTech, and these are playing an increasingly significant role in curriculum development.

Figures three and four below show data pertaining to teacher *comfort* and *excitement* to implement new HealthTech into their curricula.

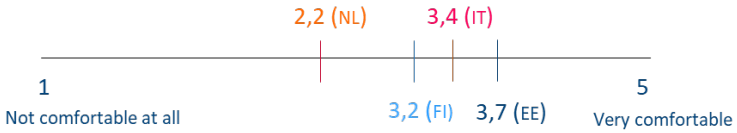


Figure 3: *Teacher comfort in teaching with new technology.*

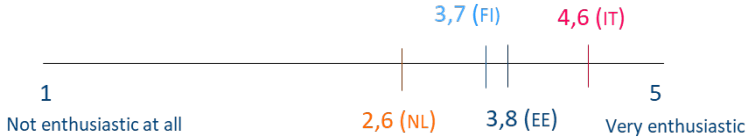


Figure 4: *Teacher excitement to introduce technology.*

There is quite a wide array of current competence and openness to new technologies across the surveyed regions. The Netherlands stands out for teachers being neither enthusiastic nor confident to implement new technologies in their education. It is elaborated from the report that teachers in this region are 'not keen to deviate from knowns'. The noted possible solutions from this are to have more coaching/training on classroom HealthTech, and for managers/leadership to help generate more trust and enthusiasm in HealthTech.

The remaining results from other regions are more varied. In Italy, the comfort of teachers with new technology is relatively low, perhaps due to the lower level of HealthTech typically available in schools. However, the enthusiasm to learn and deploy new technologies is relatively high – much more so than the

Netherlands. Estonia scores highly on both comfort and enthusiasm. This is despite notes from the regional report that HealthTech is not well reported – meaning what schools have/are able to share and at what locations, are not widely known or shared.

Data from Finland delivered a broad range of answers – as many are comfortable and confident as not, and the averages deliver very medium levels of confidence and enthusiasm.

General Info – Healthcare providers

It can be summarised that all regions surveyed do have healthcare institutes of varying sizes and functions, from large teaching hospitals to specialist physicians, to nursing homes. The levels of HealthTech in these regions can also be considered quite strong, but with regional challenges. In Italy (similar to problems discussed previously and particularly noted in nursing homes), there is a recurring problem with interoperability of digital systems. Despite this issue, and the related issues of lacking staff training and funding, there is a strong desire to implement more HealthTech in Italian nursing homes.

The list of regional care providers in southwest Finland is similar to that of Piedmont – albeit smaller, there is a good, broad level of specialisation. As such, there is a good level of HealthTech at these institutions, and a good awareness and enthusiasm for future HealthTech, including a digital record system similar to Italy. Since 1.1.2023 Finland has been divided to 21 wellbeing services counties, which are ultimately responsible for healthcare services for the people in their region. Wellbeing services counties can outsource their services. Most of the nursing home services are outsourced, therefore run by private health organisations. Even though services are outsourced, wellbeing services counties are still responsible for the service. In some interviews some organisations brought out that if a person is living at nursing home, wellbeing services counties do not see a need (or finance) for some HealthTech services, such as automatic glucose monitors, as there are nurses who can do the same thing. This is seen as a problem with resources and with a different point of view to certain solutions.

The Estonian healthcare system is based on compulsory solidarity-based health insurance. Healthcare services are made available mostly by private service providers. The management and supervision of healthcare system and development of health policy is under the scope of the Ministry of Social Affairs and its agencies. In Estonia, the healthcare system is governed by the Health Services Organisation Act, which provides the organisation of and the requirements for the provision of healthcare services, as well as the procedure for the management, financing and supervision of healthcare.

The philosophy underpinning the Dutch health care system is based on several more or less universal principles: access to care for all, solidarity through medical insurance (which is compulsory for all and available to all) and high-quality health care services. As stated by Hi!Noord – Health Impact Noord: '' Dutch healthcare is a reactive system; action is taken when someone's health falters. At the same time, it has been clear for decades that many diseases -

and costs - can be saved with preventive measures. The current system is unsustainable in the long run. A change is needed, such that healthcare is not the starting point, but health care."[4]

Collaboration between stakeholders

In this report, we are specifically interested in the different collaboration that are already in place between the different stakeholders, and how they would like to see the different collaborations evolve in the future. In that way, we can adjust our activities to fit their preferred way of collaboration.

Collaboration with educational institutions

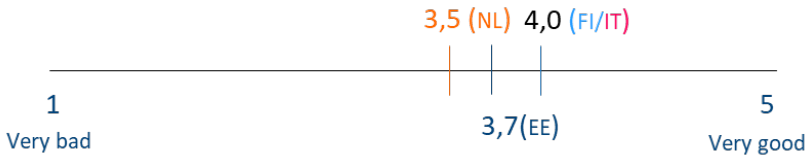
In all countries there is extensive collaboration with educational institutions. Generally, this collaboration is seen as positive, as can be seen in figure 5.
In Finland in general, collaboration and contacts with educational institutions were considered good. Healthcare institutions do collaborate with educational institutions regarding nursing students training periods. Collaboration is done mainly with EQF levels 4-7, but collaboration with EQF levels 4-5 was discussed in the interviews. Collaboration regarding HealthTech is considered quite minimal.

In Italy, most healthcare facilities and IT/ICT companies collaborate exclusively with universities. Healthcare facilities and companies collaborate with EQF 3-5 education and training institutions only for student placements and to a very limited extent in healthcare. Apprenticeships are mainly aimed at IT/ICT students.

In Estonia, there is plenty of collaboration between different educational institutions and between educational institutions with IT/care facilities. In general, this is perceived positively.

For the Netherlands, most of the interviewees already collaborate with educational institutions. The current collaboration receives an average of 3.5/5. They mainly collaborate with VET level EQF 3/4 and bachelor level EQF 6

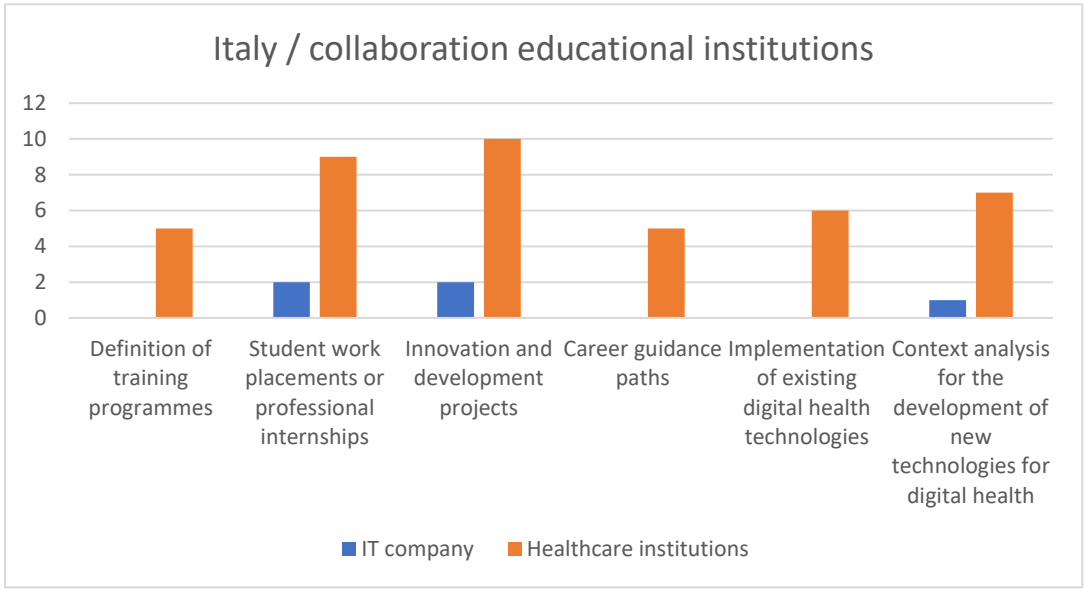
The relatively positive attitude towards collaboration with educational institutions can be seen in the score below. This is the case across all four countries.

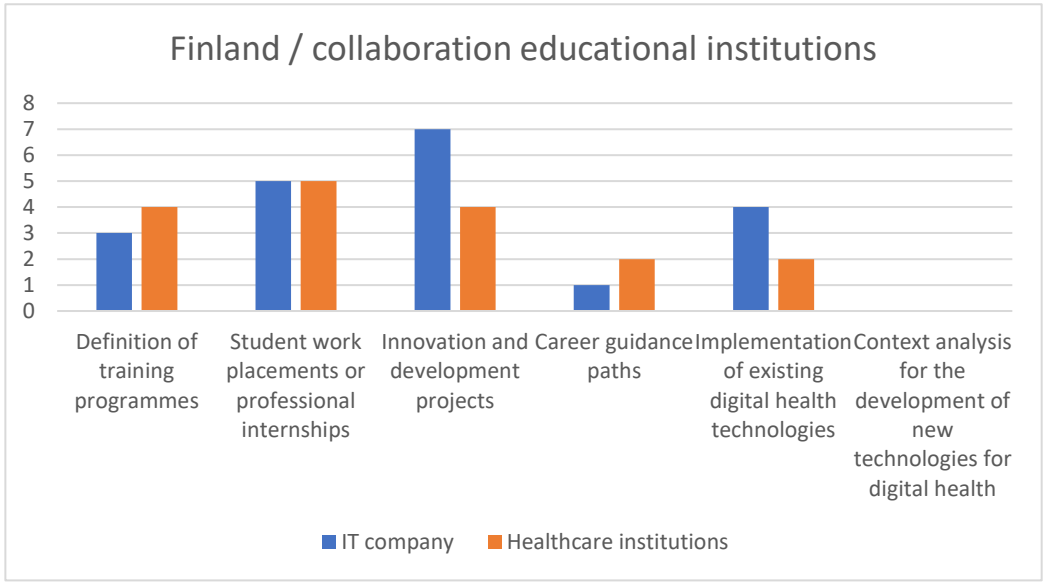


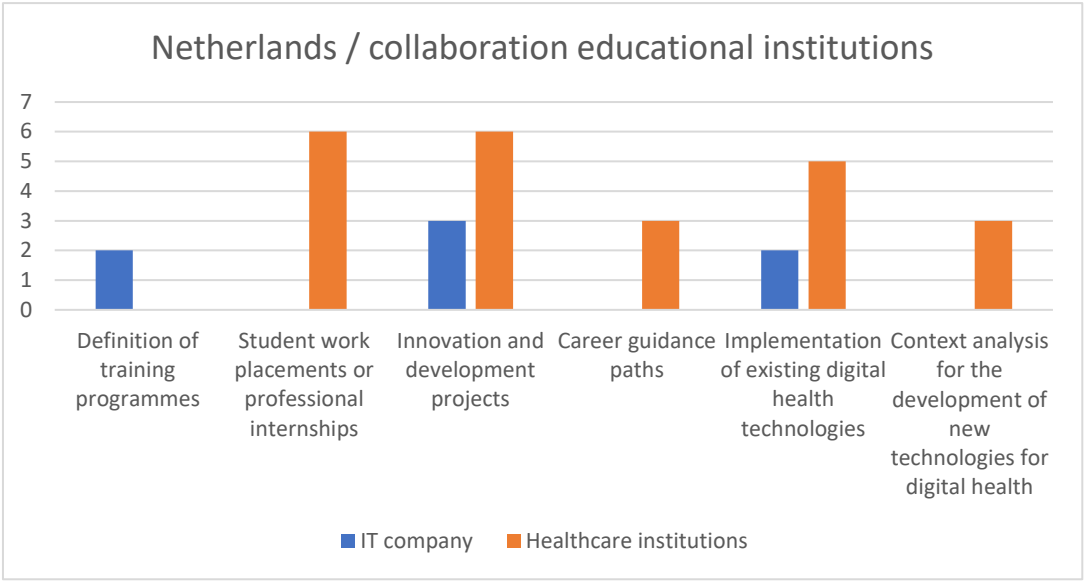
[4] https://www.rug.nl/aletta/innovation/hi-noord-health-impact-noord?lang=en

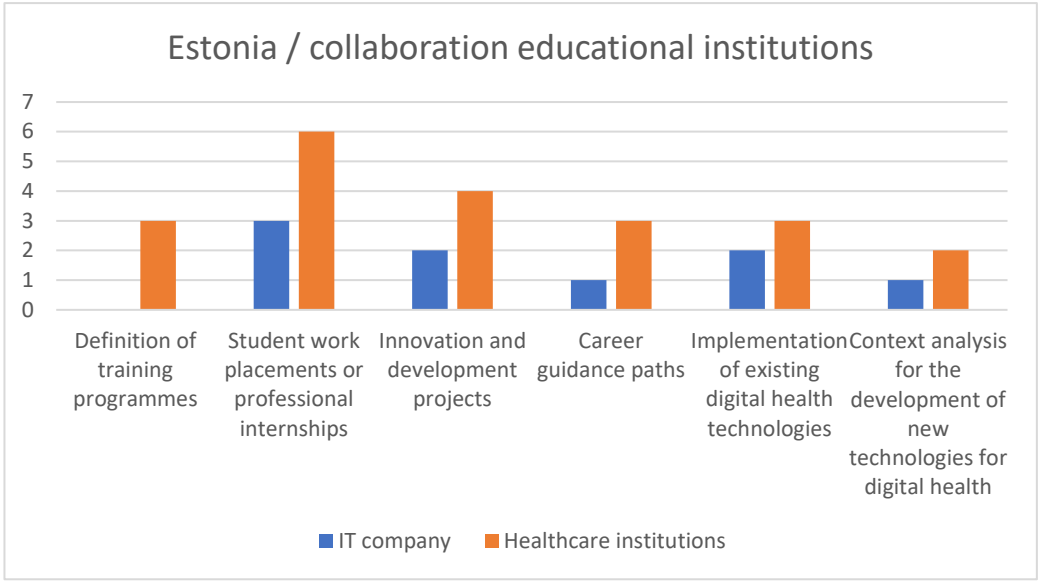
Figure 5: *rating of collaboration with educational institutions*

Collaboration with educational institutions was done on many different aspects. See the graphs below on which aspects the different stakeholders are currently cooperating with educational institutions.









Figures 6: *collaboration with educational institutions in Italy, Finland, the Netherlands, and Estonia*

As can be seen in the figures above, except for the Netherlands, IT companies like to cooperate with educational institutions for *student work placements or professional internships.* Another popular way of collaborating is via *innovation and development projects* and *implementation of existing digital Health technologies.*

Healthcare institutions also collaborate with educational institutions in more varied ways. The most popular one is on *student work placements or professional internships.* Healthcare institutions also collaborate with education institutions in all countries on *innovation and development projects.*

In terms of desired topics that all stakeholders would like to collaborate on more closely, three main topics were mentioned: defining training programmes, innovation and development projects, and implementing of existing digital Health technologies. In Finland, innovation and development projects, student work placements or professional internships were also seen as important topics on which stakeholders would like to see more emphasis on.

For instance in Italy, health service providers also indicated that they are particularly interested in collaborating on contextual analyses for the development of new technologies: this shows that it is crucial for health and social service providers that new technologies respond to the real needs of professionals and solve their professional problems on the basis of an analysis of their needs. On the other hand, career guidance activities are mainly of interest to healthcare providers, where staff shortages are causing many problems.

In Finland, in general, collaboration was seen as an important factor. Educational institutions do not have to or should not do everything themselves. Joint training, project work, guest lectures, joint seminar days and company visits were mentioned as examples of good forms of cooperation.

In The Netherlands, an interesting point was made that the success of the collaboration with educational institutions is that it is very dependent on the enthusiasm of the teacher. This should be replaced by institutional enthusiasm for collaboration, perhaps initiated by management.

In Estonia, stakeholders are enthusiastic about the good connections between different education institutions in the field of healthcare – this is particularly seen in the examples of research (innovation and development projects, and in context analysis for development of new technologies) and further, in the implementation of existing digital Health technologies. The strength of these existing partnerships is seen in the desire for further collaboration at all EQF levels 3-7.

Collaboration with healthcare providers

Collaboration with healthcare institutions is rated relatively positively, as illustrated by figure 7. Especially in the Netherlands, the contact with healthcare institutions is rated positively. In the Netherlands they state that there is already a lot of intensive collaboration with healthcare organisations, especially from the education sector and from other actors in the healthcare sector. This is to a slightly lesser extent in IT companies, but cooperation is increasingly sought.

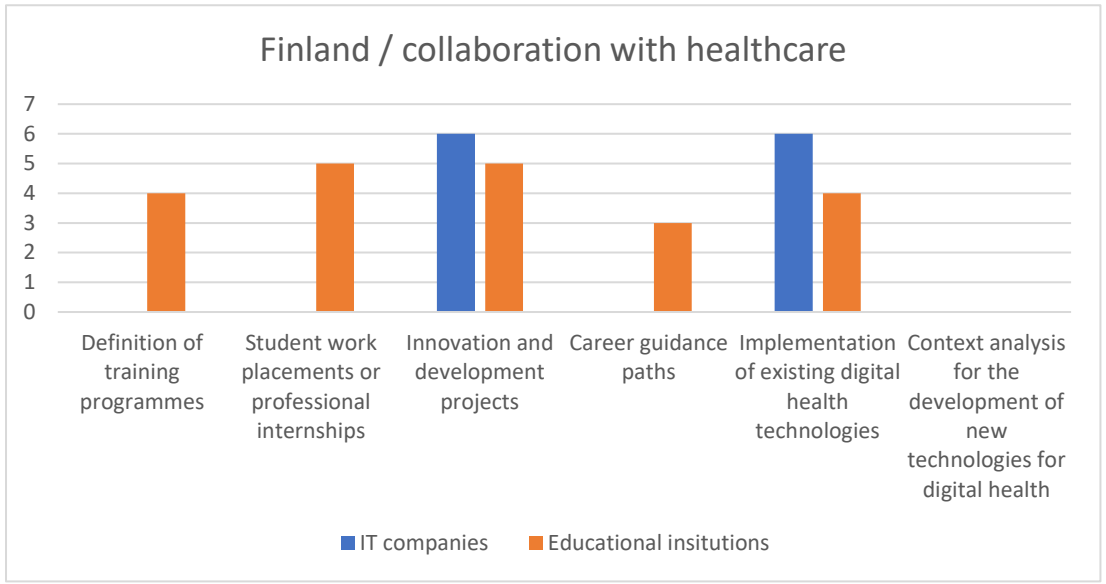
In Estonia, there is a varying degree of cooperation between healthcare organisations. They typically cooperate in a range of subjects, concerning student placements, innovation and development, applying existing technologies and context analysis for new technologies. However, the extent of these connections is typically limited to one or two subject areas – this can be better defined as a broad range of connection with limited depth. This contrasts to the good relationships between education and healthcare organisations, as outlined previously. Compared to cooperation between different healthcare organisations, the cooperation between IT and healthcare is marginally stronger. They typically work on developing new systems/technologies and implementing existing technologies.

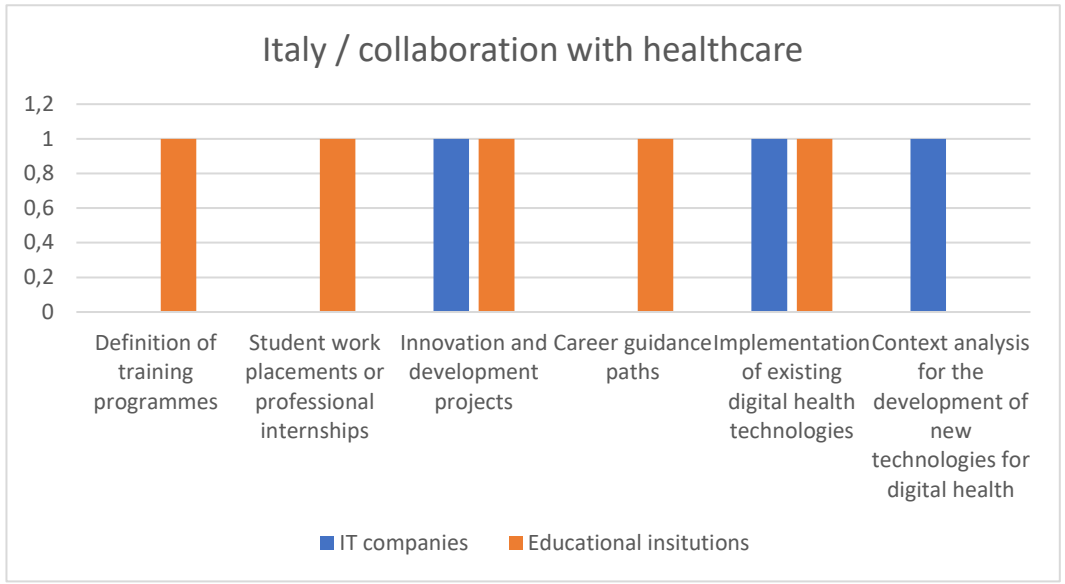
Finland has since 1.1.2023 been divided into 21 wellbeing services counties, which are ultimately responsible for healthcare services for the people in their region. Thus, the main partner for the collaboration with healthcare organisations in this area is the Wellbeing Services County of Southwest Finland - Varha. This collaboration was considered challenging. Many felt that communication with wellbeing services counties was challenging, while other organisations felt that they did not receive information from wellbeing services counties and did not know who to contact. Cooperation with other healthcare providers besides wellbeing services counties was considered quite limited. Most of the providers are private companies, and there is competition amongst the companies.

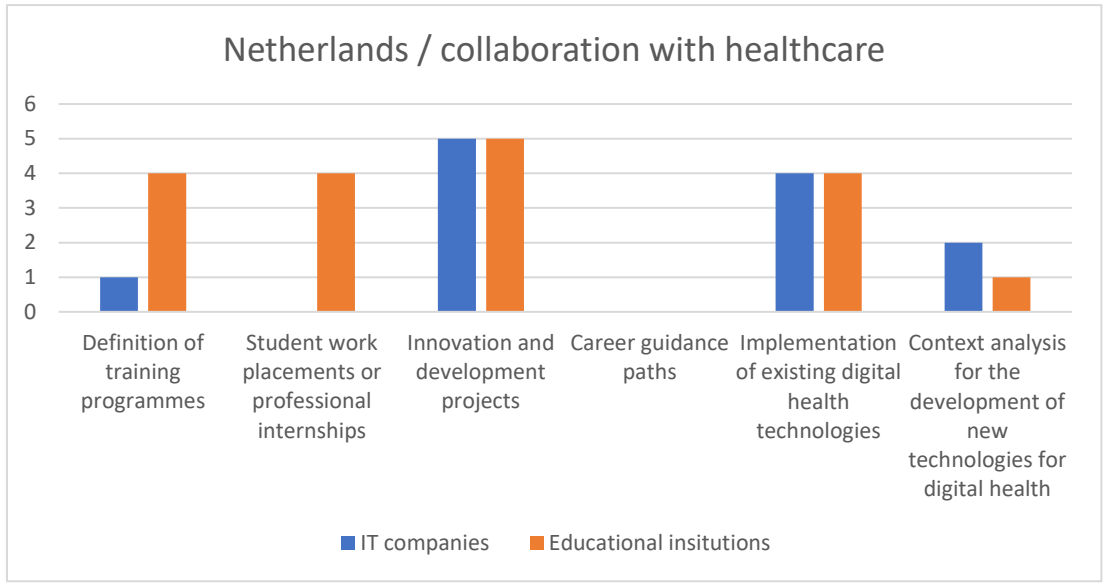
In Italy, co-operation between enterprises and health and social service providers is mainly commercial, whether in the implementation of existing solutions or in the development of new products.

EQF 3-5 education and training institutions have direct relations with health service providers almost exclusively when they provide IT/ICT training. In the social/health sector, institutions complain about difficulties in developing school-to-work pathways in social/health institutions as well as in finding moments of confrontation to update training pathways.

Figure 7: *rating of collaboration with healthcare institutions from 1 -5*







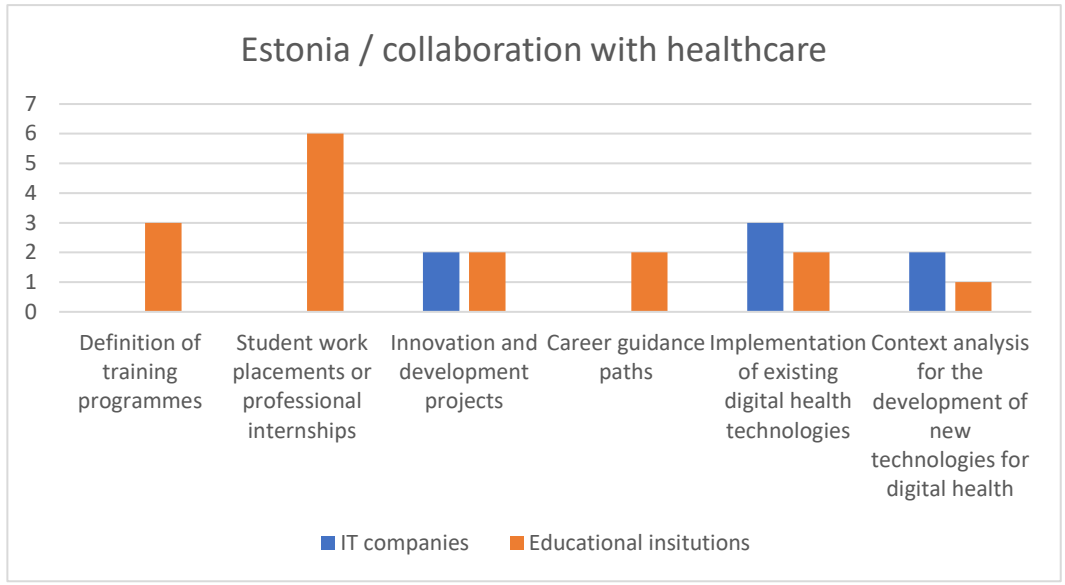


Figure 8: collaboration with healthcare institutions in

As can be seen in the graphs above, in nearly all countries, IT companies mainly cooperate with healthcare organisations on the topics – *innovation and development projects, implementing of existing digital Health technologies, and context analysis for the development of new technologies for digital health.* This is consistent over all countries, although in Finland they are not collaborating in the *context analysis for the development of new technologies for digital health.* For educational institutions, their collaboration with healthcare institutions is more varied and again relatively consistent over the countries. Popular topics for collaboration include *definition of training programmes, student work placements or professional internships and innovation and development projects.*

In relation to the topics mentioned above, in the Netherlands, stakeholders would like to have closer collaboration on topics they are already collaborating upon. Many respondents stated that healthcare organisations are very important for a good context analysis, as they know the professional practice best and therefore have important information for good innovation and development projects and implementation.

In Finland, it was stated that developing professional internships and student training was seen as an important factor, especially with other healthcare providers. Also, in general the development of the whole healthcare sector was considered important.

In Italy, health service providers also indicated that they are particularly interested in collaborating on contextual analyses for the development of new technologies: this shows that it is crucial for health and social service providers that new technologies respond to the real needs of professionals and solve their professional problems based on an analysis of their needs.

Collaboration with IT companies (with affinity with HealthTech)

As can be seen in the figure 9 below, contact with IT companies is rated very diversely. Especially educational institutions rate contact with IT companies relatively often negatively/commercially. This is illustrated by the answers from respondents from Italy. They state that collaboration between IT/ICT enterprises and education and training institutions (EQF 3-5) is only present in cases where the institutions deal with IT/ICT pathways. Even in this case, collaborations are rather limited and not strictly related to HealthTech. The relationship between companies and healthcare providers, on the other hand, is closer: mainly driven by commercial reasons, it relates to the implementation of existing technologies and collaboration on development and innovation projects that healthcare providers are undertaking.

In the Netherlands, this supplier-client relationship also has the upper hand. A collaboration amongst equals is often not present.

In Finland, there are also mixed experiences of collaborating with IT companies, due to a lack of knowledge about what is available. Some organisations would like to collaborate more with IT companies, but they feel that IT companies do not advertise themselves much, while others feel that they either do not have the resources or need more collaboration.

In Estonia, there is a more positive collaboration between healthcare institutions and IT companies, where they typically work on developing new systems/technologies, and implementing existing technologies, but there is a noticeable lack of cooperation between educational institutions and the IT sector. The only connections current available are limited student work placements and professional training placements.

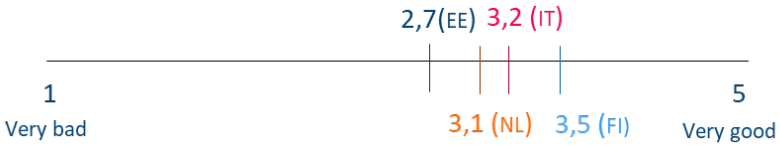
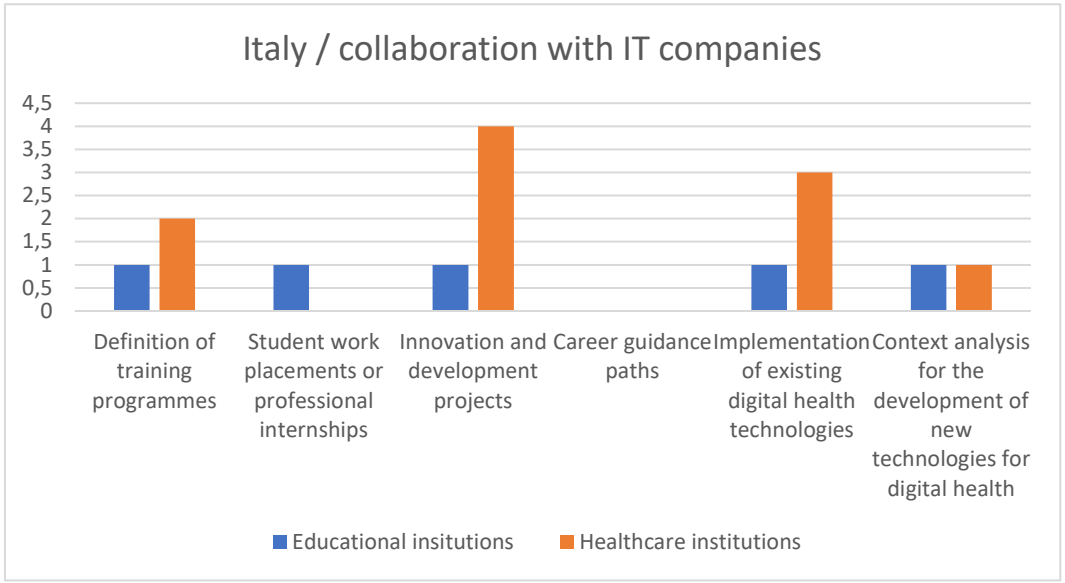
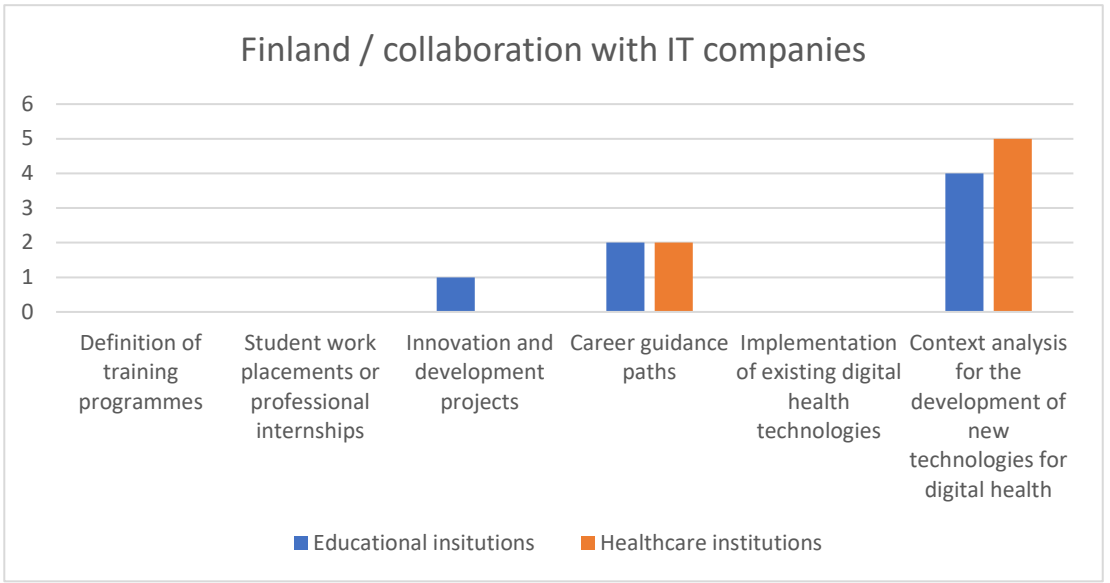
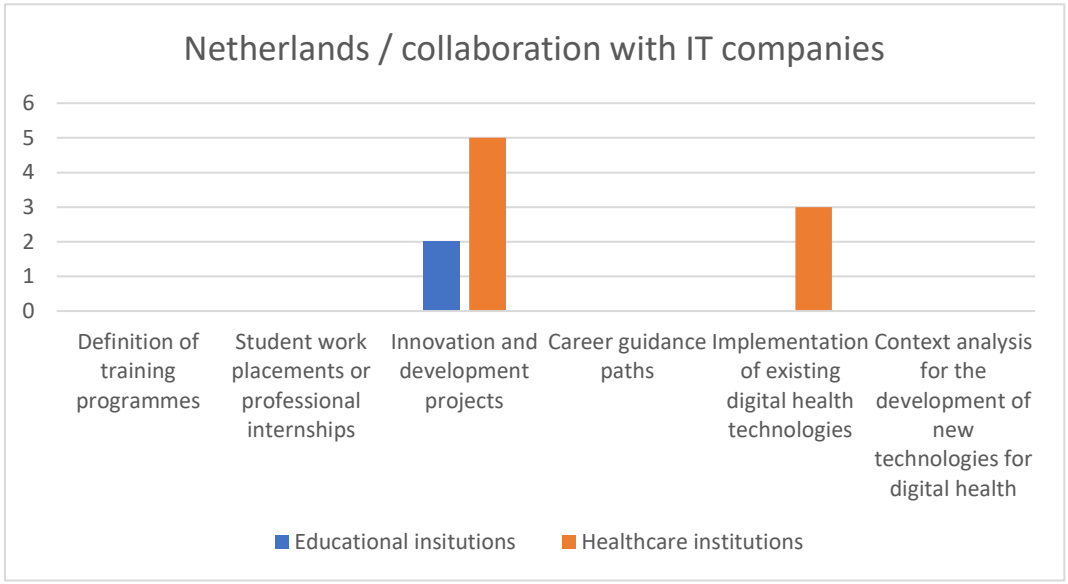


Figure 9: *rating of collaboration with IT companies from 1-5*

Respondents were also asked on what themes they are currently collaborating on with IT companies.







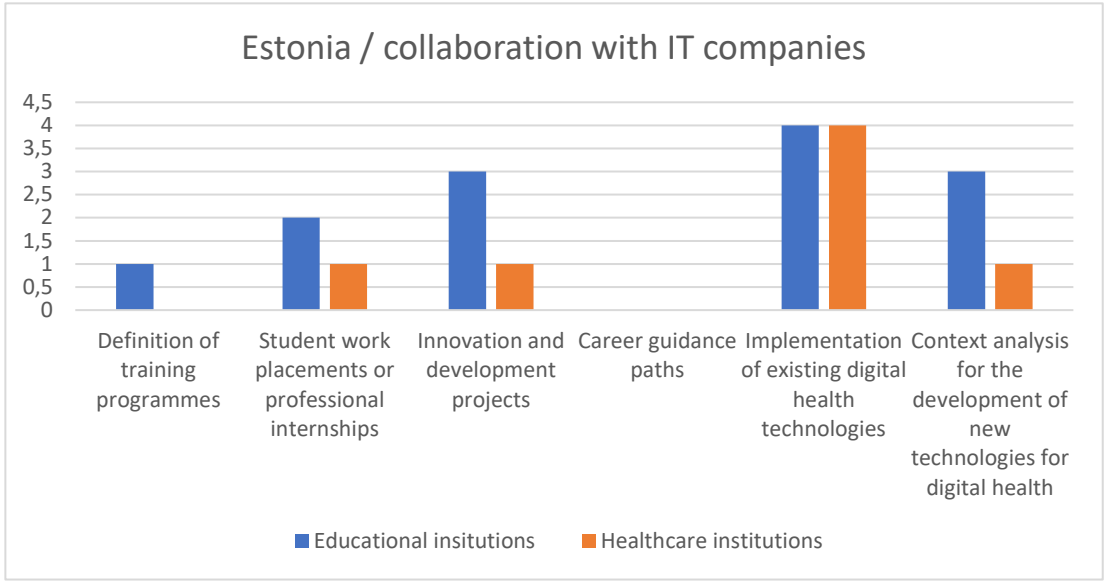


Figure 10: *collaboration with IT companies*

As can be seen in the graphs above, there are generally very limited topics on which there is collaboration with IT companies. As mentioned earlier. the main topics that some collaboration exists in is *innovation and development projects* and *implementation of existing digital health technologies.*

This current limited collaboration does not mean that there are no opportunities for collaboration. In Estonia, there is enthusiasm for more collaboration.

This is also the case in Finland, where healthcare organisation would like to collaborate with IT companies on implementing pre-existing solutions rather than innovating new ones. Due to the strict regulations in the healthcare sector, it is more beneficial to implement pre-existing solutions rather than innovate new ones. In general, healthcare organisations see opportunities to use new technologies, but time/money/knowledge/strict regulations limit the use of innovative solutions.

In Italy, educational institutions would like to expand cooperation to update programmes, create more apprenticeships, develop guidance pathways and create a network of contacts that does not currently exist. Healthcare providers would like to expand this collaboration by improving context analysis and training programmes, and by participating in further innovation and development projects. However, excessive bureaucracy and a lack of funding and human resources limit this possibility.

In the Netherlands, lots of opportunities are seen to work together more on innovation and development projects as well as the implementation of existing digital health solutions. For collaboration to be fruitful, there should be clear communication on what the expectations are and what the role is of each partner to create a win-win situation.

Factors hindering collaboration

There is a consensus on the need for having further collaboration in HealthTech, multiple factors hinder better collaboration between all different types of stakeholders in the countries. Many of the factors can be summarised into one topic: ''lack of resources''. This is particularly true in the education and the healthcare sectors, where there is a significant shortage of personnel, resulting in a lack of time for additional tasks/projects. In both sectors, HealthTech is often implemented through projects that are not part of the primary tasks. As a result, they are not fully implemented in general. Furthermore, lack of financial resources is also a reason why HealthTech projects are not initiated/implemented as often as the organisations would like. This lack of time and resources also leads to difficulty in updating training pathways (IT).

Several other points were being mentioned by partners:

- Speaking different ''languages'' (EE/NL/FI): In Finland, some stakeholders mentioned that some students do not have sufficient Finnish language skill. This affects negatively to collaboration with educational institutions regarding professional internships and training periods. In the Netherlands and Estonia, the speaking different languages was meant more figuratively. Educational institutions and healthcare institutions have a different way of

thinking/speaking than IT companies, who are much more commercially minded than the other two. This leads to misunderstandings between the different stakeholders.

- Lack of urgency from management (NL): management is not always giving HealthTech the attention it should be due to the day-to-day tasks being prioritised, even though in the long run it will be beneficial to focus on HealthTech so it can help overcome the shortage of staff.
- Having a business-like relationship (IT/NL): this is mainly the case for the relationship between educational institutions and IT companies, and between healthcare institutions and IT companies. Often IT companies are seen as suppliers, and not as collaboration partners.
- Seeing each other and HealthTech as competition (IT/NL): healthcare organisations and IT companies compete in their own sector; they do not always work together to improve/implement HealthTech solutions. Furthermore, some healthcare workers see HealthTech itself as a threat to their own job, and therefore they are hesitant to implement it.
- Difficulty finding the correct contact person (FI/NL): it is often difficult to find the right contact person within the organisation when the organisation wants to collaborate on a topic related to HealthTech. This is mentioned by all different types of stakeholders. A related issue mentioned was that once a contact person is found, they often change, leading to a discontinuity in collaboration.
- Not knowing enough of each other's work (FI): Factors that also hinder collaboration with educational institutions are the lack of knowledge about the specific field in which the healthcare provider operates, for example care for disabled persons.
- Bureaucracy (EE/IT/NL): The healthcare sector is very regulated; therefore, it can be difficult to introduce new systems/products into this sector. Although there is a possibility of doing more than a lot of organisations expect, to some extent it is also considered bureaucracy.

Ideas for better collaboration

All interviewees were also asked what ideas they could think about to improve collaboration:

- Consistency (FI/NL/IT): In Finland, the main theme was that collaboration should be constant. This was also mentioned in the Netherlands, where the importance of having one contact person was described. Finland and Italy advise to have regular meetups/visits where aspects of the collaboration such as the vision, expectations and responsibilities are discussed.
- Increased focus from management on HealthTech cooperation (NL): it was recommended that senior management should push for more collaboration on HealthTech related topics, as it is now often being too low on the priority list, resulting in no time being allocated for cooperation. If encouraged by management, the staff could also become more positive towards HealthTech.
- Just go for it (NL): Instead of first figuring out every detail of the collaboration, just get started and adjust as needed. This means that the participating partners can get started more quickly with collaborations. Often, there are less rules/bureaucracy than initially expected, and often regulatory bodies would like to think along with them.
- Create pilots (IT): work with concrete pilot projects that can be disseminated as good practice.

- More focus on creating a win-win situation (FI): focus on creating "win-win" -situations for all parties involved in the collaboration. The parties should find "business logic" behind collaboration.
- More focus on work-based learning (FI): Another aspect that was seen as important to develop is a greater focus on work-based learning in educational institutions – education should be developed more in collaboration with healthcare organisations to improve the skills needed in practice.
- Build further on current cooperations (EE/NL/IT): instead of constantly working on creating new projects, build further on projects that are doing well. Especially in smaller countries such as the Netherlands and Estonia, there is a community that knows each other and that wants to continue building on what is working for them concerning HealthTech. In Italy, there are already ''working groups'' on the topic that should be consulted, and they should include both health and social workers and IT professionals in the working groups.

Best practices

Many best practices already exist in the EU concerning HealthTech. It is important to know what they are so that we can build upon them. Below is an overview of the best practices per country:

Italy

Among the respondents, the implementation of the electronic health record stands out.
This implementation, which is still ongoing, is described as one of the fundamental steps for the digitalisation of regional healthcare:
"In the field of digital health, as already mentioned, a concrete contribution has been made by CSI Piedmont, which has made data and information available and usable to those who need it, in the appropriate format and within the required timeframe, putting technology at the service of people. It has created a single regional archive in which the citizen is uniquely identified. It has connected the various local health authorities and hospitals in Piedmont to ensure that they share as much data and information as possible. It has created the Register of Healthcare Institutions and Patients, which guarantees the quality of data and is the basis for the development of all e-health services".

The Netherlands

Many best practices can be found within the region in the field of healthcare technology. In particular, the many partnerships were frequently mentioned here. Herewith some best practices are highlighted:

1) Technology & Care Academy Groningen & Drenthe

The Technology & Care Academy (TZA) guides awareness, acceptance, and adoption of care technology in practice. It is seen as very positive that there is a well-structured exchange of information and that many parties are involved in this initiative.

2) Increasingly better deployment of apps

Considering the use of the existing apps for home care and informal care, there is an increasing use of apps by caregivers in the region to reduce the pressure on caregivers.

3) Putting the client first

In consultation with the client, Cosis has assessed whether the use of technology is helpful and which technology should be used.

Estonia

Many best practices exist in Estonia considering HealthTech. Here are some of the most important ones:

- Useful web pages:
  - Terviseportaal: https://www.terviseportaal.ee/en/
  - National e Booking system: https://digiregistratuur.ee/login
- Simulation environments before interaction with patients.
- Hospital information system development.
- National Health Portal – common platform for healthcare workers & patient data.
- Student participation in training programs.
- Estonian Connected Health klaster (ECHC)
- Artificial intelligence used at Narva hospital, for analysing/describing x-ray images.
- Point of Care Testing (POTC)
- HEDA information system
- Telemedicine
- The eAmbulance solution is a digital work tool used by ambulances, which allows the ambulance brigade to receive operational patient health information and document their actions in solving the case.

Finland

All actors mentioned cooperation as part of their best practices, such as joint training, project work, seminar days, networking through brunches or company visits with students.

In particular, educational institutions were seen as a link by organising events for companies and social and healthcare providers. For example, to test, learn and train on different Health Technology solutions.

For companies, the involvement of students in product development projects has been identify as a best practice. At the same time, students gain experience of working life and companies get results, for example on the usability of their own product.

Customer orientation came up in several discussions when it came to best practice in the sector. From a social and health perspective, equipment training was seen as valuable. In the social and health sector, there are many workers who lack technical skills, so it was considered particularly good to have at least one person with deeper skills in all workplaces. This would enable them to train, instruct and support others in the use of the equipment.

Health Technology should be introduced step by step, especially to healthcare providers who do not have any previous experience. Introducing an easy-to-use solution in the start encourages people to try new solutions in the future. Initially, user training and readily available support are important.

From the company's perspective, customer orientation often meant testing a product in the development phase with a pilot group of end-users before the actual launch. Companies also stressed the importance of a shared vision.

From an individual perspective, customer orientation was considered that the end-user, i.e., the client and their relatives, would be involved in the deployment of the Health Technology. This is intended to improve the clients' experience of the deployment and make it easier to ask for help.

The use of service design was seen as a concrete action to implement customer orientation. Using service design also allows all actors to participate in the same project.

Company challenges

In work package 4, innovative teams consisting of a mix of students, industry professionals and teachers will work together on company challenges in a competition format. Teachers and professionals from the business(es) the challenges are set by, will serve as coaches. The aim of work package 4 ''innovation'', is multipart: First, it aims to introduce students to real life challenges around HealthTech that companies face. By working on real life company/industry challenges, students can directly apply their knowledge, get a grasp of the challenges faced by real companies, and they feel more motivated due to having a ''real'' client. Also, by working together in multidisciplinary teams together with teachers and industry professionals, this teaches students about teamwork and incorporating multiple perspectives. These assignments will also help students, teachers and professionals gain 21st century skills due to e.g., the critical thinking, creativity and teamwork needed to solve the challenges. Furthermore, for companies, this gives them a chance to let

students with the most recent knowledge on HealthTech look at their problems and to look for potential hires for the future. By working in interdisciplinary and international teams, more creative solutions can be presented to the companies. These challenges are also an important step in building a skills ecosystem with a constant dialogue between VET providers and stakeholder groups, guaranteeing that the skills of VET graduates correspond to those needed in working life. The focus of the challenges that companies can bring in, will be decided upon based on the results of the industry scans in WPs 2 and 3. Each round will result in identifying the most urgent challenge. This challenge will be further explored with the support of coaches from companies/stakeholders. All solutions that students have come up with will be put online on the website, so they are accessible to anyone.

Respondents were asked if they had suitable challenges for the students concerning HealthTech, these were the responses:

NB more challenges to be added at a later date.

Country	**Challenge name**	**Challenge explanation**
Netherlands	'' Goed oud worden in Nijeveen''	Growing old consciously is important. How can we combine housing, care and welfare and strengthen each other? How can you match the request for help from older residents and the offer of help from volunteers?
Netherlands	'' Nachtzorg inrichten met tekort aan personeel''	New light on night care: Explore night care optimisation with a broad perspective and develop new approaches.
Netherlands	''Wachttijd SEH'	How can we make good use of waiting time in A&E and give patients more control over their situation? Design a prototype.
Netherlands	'' Virtuele thuiszorg''	In what ways can you encourage healthcare professionals to start using Virtual Home Care? Develop a way to entice healthcare professionals.
Netherlands	''De Friese huisartsenzorg in 2050''	What will Frisian GP care look like in the future? Develop an inspiring prototype.

Italy	"Lonely elderly people"	What are the parameters for a complete remote medical/health picture? Definition of a technical solution.
Italy	"The importance of the correct colleDigital Data: use in Healthcare"	How to make those who record/generate digital data in health care perceive that there is a dual use for it: immediate and operational for the functioning of the care/rehabilitation process (which is easier for everyone to see) and a more managerial/strategic one that serves other types of people (the controllers and decision-makers) to monitor, pay for, change processes and the health care system.
Estonia	3 N implementation program	3N unification in app or program so nurses can select and record nursing diagnoses and NIC+NOC with one click
Estonia	Medicine administration app	The drug administration app can be selected by the name of the active ingredient or brand/trademark, how to use and administer (interactions with other drugs and side effects) would be outlined, and patient safety could also be ensured with this.
Estonia	Hospital guide app for easier orientation in the hospital	Hospital directions often do not help patients/clients understand where they need to go. There could be some app/artificial intelligence from the IT side that helped to orientate around the hospital
Estonia	Operating room plan planning app	An IT solution that would help plan the operating room`s work, establish the

		surgery plan, and it would also be visible to other employees (surgeons, anesthesiologists, etc.), who also monitor the surgery plan and plan patients there. So that the operating room`s work is planned and visible.
Estonia	IT solution for ED workload traceability	The problem is the workload of hospitals and its traceability, i.e. what is the workload of the departments at the moment (number of patients, number of employees). At this point, the monitoring of the ED's workload would also be good, which would be able to show patients how many patients are currently in the ED and with what degrees of severity.
Estonia	Planning and monitoring nursing interventions through an IT solution	Planning and monitoring of nursing interventions through some IT solution, perhaps the nurse could enter procedures/medications somewhere (can also be connected to the idea of our medicine app), the application will remind the nurse when the time of a medicine or procedure is approaching and the nurse can check it characteristics of the procedure or drug. Also, this information could be somewhere on the monitor, which would be like a "time table". Perhaps the idea is to prevent some procedure/medicine from being done or done incorrectly in some way. What is important is patient safety.

Finland	Staffing issues	How can technology help with staffing? Is it a threat, why? Is it an opportunity, in what way?
Finland	Cooperation	How do we bring all sectors together?
Finland	HealthTech cost	What are the costs? Calculating the impact of products.
Finland	Bias reduction	How to reduce bias related to welfare technologies, especially in the social and health sector.
Finland	Mental health improvement	How to improve the mental health of patients living alone by using Health Technology.

Career in HealthTech

The aim of the project is to make it more attractive for people to choose a career in a HealthTech related field. Therefore, part of the questionnaire was also targeted towards getting an overview of how well HealthTech is incorporated into the curriculum.

Trends

Interviewees were asked about the most important trends in healthcare as follows.

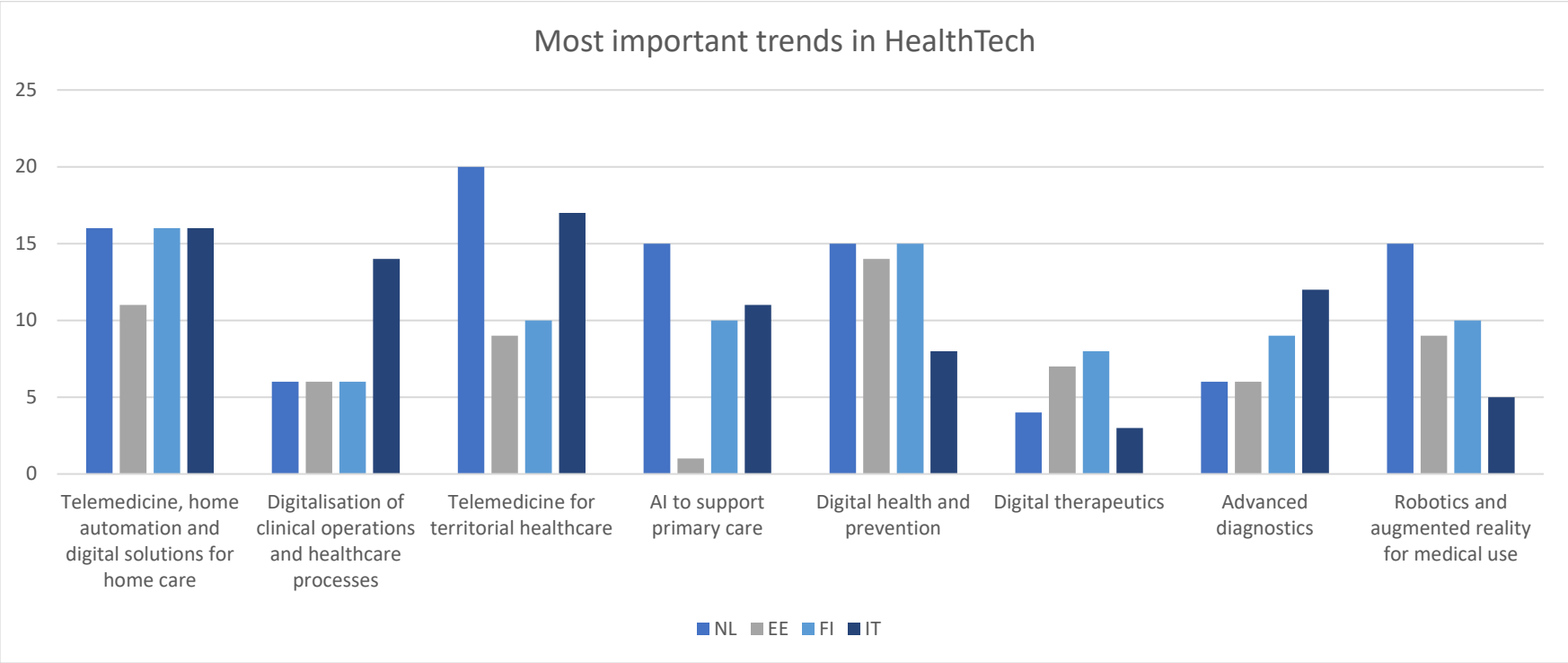


Figure 11: most important trends in HealthTech

As can be seen in the figure 11 above, the overall top 3 is relatively consistent over the different countries.

1. Telemedicine, home automation and digital solutions for home care was number one in Finland and number two in Estonia, the Netherlands and Italy.
2. Telemedicine for territorial healthcare was number one in Italy and the Netherlands and number three in Finland and Estonia.
3. Digital health and prevention were number one in Estonia, number two in Finland, number three in the Netherlands and not in the top three for Italy.

In the Netherlands, the trends seen as most impactful within healthcare technology are mainly in remote monitoring and care delivery and the use of AI/robotics. Developments in these areas are moving very fast and it is believed that AI in particular can also have a great impact on how care provision is organised. Currently, these trends are still very little incorporated into education because these developments are happening so fast, and it is also still very new for teachers.

- ➔ The newest trends are not very well included into the curriculum. There is a discussion about whether that is necessary or not, since it is ought to be more important to know the theory and dynamics behind HealthTech (systems) than understand all the latest trends/technologies/systems.

In Estonia, the single most recurring trends are the combined emphasis on digital health and prevention, digital therapeutics home automation and telemedicine. With these seen together, it indicates an essential trend toward remote care – this being the ability for healthcare organisations to communicate with and treat patients without physical contact. After that, a use of artificial intelligence to support various healthcare activities, from primary support care to clinical decision support. Further to this are trends towards using HealthTech in daily activities in healthcare – advanced diagnostics and digitalisation of processes will help streamline common activities, increasing efficiency of healthcare staff.

In Italy, the responses of the interviewees confirm those of the representatives of the IT/ICT companies: the leading sector is telemedicine and tele-monitoring, based on the various projects undertaken by local healthcare companies. These solutions make it possible to decentralise care, to provide it in different places or at home, to reduce the pressure on hospitals and to connect different care facilities. They also meet the needs of rural or very large areas by enabling the development of territorial healthcare. At the same time, solutions for advanced diagnostics and the use of AI in healthcare are also emerging, but with closer links to the medical profession. Interestingly, management systems, which are essential for optimising logistics and data analysis, are also mentioned among the trends.

In Estonia, in the curriculum of nursing the subject “Digital Technologies in Health Care” is in the amount of 3 ECTS. The learning outcomes are: The student uses the terminology of the field of digital technology and e-solutions and knows the principles of data use and transfer in health care. 2. Distinguishes and is able to choose suitable solutions of implementing health care telematics. 3. Understands data and cyber protection requirements and the importance of cyber security requirements.

- ➔ Industry trends are part of university training pathways but are not part of the training pathways of EQF 3-5 institutions.

In Finland, telemedicine, home automation and digital solutions for home care and digital health and prevention were clearly considered the most important trends in Health Technology by the interviewees. This may be partly because many of the organisations interviewed operate in the home care sector, where these trends are central.

- ➔ All vocational upper secondary qualifications include a common unit of study (CU), which includes general education in IT skills (working in the digital environment), maths, languages, entrepreneurship and working life.

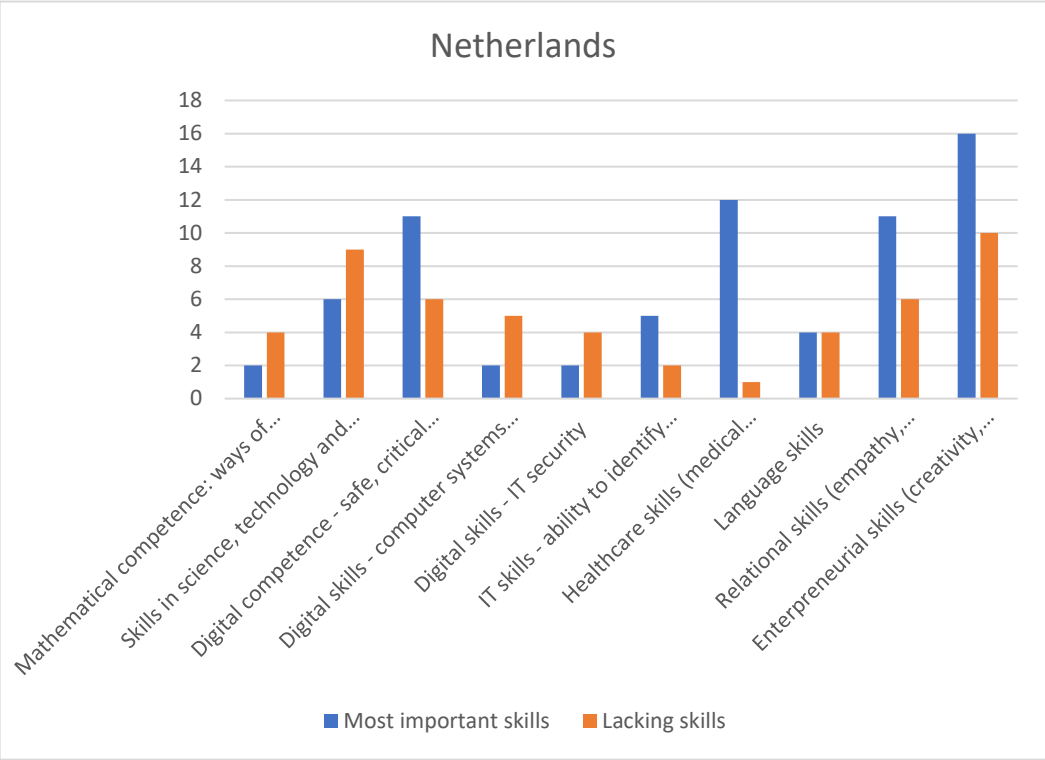
Most important skills

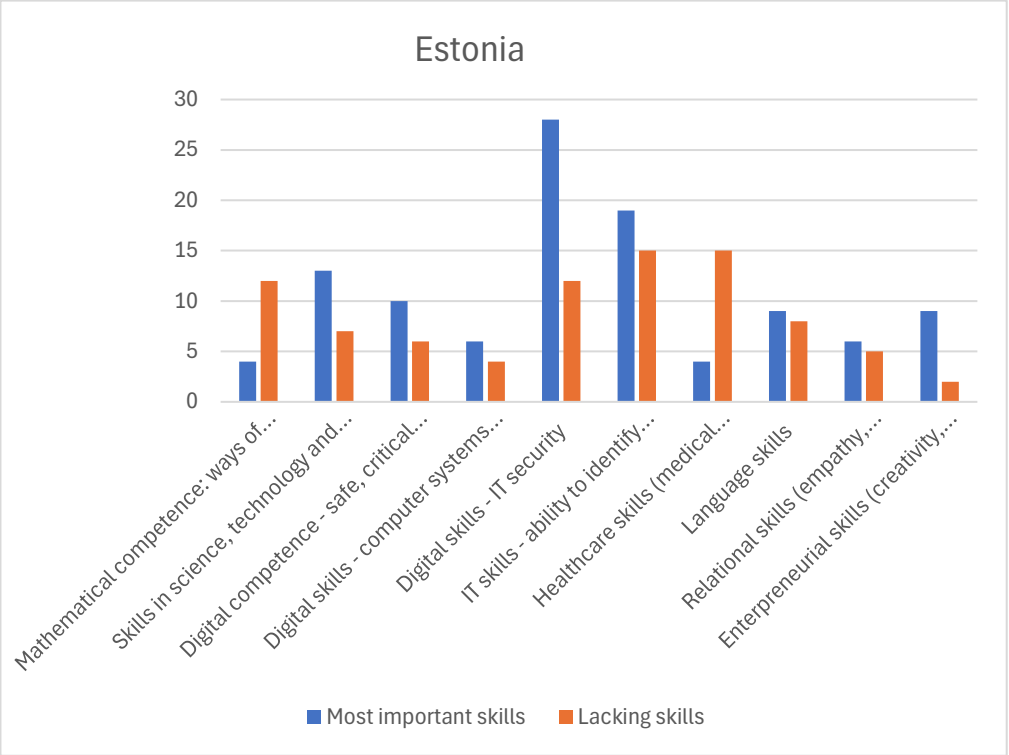
To get an idea of the skills that are important when pursuing a degree in HealthTech, respondents were asked what the most important skills for students are who want to pursue a career in HealthTech, and which skills do students tend to miss when they finish EQF4.

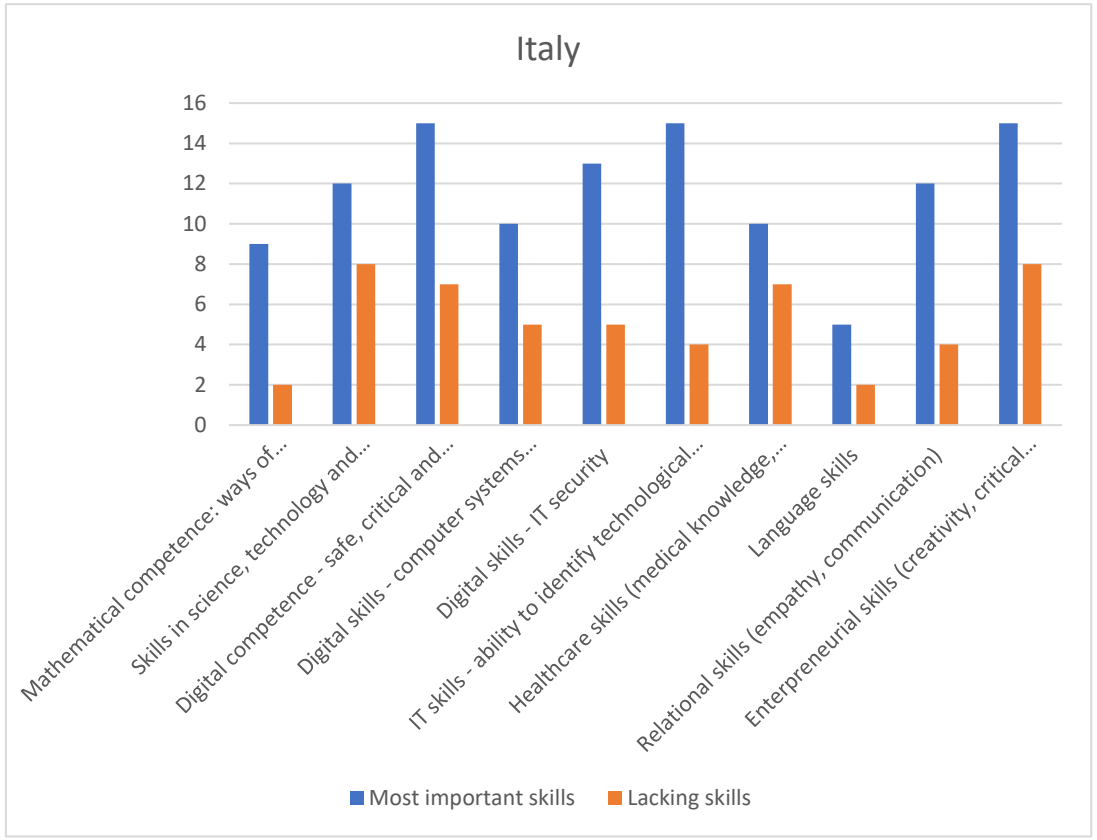
List to choose from:

- Mathematical competence: ways of thinking about and presenting mathematics (formulae, models, constructs, graphs, diagrams), understanding the mathematical aspects of digitisation.
- Skills in science, technology, and engineering
- Digital competence - safe, critical, and responsible use of digital technologies
- Digital skills - computer systems programming
- Digital skills - IT security
- IT skills - ability to identify technological needs and responses, using digital technologies in a creative way
- Healthcare skills (medical knowledge, working with patients)
- Language skills
- Relational skills (empathy, communication)

- Enterpreneurial skills (creativity, critical thinking, problem solving)







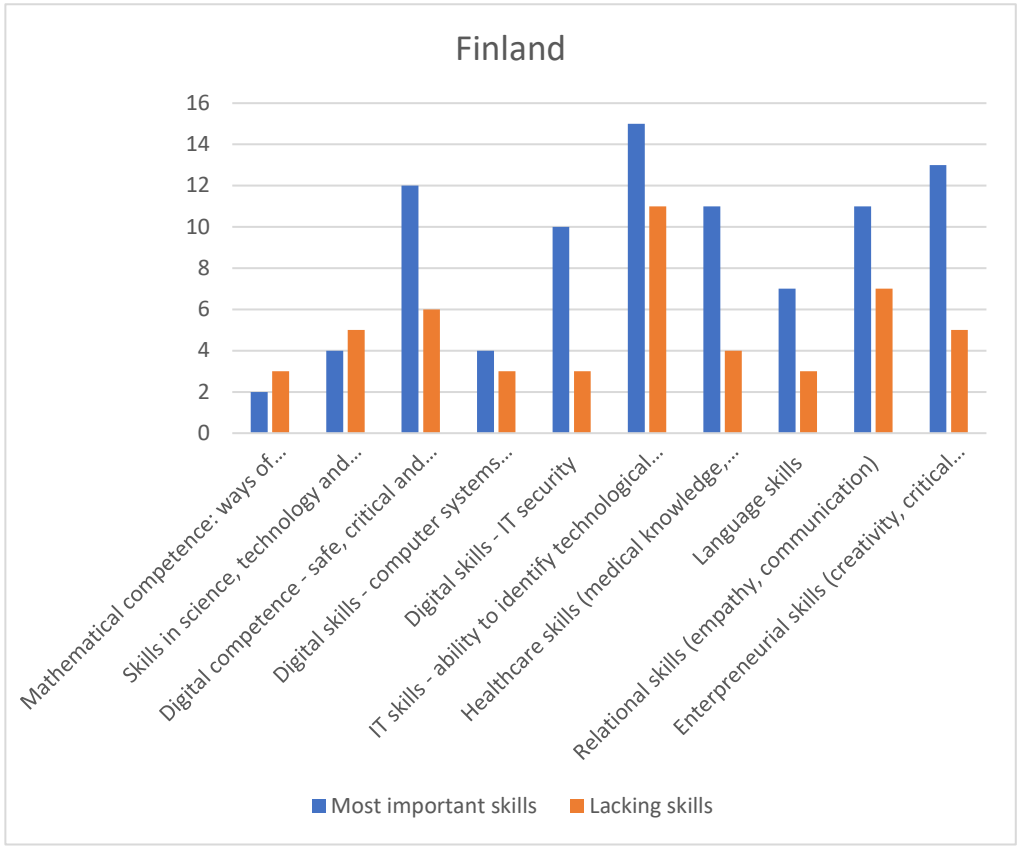


Figure 12: most important skills for a degree in HealthTech across the different countries.

There are several similarities in the responses from Italy, the Netherlands and Finland there are several similarities. In all three countries, the following skills are seen as relatively important and still lacking when students graduate:

- Digital skills - safe, critical and responsible use of digital technologies, relational skills (empathy, communication);
- Entrepreneurial skills (creativity, critical thinking, problem solving).

The key part in both skills is critical thinking. This fits well with what for instance several respondents in the Netherlands stated. They stated that students should not be trained too much in a particular healthcare technology, but they should learn how to think creatively/problem-solving, so that students become familiar with the possibilities of (healthcare) technology and how to use it responsibly. To date, this has often not been sufficiently incorporated into

the curriculum. In addition, students and teachers are often unaware of the possibilities for a career in healthcare technology. As a result, students do not gain the right insights into the field, and the unknown makes it unpopular. It was also indicated that students can be forerunners in the field of healthcare technology when they graduate. This is only possible if the teachers are also pioneers and push the students to be one of them.

Both in Italy and Finland, digital competence - safe, critical, and responsible use of digital technologies scored high on importance and students are currently lacking knowledge on the theme.

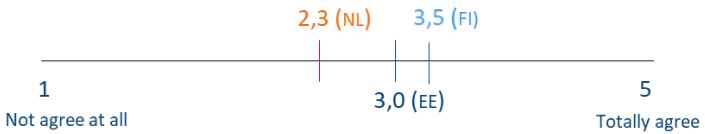
This also ties into a skill that scores highly in Estonia and Finland, namely IT skills - ability to identify technological needs and responses, using digital technologies in a creative way. In this skill also creativity and critical thinking is key.

In the Estonian data it is notable that respondents say that healthcare skills (medical knowledge, working with patients) are lacking in graduates, but this is not of much importance, although in the other countries it is the other way around.

Interestingly, according to EUROSTAT, only 6.7% of young Italian graduates have a degree in STEM subjects, compared to a European average of 12-13%. To promote STEM education, the Italian government launched a STEM Week in 2023, involving educational and training institutions of all levels, with laboratory activities and orientation paths for students. In addition, the Ministry of Education and Merit has issued specific guidelines: all education and training institutions, from pre-school to high school, state, and parity, are invited to update the three-year plan of the educational offer and the institute curriculum by providing specific actions to strengthen the development of mathematical-scientific-technological skills. In terms of digital security skills, the Italian National Statistics Institute found that in 2023, 27.9% of citizens aged 16-74 had no digital skills in this area. Among the non-digital skills, except for those related to health, which can be acquired through specific and sectoral training, there is a gap in skills related to creativity, critical thinking and problem solving, with negative consequences for teamwork and project management.

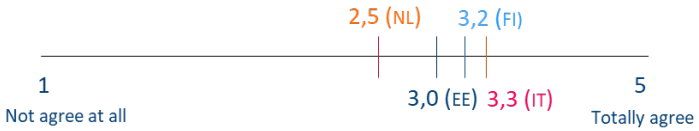
Respondents were presented with the statements below and rated them on a scale ranging from not agree at all, to totally agree:

It is clear which courses are being offered concerning HealthTech on VET level[5]

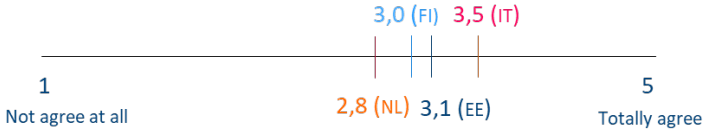


The curricula of (VET) training institutions are well aligned with the required knowledge and skills:

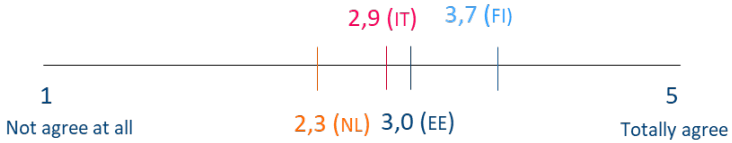
[5] Not answered by Italian respondents, since HealthTech/Healthcare pathways are EQF 6-7



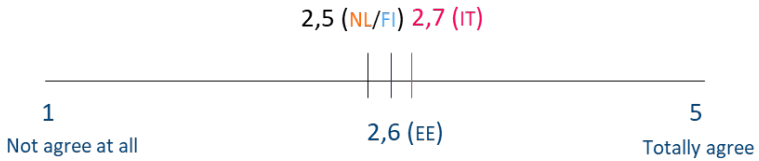
Most alumni of (VET) programs are able to adapt to innovation in the HealthTech sector.



(VET) graduates are aware of career opportunities in the HealthTech sector.



Plenty of courses are offered for professionals to keep their knowledge of HealthTech up to date.



The consensus is that there is still much to be improved. Especially the statement *Plenty of courses are offered for professionals to keep their knowledge of HealthTech up to date* scores significantly lower than the other statements. This means that extra attention should be given to addressing also adult learners when developing education within the HealthTech sector.

What can be noticed straight away is that the Netherlands consistently scores lower than the other countries, which means there is plenty to learn from the other countries. This aligns with the general feeling in the Netherlands that there is a lot of potential in the region that still needs to be achieved.

Another outlier is that Finland scores relatively much higher on the statement *(VET) graduates are aware of career opportunities in the HealthTech sector*. Therefore, it could be interesting for other countries to look at what is happening in Finland concerning the promotion of career opportunities within HealthTech.

Main conclusions and next steps.

Despite hosting quite different regional landscapes, there are common themes that emerge from the regional reports that generate some clear conclusions, and next steps.

- There is a strong inter-regional desire to improve existing connections. In all regions (especially Estonia and the Netherlands), there exists good connections between healthcare and education in particular, and improving these connections will improve access to HealthTech.
- There should be enhanced digital literacy for healthcare practitioners and educators.
    - This is a noted problem in Italy in particular, but there is room for improvement in all regions.
    - Improved digital literacy of patients/the public is desirable, as it would enable them to interact with healthcare record systems more easily, making these systems more efficient.
- In regions like the Netherlands where attitudes to HealthTech are typically conservative, there should be an emphasis from management on the benefits of HealthTech.
    - The goal of management in these cases is to help build trust and confidence of practitioners or educators in new technologies.
- In Finland, healthcare organisations brought out that strict regulation of healthcare could be a factor limiting the use HealthTech solutions. Some solutions are seen as restricting and limiting patients by the supervising authorities. Another factor limiting collaboration and the use of HealthTech is lack of resources.
- Several regions note a lack of partnerships between IT companies and other sectors.
    - They are seen as external to the good relationships between healthcare and education, but they can help deliver innovative technologies to classrooms, and deliver further improvements to existing student placement relationships.
- Across all regions, there should be a 'common language' defined. This has been seen as a barrier to development of partnerships. IT companies in particular are used to different vocabulary, and the privatised nature of their industry makes it difficult to establish common goals.
    - This means a need for both mutual understanding of terminology and concrete understandings of ambitions/agreements when forming partnerships.
- There should be greater funding offered wherever possible to deliver new HealthTech to healthcare providers and education providers.
    - These technologies should be woven into curricula as far as possible, as standard.

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Attachment 1: regional report Estonia

Introduction region analysis

This report provides an overview the healthcare technology ecosystem in Estonia. Two ways of collecting data were used, a questionnaire with a mix of likert scale and short form answers, and interviews have been conducted. To get balanced input, stakeholders from educational institutions, healthcare institutions and IT companies (with an affinity for healthcare) were contacted. The breakdown of the responses can be found in figure 1. After completing the interviews, the initial outcomes were reviewed with 10 stakeholders in a regional meeting on March 22, 2024 and further refined and supplemented where necessary.

	Educational institutions	Healthcare organizations	IT companies
Questionnaires completed	9	6	4
Interviews Completed	7	4	3

Figure 1: Number of questionnaires completed and interviews conducted by stakeholder group. Note there is overlap between stakeholders who were interviewed and completed the questionnaire.

The survey was conducted in early 2024. Topics covered included current healthcare technology experience, healthcare technology opportunities, stakeholder collaboration and career opportunities.

The purpose of this report is to analyse the current healthcare technology ecosystem in Estonia and identify the areas for improvement. These points for improvement can then be taken into account in the design of the rest of the project, for example, in determining the themes for the micro-credentials to be developed and in planning future hackathons. Due to the limited responses, this report does not provide an overall picture, but can only provide a general picture.

Centre of Vocational Excellence - Care About IT

This report is part of the Erasmus+ project "Centre of Vocational Excellence - Care about IT". In this project, fifteen educational institutions, healthcare institutions and IT companies (with an affinity for healthcare) from Italy, Finland, Estonia and the Netherlands are jointly working on:

- Improved (international) cooperation between industry, healthcare institutions and educational institutions (both teachers and students) in the field of healthcare technology.
- Improve the attractiveness of careers in healthcare technology.
- Improve knowledge and skills around healthcare technology for all stakeholders involved.

The Estonian partners cooperating in this project are Tallinn Health Care College, Tehnopol, IVKH, TNP and Kood/Johvi. More information about CoVE Care about IT can be found at https://careaboutit.eu/.

Estonian Region

The immediate conclusion from analysis of the interviews and surveys is that there is already significant connection/cooperation in this sector. For example, the connection between educational institutions and health organisations is well established, particularly for student and professional work placements. As will be explored later, there is unanimous ambition for further collaboration. It is noted that as Estonia is a small country, the existing cooperation is between organisations (and individuals) that know each other well. Estonia has been successful in the development of e-health, the collection and analysis of genetic data, and the digitization of health data, and this gives Estonia a good opportunity to take a leading role in updating the health care system at the international level. In a functioning ecosystem, consumers of services should be partners, not customers, and it is important to develop systems and services together - doctors, patients and IT people - in order to reach the best result.

In Estonia, the strategy and action plan for the development of the field of HealthTechnologies and services for the years 2023-2028 have been completed. The strategy represents a vision that aims to significantly promote medical innovation and entrepreneurial activity in Estonia. The strategy and action plan were prepared in the framework of the project "Services for the creation and development of knowledge-based startups and the development of the ecosystem of knowledge-based entrepreneurship in Estonia". The project includes the University of Tartu, Tallinn University of Technology, Tartu Science Park and Tehnopol research and business campus.

The strategy focuses on five main areas:

1. Fostering innovation: creating an environment that encourages and supports new and innovative initiatives in the HealthTechnology sector.

2. Export support: raise the international profile of the Estonian HealthTechnology sector by contributing to the growth of exporting companies.

3. Increasing knowledge and experience related to industry regulations: to enhance the knowledge and skill set that will help us better adapt to the rapid development of the industry and regulatory challenges.

4. Increasing the number of professionals operating in the field: increase the number of competent and experienced experts in the HealthTechnology sector to ensure the sustainable growth of the field.

5. Additional financing options and improving access to capital: develop structures and measures that expand financing options and facilitate capital mobilization.

Definition of healthcare technology

Since healthcare technology has no set definition, survey respondents were asked to define healthcare technology. From Estonian data sets, it is generally agreed that there should be a broad definition of what should be considered healthcare technology. This includes anything that can aid processes in healthcare or educational organisations, or technology available to the public that improves their wellbeing. The general interpretation of this term focussed on digital technologies, but the type of equipment and intended application is considered to be open to anything which will benefit the sector in some way. It is possible that the interpretation of this term may differ across the four participating countries, but that comparison will be made in the international comparative analysis.

IT companies (with an affinity for healthcare) - general

Estonia is well known to be a leader in IT services. There are several companies focussing also on HealthTechnology in the Tallinn area.

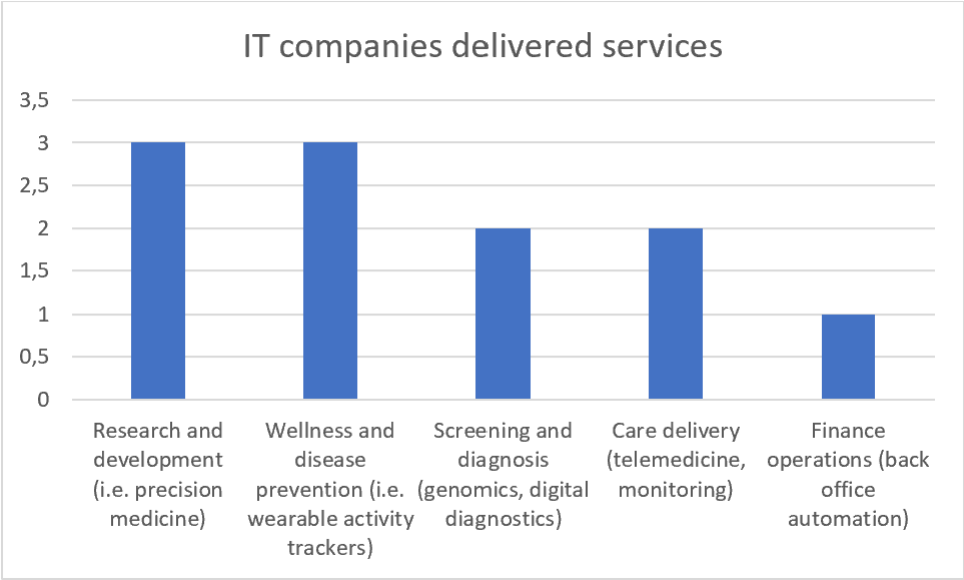


Figure 1: IT companies – delivered services

There is a high demand for IT companies to deliver on complex IT solutions. In addition to research (Behaviour research and diagnosis) and development for future products/services, this includes current products. The focus of the current IT offerings are in the form of wellbeing and disease prevention products, and of healthcare delivery (being telemedicine and monitoring products). IT tutorials and support. But not all IT companies are offering training on HealthTechnologies.

Educational institutions - general

The purpose of vocational education is to acquire knowledge, skills and attitudes, skills and social readiness for work, participation in social life and lifelong learning. Vocational education is organised by vocational education institutions and universities of applied sciences. 98% of all vocational training places are state-funded, i.e. free of charge for the learner.

To what extent do teachers feel confident teaching subjects/projects/courses involving new technologies?

How enthusiastic are teachers about using new technologies in education?

As can be seen in the scores above, teachers are both relatively enthusiastic and feel confident towards the use of new technologies. This means that there is a high possibility of teachers accepting HealthTech as part of the curriculum when it is offered to them.

There is a significant level of agreement in the current state of HealthTech in educational institutions, and what is needed to move forward. Educational institutions generally do possess HealthTech equipment, but these are not widely known/used by the institute or network.

However, teachers are enthusiastic to move forward with further integration of IT technologies, and are typically quick to adapt to using them. There should be work done to integrate the equipment into modernised curriculum. It is commonly noted that collaboration would be a step toward improving the state availability and staff competence of HealthTech.

Healthcare organizations - general

The Estonian health care system is based on compulsory solidarity-based health insurance. Health care services are made available mostly by private service providers. The management and supervision of health care system and development of health policy is under the scope of the Ministry of Social Affairs and its agencies.

In Estonia, the health care system is governed by the Health Services Organisation Act, which provides the organization of and the requirements for the provision of health care services, as well as the procedure for the management, financing and supervision of health care.

Provision of health care is organised according to the specifics of the service:

- emergency care
- ambulance
- primary care
- specialized medical care
- nursing care
- midwifery care

Health care is financed mostly from the state budget under the health insurance budget through the means of the Estonian Health Insurance Fund, as well as through direct allocations. Health care also gets finances from the rural municipality and city budgets, through patient deductible fees (e.g. fees of medical specialist visits) and from other sources

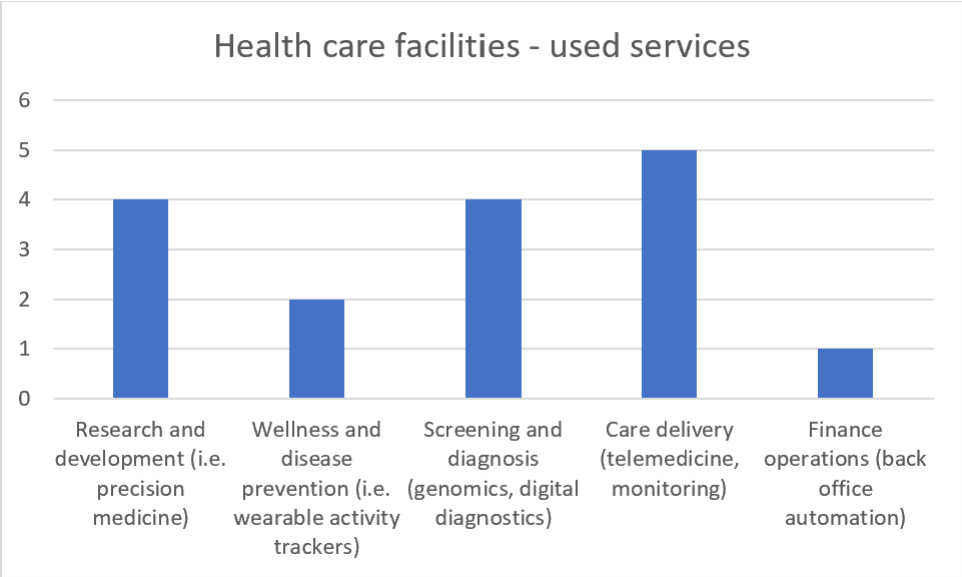


Figure 2: health care facilities – used services

As might be expected, there is widespread and advanced use of HealthTech amongst healthcare organisations. The technology already in use includes;

- Diagnostics
- Patient monitoring
- Disease prevention
- Digital solutions

- Holter-monitoring
- Simulation training
- Remote-sensing
- Precision therapy
- Digital health records
- Electronic health records
- Medical devices
- Health tracking applications.

Healthcare institutions are increasingly aware of the advantages of HealthTech like those above, and are continually investing in research and development, and new technologies. In addition to continuing to search for technology like those described, there is a specific note for more telemedicine and remote consultation.

Collaborations

Within this project, the focus is on the collaboration between educational institutions, IT companies and healthcare organisations. Therefore, we specifically looked at the current collaborations between the different stakeholders and how that can be further improved.

Collaborating with educational institutions

Current collaboration with educational institutions

There are currently good connections between **different education institutions** in the field of healthcare – this is particularly seen in the examples of research (innovation and development projects, and in context analysis for development of new technologies) and further, in the implementation of existing digital HealthTechnologies. The strength of these existing partnerships is seen in the desire for further collaboration at all EQF levels 3-7.

There is also significant existing cooperation between **educational institutions and health organisations**. These are primarily in student placements or professional training placements, with some further collaborations seen developing training programs and innovation and development projects.

Despite the good connections above, there is a noticeable lack of cooperation between **education institutions and the IT sector**. The only connections current available are limited student work placements and professional training placements.

Areas for improvement in cooperation with educational institutions

There is obvious enthusiasm for even further partnerships **between education institutions**. This is particularly evident in a desire to further strengthen the already significant cooperation on innovation and development projects. The clear barrier to furthering this cooperation is staff capacity, with the key area for improvement being time and/or funding being necessary for increased focus.

There is similar enthusiasm to further the existing good relationships **between education institutions and healthcare organizations**. There is enthusiasm for definition of training programs, improving student & professional placements, and to innovation projects. It should be noted that this survey question on areas for improvement was met with a broad range of responses, indicating a strong desire for collaboration in a broad range of areas. Regarding the barriers to this cooperation, in addition to the recurring problem of time/funding for extra capacity for these collaborations, there is the additional lack of contact information and knowledge.

There is much work to do on improving the connection between **educational institutions and the IT** sector given the very limited current cooperation. It should be noted that that few surveyed education institutions were able to suggest companies they would like to cooperate with, and this is reinforced by results from interviews that suggested these sectors 'speak the same language'; there is clearly difficulty with communication. IT companies are typically commercially focussed and a key to further cooperation will be meetings to discuss goals/methods to find common ground. There is a particular appetite for this type of collaboration to be focussed on furthering innovation and implementation of new technologies.

Collaborating with healthcare organizations

Current collaboration with healthcare organizations

There is a varying degree of cooperation between healthcare organizations. They typically cooperate in a range of subjects, concerning student placements, innovation and development, applying existing technologies and context analysis for new technologies. However, the extent of these connections is typically limited to one or two subject areas – this can be better defined as a broad range of connection with limited depth.

This contrasts to the good relationships between **education and healthcare organisations**, as outlined previously.

Compared to cooperation between different healthcare organisations, the cooperation **between IT and healthcare** is marginally stronger. They typically work on developing new systems/technologies, and implementing existing technologies.

Areas for improvement in cooperation with healthcare organizations

The areas for improvement **between healthcare and education** has been analysed above – in that area that is a strong appetite for improvement, with general agreement on what this area should be.

However, such is the limited cooperation that **healthcare organisations** have between themselves **and with IT**, there are a number of areas for improvement and there is the ambition to do so. The important areas for further cooperation are improved training, innovation and development and implementing existing projects. There are barriers to furthering this cooperation, that are clearly identified as time and funding – a lack of staff capacity is a recurring problem within both healthcare and education organisations. Similarly to a previously discussed challenge present in collaboration between education and IT, there is a recurrence of organisations speaking different languages, and being unable to find common approaches for collaboration.

Collaborating with IT companies

Current Collaboration with IT companies

The collaboration between IT companies and both healthcare and education organisations has been covered above, so this section will focus on the current collaboration and improvement areas **for IT companies**.

The current cooperation is already well established. There is cooperation with a broad range of companies, and this connection primarily centred around developing new technologies, analysing context for further developments, and implementation of existing technologies. There are student work placements or professional internships, Innovation and development projects, Career guidance, Applying existing digital HealthTechnologies, Context analysis for the development of new technologies for digital health.

Areas for improvement in cooperation with IT companies

There is an obvious enthusiasm to further these existing connections, along the same subject lines – this indicates an obvious satisfaction with current practices, and the desire is for more of the same. However, there remains the recurring barrier to further cooperation: resources and funding.

Best practices

Many best practices exist in Estonia considering HealthTech. A couple of the most important ones:

- Useful web pages:
  - Terviseportaal: https://www.terviseportaal.ee/en/
  - National e Booking system: https://digiregistratuur.ee/login
- Simulation environments before interaction with patients.
- Hospital information system development.
- National Health Portal – common platform for healthcare workers & patient data.
- Student participation in training programs.
- Estonian Connected Health klaster (ECHC)
- Artificial intelligence used at Narva hospital, for analysing/describing x-ray images.
- Point of Care Testing (POTC)
- HEDA information system
- Telemedicine
- The eAmbulance solution is a digital work tool used by ambulances, which allows the ambulance brigade to receive operational patient health information and document their actions in solving the case.

Careers in HealthTech

Trends identified as most important within healthcare technology are:

Trend	Occurrence
Advanced diagnostics	8
Augmented diagnostics	6
Digital health and prevention	14
Digital therapeutics	7
Digitisation of clinical procedures and healthcare processes	10
home automation and home care digital solutions	11

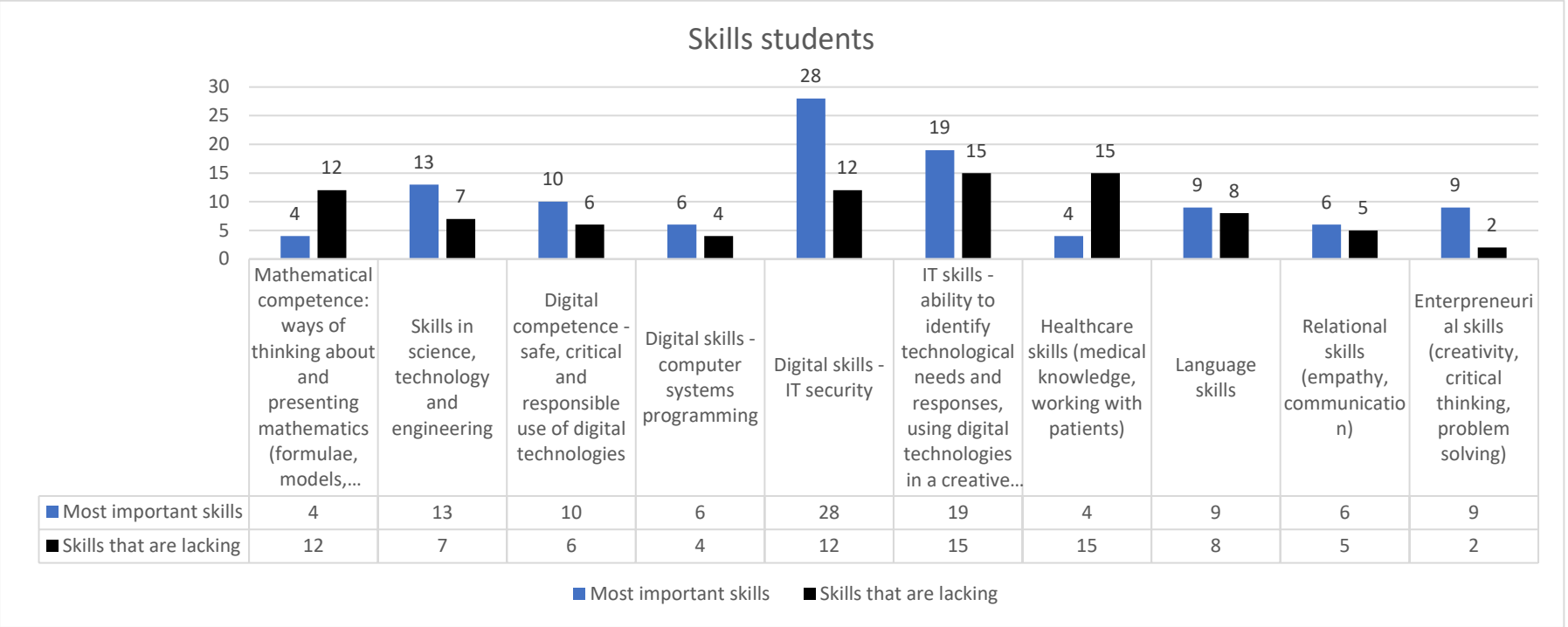
Robotics and Augmented Reality for Medical Applications	9
Use of AI in clinical decision support.	1
Use of artificial intelligence to support primary care	14
Use of telemedicine in territorial healthcare	9
Digitalisation of clinical operations and healthcare processes	6
Telemedicine	11

Figure 2: trends within healthcare technology

From the survey, the single most recurring trend the combined emphasis on digital health and prevention, digital therepeutics home automation and telemedicine. With these seen together, it indicates a very important trend is toward remote care – this being the ability for healthcare organisations to communicate with and treat patients without physical contact. After that, a use of artificial intelligence to support various healthcare activities, from primary support care to clinical decision support. Further to this are trends towards using HealthTech in daily activities in heathcare – advanced diagnostics and digitalisation of processes will help streamline common activities, increasing efficiency of healthcare staff.

Key skills for careers

If students would like to have a career in healthcare technology, these knowledge and skills are seen as important. The graph below highlights in blue which skills are seen as the most important for a career in HealthTech, while the column in black highlights which of these skills are considered lacking in the region.



	Mathematical competence: ways of thinking about and presenting mathematics (formulae, models,...	Skills in science, technology and engineering	Digital competence - safe, critical and responsible use of digital technologies	Digital skills - computer systems programming	Digital skills - IT security	IT skills - ability to identify technological needs and responses, using digital technologies in a creative...	Healthcare skills (medical knowledge, working with patients)	Language skills	Relational skills (empathy, communication)	Enterpreneurial skills (creativity, critical thinking, problem solving)
Most important skills	4	13	10	6	28	19	4	9	6	9
Skills that are lacking	12	7	6	4	12	15	15	8	5	2

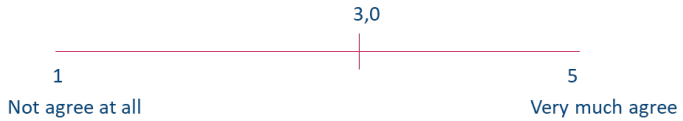
Figure 3: most important skills in HealthTech (blue) and skills that are lacking (black)

From the graph it is clear that the most important skills for HealthTech are digital and IT skills – these are the abilities to use IT for problem solving, and to use IT to easily (and securely) complete essential daily tasks). It is also clear that these IT skills are seen as lacking, despite their high importance.

It is notable that while mathematical competence and healthcare skills/knowledge are not considered significant for a career, there is a considerable lack of these skills present in the industry. We might therefore consider that these skills should be of a basic/intermediate level, but that this basic/intermediate level is not being met. Based on this data, there may be a need to prioritise these skills for the industry.

More advanced IT skills like programming are considered less relevant, as were soft skills concerning relationship building and communication.

It is clear which courses are being offered concerning HealthTech

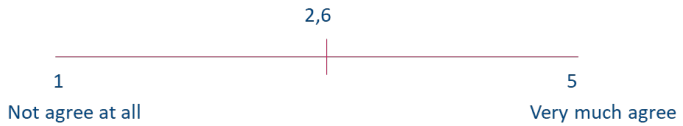


The curricula of (VET) training institutions are well aligned with the required knowledge and skills:

Most alumni of (VET) programs are able to adapt to innovation in the HealthTech sector:

(VET) graduates are aware of career opportunities in the HealthTech sector:

Plenty of courses are offered for professionals to keep their knowledge of HealthTech up to date:



SWOT Analysis

SWOT Analysis is a method to evaluate strengths, weaknesses, opportunities, and threats for the purpose of strategic planning. Here is a SWOT analysis of the HealthTech ecosystem in Estonia:

Strenghts: • E-country • Good education • Interest for healthcare is big • Motivated dutiful workers	*Weaknesses* • *Financing* • *HealthCare organisatsions use different IT systems* • *overburdening health workers*
Opportunities • Small country • sharing experience • Good cowork between organisatsions • Healtcare is appreciated	*Threaths* • Data protection • Legislation • Underfunding of the health sector

Main conclusions

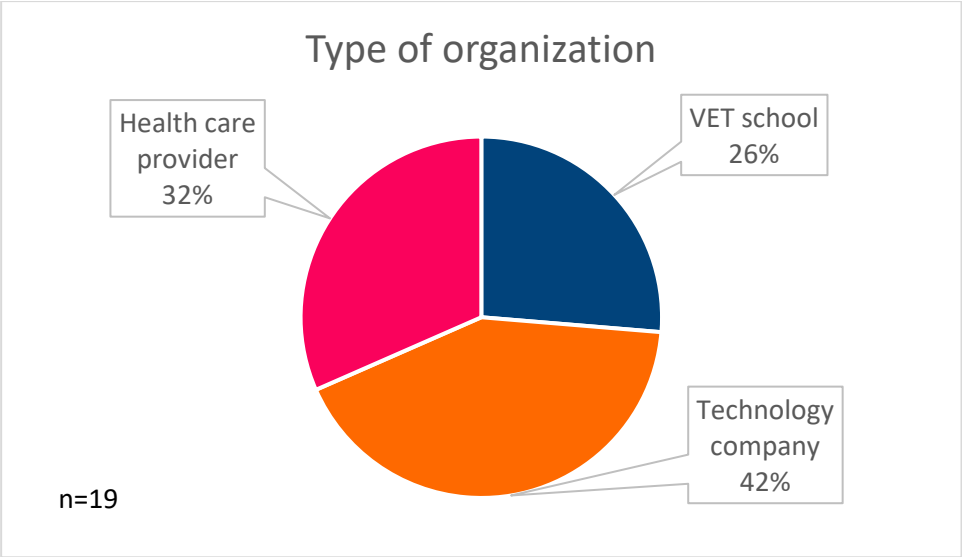
1. Due to the limited amount of people in Estonia, there is a very strong sense of community and people all know each other, especially in such a specific field as HealthTech. Therefore it is very important to work closely together and to connect to the other HealthTech projects in Estonia.

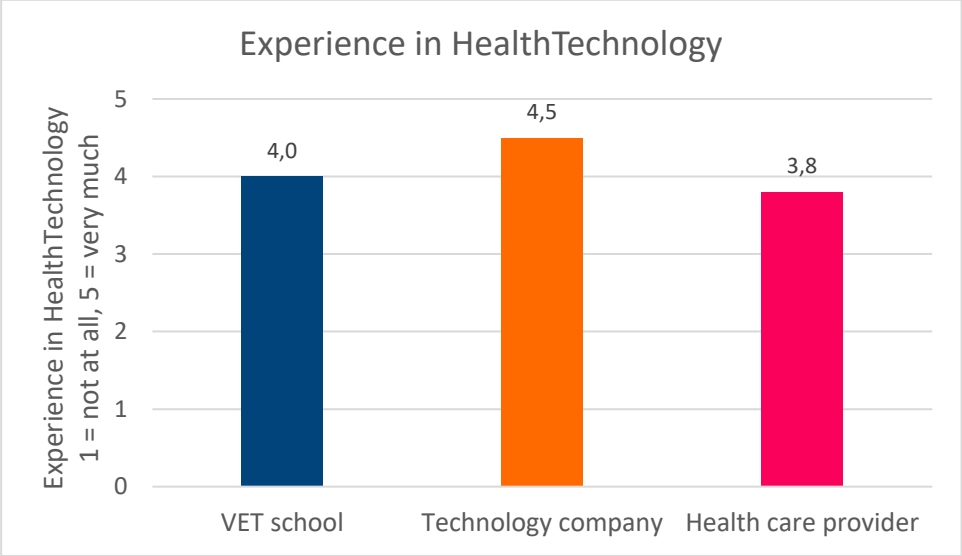
2. There is a high rate of acceptance of technology from the teachers, this means that with the correct knowledge, skills and materials offered to them, they will most likely be open to teaching HealthTech related courses.
3. There is already a good infrastructure concerning technology, use that basic infrastructure to build further upon.
4. Digital security is a skills that is of the most importance for a career in HealthTech and graduates are often lacking this. Therefore, more focus should be placed onto this topic.
5. There is a high amount of enthusiasm concerning working on HealthTech related issues by all partners. We should utilise this enthusiasm to start setting up new partnerships.
6. Lack of a ´´shared language´´ is often seen as a reason why there is not more cooperation between the different stakeholders. Especially the IT companies are used to a very different vocabulary and context and therefore it is important that there is a mutual understanding of the agreements made.

Attachment 2: regional report Finland

Background

This report covers the Southwest Finland region and interviews conducted by Turku Vocational Institute. In total 19 companies or other institutions were interviewed, of which five VET schools, eight technology companies and six healthcare providers. The interviewees rated their organisations experience in HealthTechnology rather high: on average the score was 4,2 (scale 1 – 5). The rating of the experience varied slightly between different types of organisations: VET schools were rated on average at 4,0; technology companies at 4,5 and health care providers at 3,8.


Type of organization
Health care provider 32%
VET school 26%
Technology company 42%
n=19


Experience in HealthTechnology
Experience in HealthTechnology 1 = not at all, 5 = very much
5
4
3
2
1
0
4,0
4,5
3,8
VET school
Technology company
Health care provider

Definition of ecosystem

In the Finnish language, Health Technology and wellbeing technology are distinguished from each other, and the terms are used to mean different things. The interviewees in the region were very much in agreement on the definition and use of these terms, and there were no major differences between the answers given by interviewees from different backgrounds or institutions.

Even though health and wellbeing technologies were seen as separate issues, they are very close to each other. Health Technologies were seen more as medical devices and solutions used by healthcare professionals for disease treatment, rehabilitation, medication assistance, diagnostics, etc. Wellbeing technologies were seen more as solutions used by consumers to support and maintain health, wellbeing, and inclusion. Health Technologies are more regulated than welfare technologies.

The interviewees stressed that the use of Health Technology should be beneficial to people's wellbeing and based on their needs. It was described as technology that makes the work of carers easier, faster, more efficient, more supportive, and safer. It brings quality of life, added value, and meaning to life and increases the sense of security.

The responsibility for organising social welfare, healthcare and rescue services in Finland was transferred from municipalities and joint municipal authorities to welfare regions on 1.1.2023. Now there are 21 welfare regions, which are mainly based on the regional division. The welfare regions were formed as part of the reform of social welfare, healthcare and rescue services, which was one of the most significant administrative reforms in Finnish history. The reform was justified by the need to ensure equal services, to reduce differences in wellbeing and health and to curb rising costs. Welfare regions are self-governing regions. They are financed by the state and do not currently have the right to tax. (Source: Ministry of Social Affairs and Health)

General info – IT companies

Regional IT companies

Finnish IT companies include several HealthTech related companies, and it has risen to be one of the most prominent export businesses of Finnish higher technology companies. Turku and the southwest region are one the leading regions in Finland with regards to Health Technology, including several HealthTech startups. HealthTech solutions also include apps for social care.

Technology companies identified to be relevant to the Care about IT project and the regional centre of vocational excellence are listed below:

- Turku City Data
- Everon Oy
- 2M-IT
- Evondos Oy
- Meditas Oy
- DoseControl Oy
- Ascom
- Metsäkoto Oy
- Kardemummo Oy
- Seniortek Oy
- Precordior Oy

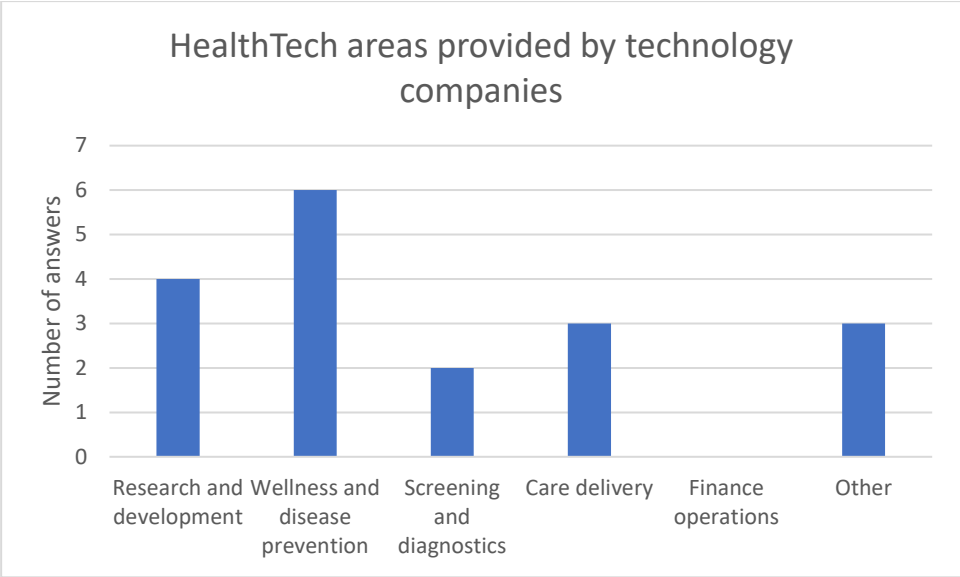
General info – IT companies

Which areas of HealthTech do your solutions address?

Areas	How many times was it picked?
Research and development (i.e., precision medicine)	4
Wellness and disease prevention (i.e., wearable activity trackers)	6
Screening and diagnosis (genomics, digital diagnostics)	2
Care delivery (telemedicine, monitoring)	3
Finance operations (back-office automation)	0
Other	3

Other including e.g.

- Public sector population projections including prevalence of diseases in each area, which provide good possibilities of forecasting.
- Public health programmes and screening



Trainings offered by technology companies include the following:

- Equipment commissioning training.
- How technology supports the health sector and how it should be used. Training in collaboration with Centria University of Applied Sciences.
- Commissioning training for a game used for work-life training: programming, graphics, game design, marketing, life management, work and study life skills and entrepreneurship.
- Training in the implementation of the service, plus training on the service as needed. Webinars. Training for partners.
- Webinars & white paper
- Training on their own products and systems. General webinars, speakers at various industry events/seminars, etc., as well as apprenticeships and theses

Training is mainly offered on the installation and use of the companies' own equipment and systems, with a special focus on company customers.

General info – Educational institutions

Regional educational institutions

Several vocational schools in the area offer healthcare, IT, and technology training at EQF levels 4 and 5, universities of applied sciences at EQF levels 6 and 7, and universities at EQF levels 6, 7, and 8. The educational institutions in the region are listed in the table below.

School	EQF level Health care	EQF level IT / technology	Interviewed by CaIT
Turku Vocational Institute	4 & 5	4 & 5	
Livia College	4 & 5		
Axxell	4 & 5	4 & 5	
Forssa Vocational Institute	4 & 5	4 & 5	
Luksia	4 & 5	4 & 5	
Länsirannikon Koulutus Oy WinNova	4 & 5		yes
Novida	4 & 5		yes
Raseko	4 & 5	4 & 5	
Salon Seudun Ammattiopisto	4 & 5	4 & 5	yes
SASKY Municipal Education and Training Consortium	4 & 5	4 & 5	
Sataedu	4 & 5	4 & 5	yes
Tampere Vocational College Tredu	4 & 5		
Turun aikuiskoulutuskeskus	4 & 5		
Prakticum	4 & 5	4 & 5	
Turku University of Applied Sciences	6 & 7	6 & 7	
Satakunta University of Applied Sciences	6 & 7	6 & 7	
Häme University of Applied Sciences	6 & 7	6 & 7	
Novia University of Applied Sciences	6 & 7	6 & 7	
University of Turku	6, 7 & 8	6, 7 & 8	

Åbo Akademi University	6, 7 & 8	6, 7 & 8	

HealthTech courses

University of Turku, Åbo Akademi University and Turku University of Applied Sciences offer courses and a degree program in Health Technology.

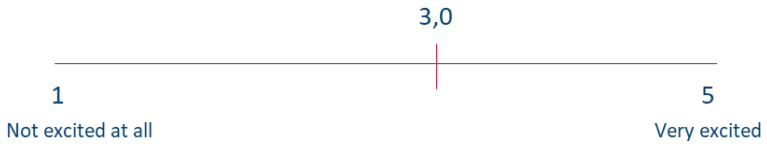
Vocational schools offer an optional course “Welfare technology in the promotion of functional ability” for practical nursing students. Health Technology is also included in the training of practical nurses. Turku Vocational Institute offers a training programme for welfare technology mechanics.

To what extent do teachers feel comfortable teaching courses with new technologies?

Answer indicated	How many times was it picked?
1 (not at all)	0
2	2
3	1
4	1
5 (very much)	1

There is quite lot of variation in the answers given by different education providers. However, as the number of respondents is relatively small, it is not possible to draw far-reaching conclusions from the responses.

To what extent are teachers excited to provide new technologies in education?



Answer indicated	How many times was it picked?
1 (not at all)	0
2	2
3	1
4	2
5 (very much)	0

Here too there is quite lot of variation in the answers given by different education providers, and it is not possible to draw far-reaching conclusions from the responses.

What is happening in the field of educational programmes, and what stands out?

Renewal of professions, which can be seen especially in the fact that jobs require more versatile skills, even from different fields. Studies are carried out more and more in multiprofessional teams.

Which obstacles are being mentioned in not offering any programmes related to HealthTech?

All the educational institutions interviewed offered Health Technology education, so the issue did not come up during the interviews.

General info – Healthcare providers

Regional healthcare providers

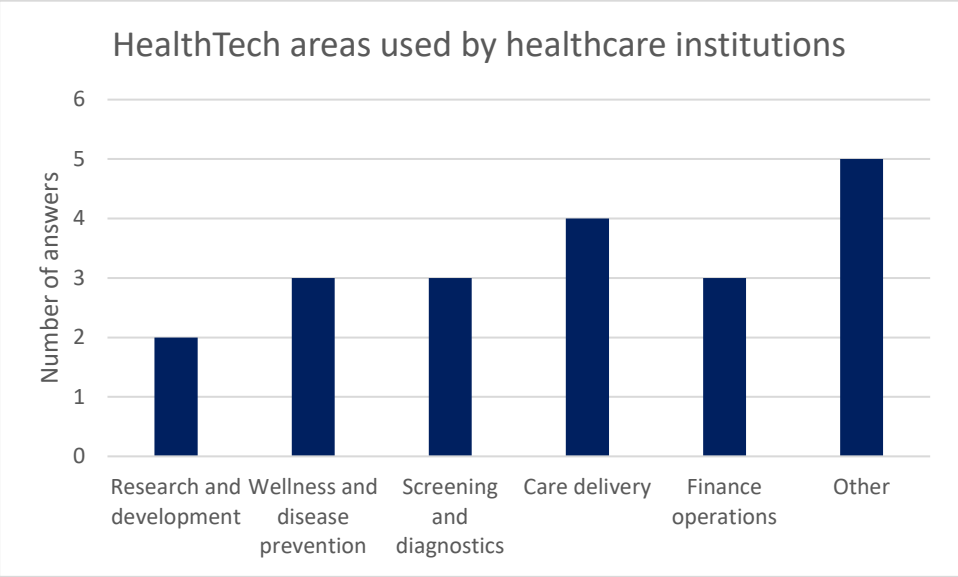
Healthcare providers identified to be relevant to the Care about IT project and regional centre of vocational excellence are listed below:

- Varha (The wellbeing services county of Southwest Finland)
    - Medical technology
    - Home care
    - Vuokkokoti and Kulkurin valssi (service housing units for the elderly)
- Kotikunnas (service housing units for the elderly)
- Parkinmäki (service home for the elderly)
- Validia (Specialist in disability services)
- Varha: Vaativat vammaispalvelut / KTO (demanding disability services)
- Mainiokoti Katariina / Hoiva Mehiläinen Oy

Varha home care, Vuokkokoti and Kulkurin Valssi along with Parkinmäki service home were not reached for interview.

HealthTech solutions & training

Which topics within HealthTech are mostly covered/used in the region?



Answer indicated	How many times was it picked?
Research and development (i.e., precision medicine)	2
Wellness and disease prevention (i.e., wearable activity trackers)	3
Screening and diagnosis (genomics, digital diagnostics)	3
Care delivery (telemedicine, monitoring)	4
Finance operations (back-office automation)	3

Other	5

There were somewhat different needs for technology. Healthcare organisations wanted to start using technology, which helps and assists with the daily needs of patients and would assist in monitoring the patients/users. One organisation brought out the need for “smart clothing” or smartwatch, which would measure parameters from user and would for example tell if user is going to fall. Important factors would be that ethical and juridical factors are considered; users would prefer to use the solution and it would be reasonably priced.

Another organisation brough out the need for a solution, which could be used to monitor patients/users especially during nighttime. The need was seen for robotic medical dispensers and electronic health record systems, which would communicate better with other systems.

In addition, one organization also brought out that if the patient lives in a nursing home, they are not provided with HealthTech solutions by the wellbeing services county (for example glucose monitoring devices such as Libre). This is because the wellbeing services county does not see a need for technology (or see a need to invest to technology), as there are nurses in nursing homes.

To what extent are there any courses/training in HealthTech?

Training provided by social and healthcare operators is mainly training for their own staff on the systems in use, including equipment security training and internal training on client and patient information systems and physiotherapy equipment.

Collaboration with educational institutions

In general, collaboration was seen as an important factor. One does not have to or should not do everything themselves. Joint training, project work, joint seminar days and company visits were mentioned as examples of good forms of cooperation. Only cooperation with vocational education (EQF levels 4 and 5) was discussed during the interviews.

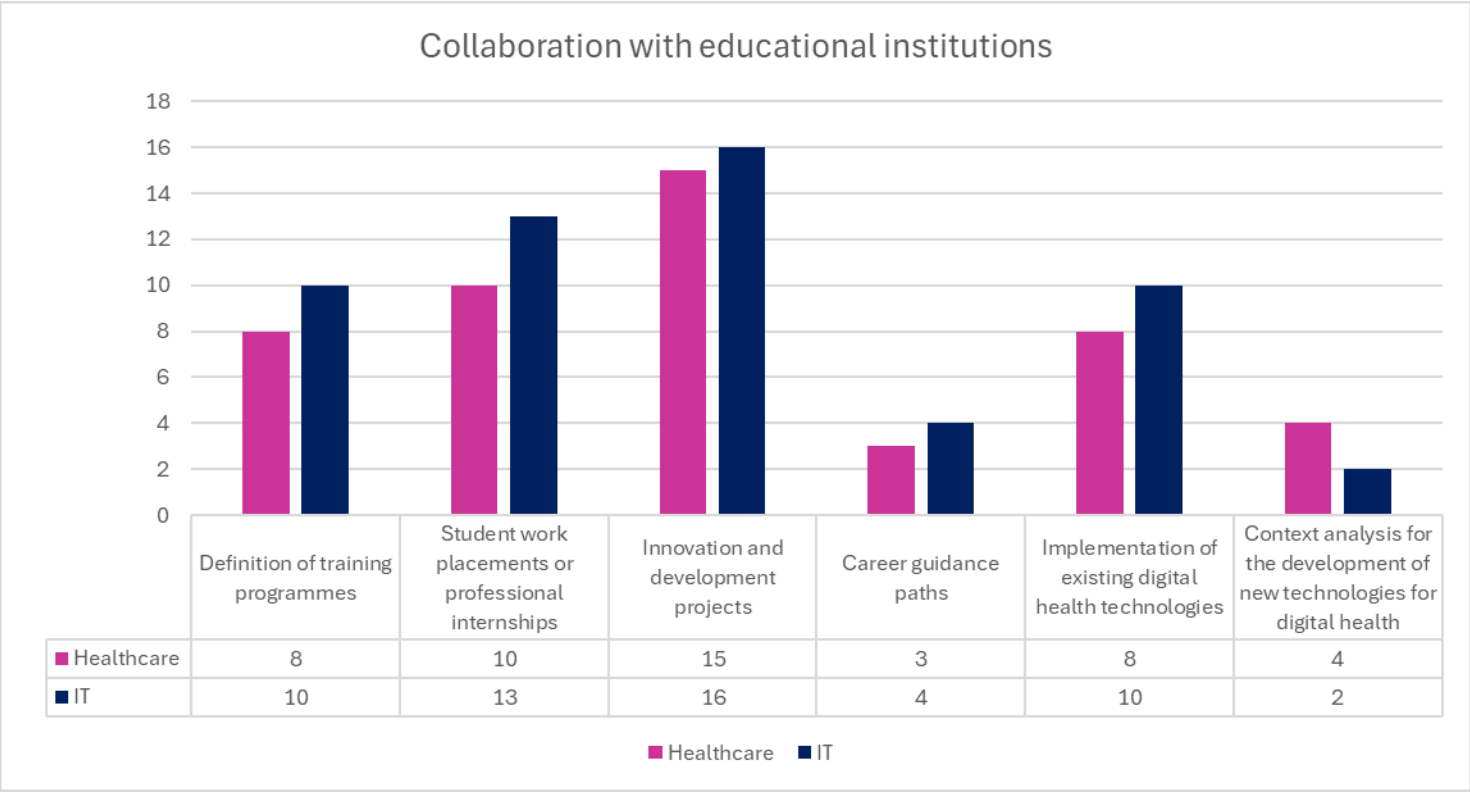
How would you rate your contact with educational institutions?

Number indicated	How many times was it picked?
1 (very bad)	0
2	1
3	3
4	10
5 (very good)	5

In general, collaboration and contacts with educational institutions were considered good. Healthcare institutions do collaborate with educational institutions regarding nursing students training periods. Collaboration is done mainly with EQF levels 4-7, but collaboration with EQF levels 4-5 was discussed in these interviews. Collaboration regarding HealthTech is considered quite minimal.

On which aspects do you collaborate with educational institutions?

Answer indicated	How many times was it picked by IT company representatives?	How many times was it picked by health care institutions?
None	1	0
Definition of training programmes	3	4
Student work placements or professional internships	5	5
Innovation and development projects	7	4
Career guidance paths	1	2
Implementation of existing digital Health Technologies	4	2
Context analysis for the development of new technologies for digital health	0	0
Thematic days and fairs in educational institutions	2	0
Other: Networking	1	0
Other: Assisting and collaborating on retraining and further training	0	1
Other: Extensive cooperation: e.g., students visit the company as part of a course (e.g., project work, as part of a lesson). The company gives lectures at TAI. TAI's trainee hairdresser is located at the company. The company provides a scholarship for one student each year.	0	1



Collaboration is mainly hindered because of lack of resources both in educational institutions and among healthcare providers. Cooperation with educational institutes seems to take place mainly through project work. On the other hand, educational institutions seem to have difficulties contacting the large healthcare providers and finding the right contact persons. Some interviewees also brough out that they lack connections to educational institutions.

Lack of time was considered the greatest factor hindering cooperation. Healthcare organisations are struggling with lack of staff and finance. Educational institutions also lack time and resources to sustain constant cooperation in other fields that are not considered to be “primary tasks” (such as training periods for nursing students). Innovations, development projects etc. are done through projects.

Factors that also hinder collaboration with educational institutions were lack of knowledge about the specific field in which the healthcare provider operates, for example care for disabled persons. What was also seen as an important aspect to develop was that education in educational institutes should be more focused on work-based learning – education should be developed more in collaboration with healthcare organisations. Education should prepare better for the skills required in practice. On the other hand, some interviewees also said that they are doing so much collaboration with educational institutions that they do not have resources to further increase collaboration. A factor which was also seen as an obstacle to collaboration was the lack of language skills (Finnish language) of the students.

There were some suggestions to improve collaboration. Main theme was that collaboration should be constant. It was also mentioned that both parties should have more knowledge of each other, which could be achieved with mutual visits and organising events.

Collaboration with healthcare providers

Which collaborations are happening in relation to health care providers?

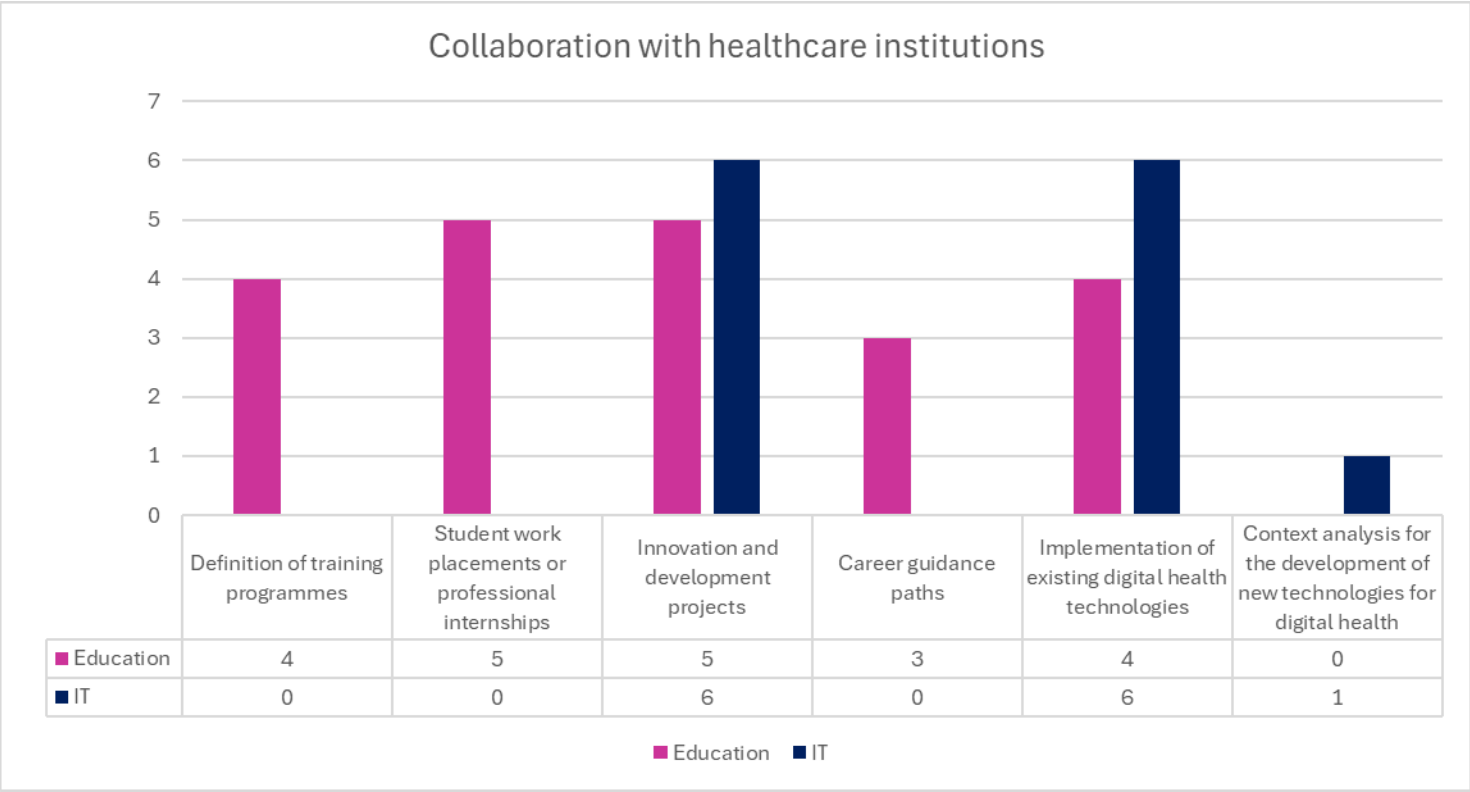
Since 1.1.2023 Finland has been divided to 21 wellbeing services counties, which are ultimately responsible for healthcare services for the people in their region. Thus, the main partner for the collaboration with healthcare organisations in this area is the Wellbeing Services County of Southwest Finland - Varha. This collaboration was considered challenging. Many felt that communication with wellbeing services counties is challenging. Other organisations felt that they do not get information from wellbeing services counties and do not know who to contact.

Cooperation with other healthcare providers besides wellbeing services counties was considered quite limited. Most of the providers are private companies, and there is competition amongst the companies.

How would you rate your contact with healthcare providers?

Number indicated	How many times was it picked?
1 (very bad)	0
2	1
3	5
4	7
5 (very good)	6

On which aspects do you collaborate with healthcare providers?



Answer indicated	How many times was it picked by IT company representatives?	How many times was it picked by education institutions?
None	1	0
Definition of training programmes	0	4
Student work placements or professional internships	0	5
Innovation and development projects	6	5

Career guidance paths	0	3
Implementation of existing digital HealthsTechnologies	6	4
Context analysis for the development of new technologies for digital health	0	0
Other: Joint trainings, workshops, webinars. National cooperation on digital vocabulary. Cooperation with Finnish Institute for Health and Welfare.	1	0

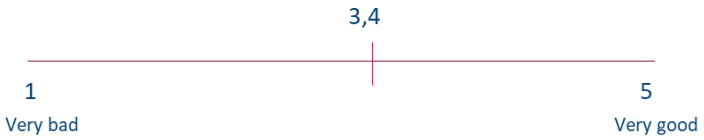
Developing professional internships and student training was seen as an important factor, especially with other health care providers. Also, in general the development of the whole health care sector was considered important. Now there are three main limitations – lack of resources, lack of collaboration with wellbeing services counties and competition with other private sector companies.

Collaboration with IT companies (with affinity with HealthTech)

Healthcare providers had mixed collaboration with IT companies. Some organisations had a lot of collaboration, while others had limited collaboration. Noteworthy in defining the extent of collaboration is what organisations define to be HealthTech.

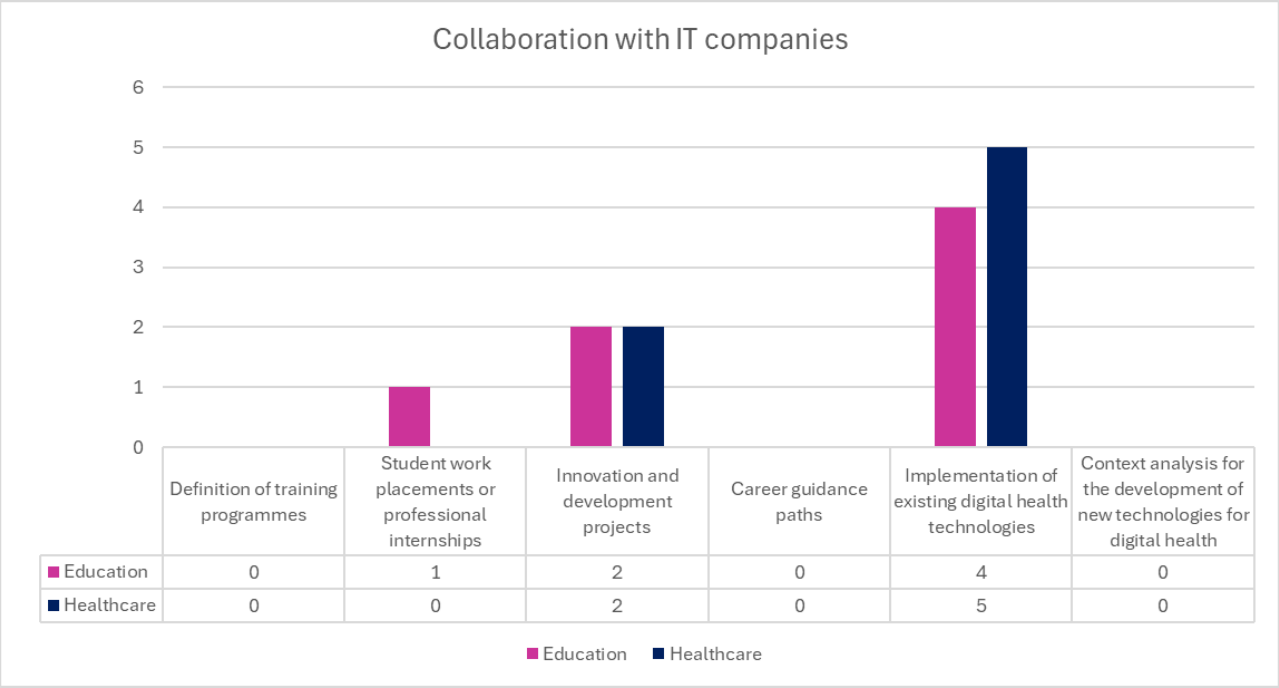
Some organisations would like to collaborate more with IT companies, but they feel that IT companies do not promote themselves very much due to a lack of knowledge of what is available, while others feel that they either do not have the resources or need more collaboration.

How would you rate your contact with IT companies?



Number indicated	How many times was it picked?
1 (very bad)	0
2	2
3	8
4	7
5 (very good)	2

On which aspects do you collaborate with IT companies?



Answer indicated	How many times was it picked by educational representatives?	How many times was it picked by Health care institutions?
None	0	0
Definition of training programmes	0	0
Student work placements or professional internships	1	0
Innovation and development projects	2	2
Career guidance paths	0	0
Implementation of existing digital Health Technologies	4	5
Context analysis for the development of new technologies for digital health	0	0
Other: In-house application development and products	X	1
Other: Chief administrators of information systems	X	1
Other: Equipment maintenance and commissioning cooperation	X	1

Healthcare organisations felt that they would like to implement pre-existing solutions rather than innovating new solutions. The healthcare sector is strictly regulated; therefore, it is more beneficial to implement pre-existing solutions rather than to innovate new ones. Innovations were also seen important, but pre-existing solutions were seen more important. In general, healthcare organisations are open to explore new solutions, but time/money/knowledge/strict regulations limit the use of innovative ones.

Strict regulation of healthcare was seen as limitation to use solutions. Some solutions are seen as restricting and limiting patients by the supervising authorities. Another factor limiting further collaboration is a lack of resources (time, money, staff etc.).

One solution to improve collaboration is to use innovation projects etc. to create “win-win” -situations for both parties. As such, both parties should find “business logic” behind collaboration.

Best practices

Which best practices are being mentioned for the region?

All actors mentioned cooperation as part of their best practices. Cooperation could mean, for example, joint training, project work, seminar days, networking through brunches or company visits with students.

Educational institutions were seen as a link by organising events for companies and social and healthcare providers. For example, to test, learn and train on different Health Technology solutions.

Companies have found it a best practice to involve students in product development projects. At the same time, students gain experience of working life and companies get results, for example on the usability of their own product.

When discussing best practice in the sector, customer-oriented approach came up in several discussions. From a social and health perspective, equipment training in particular was seen as valuable. In the social and health sector, there are many workers who lack technical skills, so it was considered particularly good to have at least one person with deeper skills in all workplaces. This would enable them to train, instruct and support others in the use of the equipment.

Health Technology should be introduced step by step, especially to healthcare providers who do not have any previous experience. Introducing a solution that is easy to use at the start encourages people to try new solutions in the future. Initially, user training and readily available support are also important.

From the company's perspective, customer orientation often meant testing a product in the development phase with a pilot group of end-users before the actual launch. Companies also stressed the importance of a shared vision.

From an individual perspective, customer orientation was considered that the end-user, i.e., the client and their relatives, would be involved in the deployment of the Health Technology. This is intended to improve the clients' experience of the deployment and make it easier to ask for help.

The use of service design was seen as a concrete action to implement customer orientation. Using service design also allows all actors to participate in the same project.

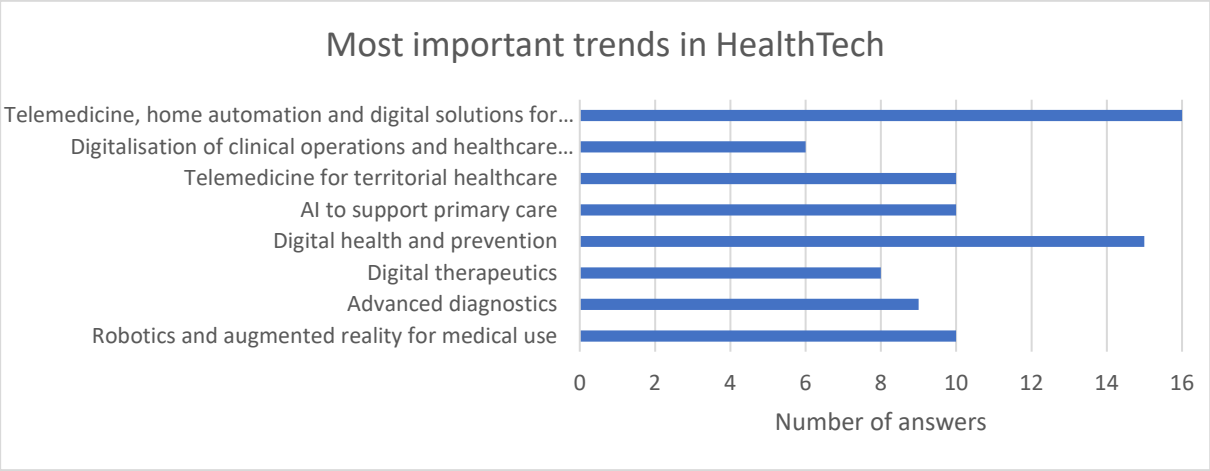
Challenges

1. How can technology help with staffing? Is it a threat, why? Is it an opportunity, in what way?
2. How do we bring all sectors together?
3. What are the costs? Calculating the impact of products.
4. How to improve the mental health of patients living alone by using Health Technology.
5. How to reduce bias related to welfare technologies, especially in the social and health sector.

Career in HealthTech

Which trends are being mentioned as the most important trends in HealthTech?

Answer indicated	How many times was it picked?
Telemedicine, home automation and digital solutions for home care	16
Digital health and prevention	15
Telemedicine for territorial healthcare	10
AI to support primary care	10
Robotics and augmented reality for medical use	10
Advanced diagnostics	9
Digital therapeutics	8
Digitalization of clinical operations and healthcare processes	6

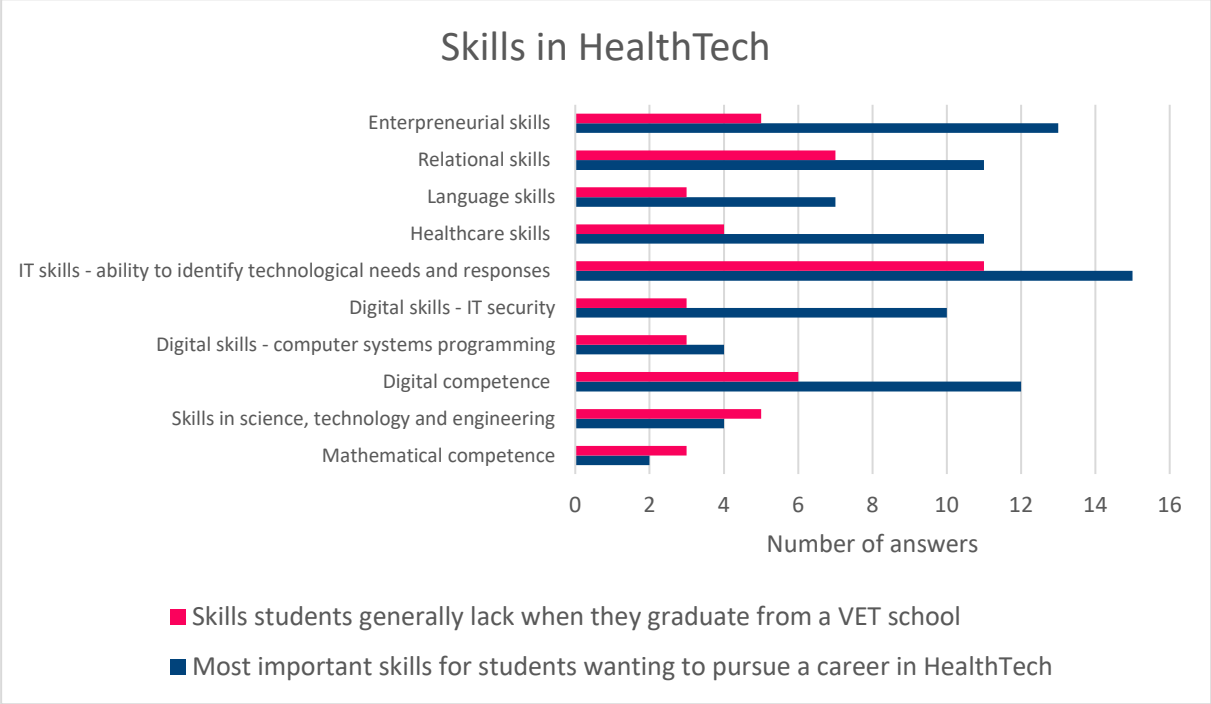


Telemedicine, home automation and digital solutions for home care and digital health and prevention were clearly considered the most important trends in Health Technology by the interviewees. This may be partly because many of the organisations interviewed operate in the home care sector, where these trends are central.

To what extent are these trends included in courses/training?

All vocational upper secondary qualifications include a common unit of study (CU), which includes general education in IT skills (working in the digital environment), math, languages, entrepreneurship and working life.

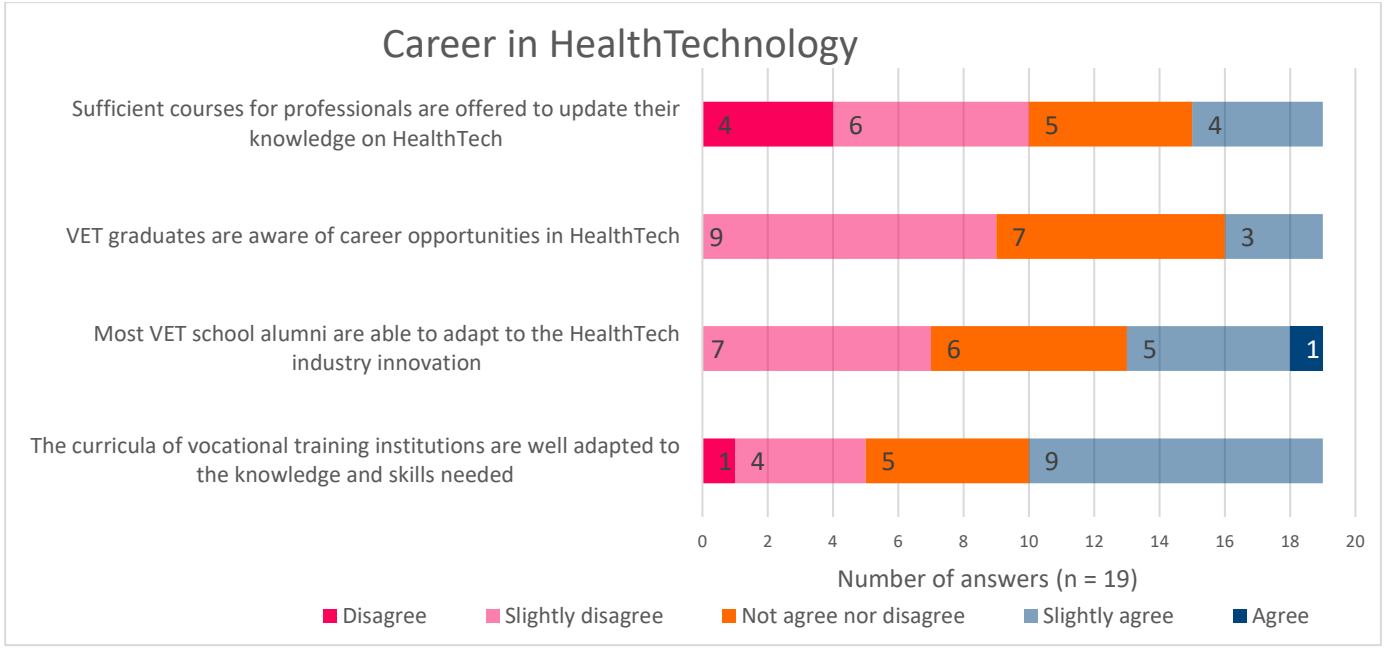
What are the most important skills for students who want to pursue a career in HealthTech and which skills do students tend to miss when they finish EQF4?



In addition to basic IT skills, skills related to information security, defining the need for and planning the use of technology, problem solving (entrepreneurship was usually chosen for this reason), interpersonal skills and knowledge of nursing were seen as particularly important in health/wellness technology education.

Statements on HealthTech education

	Average	Not agree at all	Slightly disagree	Nor agree, nor disagree	Slightly agree	Totally agree
It is clear which courses are being offered concerning HealthTech	**3,2 / 5**	1	5	5	6	2
The curricula of vocational training institutions are well adapted to the knowledge and skills needed	**3,2 / 5**	1	4	5	9	0
Most VET school alumni are able to adapt to the HealthTech industry innovation	**3,0 / 5**	0	7	6	5	1
VET graduates are aware of career opportunities in HealthTech	**3,2 / 5**	0	0	9	7	3
Sufficient courses for professionals are offered to update their knowledge on HealthTech	**2,5 / 5**	4	6	5	4	0



There is mixed knowledge of technology-related teaching offered. Mainly, the teaching offered is quite well suited to the needs of working life. Graduates have varying degrees of ability to use their technological skills in the workplace. Some graduates are aware of career opportunities in technology. More technology-related teaching is needed.

SWOT-analysis

Additional questions for the SWOT-analysis

Strengths (Internal: Project partners)
• Innovative enterprises and start-ups • Strong & long experience in Health Technology in TAI • Strong co-operation between health sector and IT education • Skilled teachers • AI generated population forecasts and scenarios from Turku City Data
Weaknesses (Internal: Project partners)
• SMEs' commitment and funding • other mandatory commitments that overlap project schedule (e.g., Skills Turku 2025)
Opportunities (External)
• Politics: need for new solutions --> new funding • Society is pro-education • Internationally recognised education system • the opportunities of HealthTech are discussed widely – pro-technology
Threats (External)
• Legislation, eg. strong regulation in data protection • Politics: current political situation and changes create uncertainty in education and health sector • the opportunities of HealthTech are discussed widely but they are not taken into action

Top 10 needs

1. Ways to understand the perspectives and needs of different parties.
2. Increasing the recognition of Health Technology.
3. Networking between different parties.
4. Developing and increasing technology education, especially in the social and health sector.
5. Planned and continuous cooperation.
6. More resources.
7. Influencing legislation in the field of wellbeing technologies.
8. Increasing the role of educational institutions and the involvement of students in the field of well-being technologies.
9. Improving workers' problem-solving skills and abilities.
10. Ensuring mutual benefit through cooperation between educational institutions, companies, and health care providers.

Attachment 3: regional report Italy

Background

According to the Digital Decade Country Report 2023, Italy has an untapped digital potential to contribute further to the collective effort to achieve the EU Digital Decade targets[6].

The country scores below the EU average both in terms of digital literacy, infrastructure and the delivery of digital public services to citizens (68 against 77).

Public services include the National Health Service, which has been investing in digitisation since the early 2000s, up to the actions of Mission 6 of the National Recovery and Resilience Plan[7] (approved in 2021).

The digitisation of healthcare in Italy is a response to two increasingly urgent challenges:

- A new demand for health, linked to the ageing of the population, the increase in chronic diseases and new social and health needs.
- the need to ensure a more efficient operation of the national health system, both in terms of management and the quality of the services provided.[8]

The main objective of the Action Plan is therefore the creation of an integrated care system, with the availability of information and digital tools, capable of providing better services to a wider public, with lower administrative and operational costs for both operators and patients.

Interventions to renew the system are therefore based on three fundamental axes: the management of health services, their delivery and the training of the social and health professionals who deal with them.

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[6] https://digital-strategy.ec.europa.eu/it/library/2023-report-state-digital-decade

[7] See in-depth box

[8] "Fascicolo Sanitario elettronico e servizi online (FSE SOL)", IRES (2022)

ELECTRONIC HEALTH RECORD[9]

As far as the management of health services is concerned, the formal path of healthcare digitisation in Italy started in 2012 with the creation of the Electronic Health Record (Decree-Law 179).

This platform allows citizens to track, consult and share their medical history with health professionals.

The EHR, which is activated by each region, collects data and digital health and social health documents uploaded by the professionals of the National Health System and the regional social health services that care for the patient; the patient can also independently add other documents related to his or her care pathway in a special section.

According to the Ministry of Health, the minimum core of data and documents required by the ESF includes

- identification and administrative data of the assisted person
- reports.
- emergency room reports,
- discharge letters.
- summary health profile.
- pharmaceutical dossier.
- eventual consent to organ and tissue donation.

The decree law of May 2020 made the creation and feeding of the electronic health record by the Italian regions automatic, and in 2022 another decree law made it possible to create a National Agency for Regional Health Services, with uniform rules throughout Italy and ministerial technicians to support the local digitisation process.

In 2022, the number of activated FSEs reached 57.6 million, although on average only 40% of citizens had at least one access to the system and the percentage of enabled health professionals was uneven, with some regions having no more than 10% of health professionals enabled to upload reports.

[9] For more on the Electronic Health Record see G. Cuttica, P. Saracco, Il fascicolo sanitario elettronico alla prova dei fatti : il caso del Piemonte, Il Pensiero Scientifico Editore, 2023

Piedmont, at least in this respect, appears to be a virtuous region, with 99% of citizens having access to the file and 28.35% of health professionals enabled to update and implement data.

However, according to the IRES (Piedmont Institute for Economic and Social Research) evaluation report on the “Fascicolo Sanitario elettronico e servizi online (FSE SOL)” (2022), only 34% of the reports produced by local health authorities were uploaded to the platform.

A quantitative-qualitative analysis carried out by IRES in 2022 sought to identify the reasons for these relatively disappointing results, which were mainly due to the lack of interoperability between the platform and the management systems used by doctors, the difficulty of rigorously processing the data due to the pdf format of most of the documents uploaded, and the lack of knowledge of the platform on the part of both health professionals and citizens.

In order to solve the technical interoperability problems, a plan has been launched at national level to update the platform and to raise awareness among management system providers on the issue of interaction.

On the other hand, there is an urgent need for action to improve the digital skills of both professionals and citizens, with the launch of large-scale information campaigns dedicated to the tool.

TELEMEDICINE

Telemedicine projects are at the heart of the intervention axis for the renewal of the health system, which is dedicated to the provision of services.

The Italian Conference of States and Regions approved the first 'Linee di Indirizzo Nazionali sulla Telemedicina' (National Guidelines for Telemedicine) in 2014, and the Piedmont Region implemented them in June 2015 (DD no. 362 of 9 June 2015).

The IRES survey at the end of 2016 identified 45 telemedicine projects in the region, highlighting different experiences both in terms of the specialties covered and the services offered, with a majority of telemonitoring projects.

However, the spread of these projects has been slowed by the lack of institutional recognition by the national health service and the absence of specific legislation, which has prevented, for example, proper financial reporting.

The Covid-19 pandemic accelerated the process of digitising services, and in 2020 telemedicine services were recognised by the national health system and officially included in the Piedmont regional fee schedule, with accurate tracking and reporting.

As of December 2020, 173 telemedicine initiatives had already been registered in Piedmont: a 380% growth in just four years, encompassing different types of service (telehealth, teleconsultation, telecooperation and telehealth).

Patient profiles have also changed significantly: in 2021, more than 60% of telemedicine services were for patients aged 25 to 64 and 14% for patients aged 65 and over, compared to 25% in 2020.

Although economic investments and institutional recognition have favoured the development of telemedicine in Piedmont, according to the 2022 IRES research report[10], further adjustment of the clinical-organisational process is needed, which requires the commitment and collaboration of all the different actors.

In this way, technology can produce greater and lasting benefits in terms of improving access to care (e.g. in terms of reducing waiting times and waiting lists and supporting the development of community medicine).

The experience of the pandemic has indeed highlighted the importance of making adequate use of the most advanced technologies, of high digital, professional and managerial skills, of new processes for the delivery of services and care, and of a more effective link between research, data analysis, care and its planning at system level.

Although in Piedmont the critical issues related to the economic sustainability of the telemedicine service and the lack of institutional recognition have been overcome, there are still problems related mainly to

- lack and/or difficulty in the use of digital technologies by patients (who often do not own smartphones and/or tablets)

- low level of digital literacy in the use of these technologies.

- insufficient quality of Internet connection, especially in some contexts.

From the 2020 IRES survey questionnaire, therefore, emerges 'the need to provide patients, especially the elderly, and their caregivers (but often also the staff involved in the various telemedicine services) with the necessary training and literacy in the use of digital tools, which very often refer to commonly used devices (smartphones and tablets), but which still constitute for some an element of difficulty in accessing remote services, so much so as to be the critical issue most frequently reported in the 2020 survey'.

[10] S. Bellelli, M. Dalmasso, S. Occelli, G. Perino, C. Rivoiro, V. Romano, B. Scelfo, "CONTRIBUTO DI RICERCA 338/2022, TELEMEDICINA IN PIEMONTE, Risultati dalla ricognizione sullo stato di attuazione dei servizi sanitari erogabili a distanza", IRES, (2022)

TRAINING OF THE SOCIAL AND HEALTH PROFESSIONALS

In contrast to the vocational training pathways for nurses in the Netherlands, Estonia and Finland, since 1996 the training of nurses in Italy has been fully transferred to the universities, which have introduced the University Diploma in Nursing Sciences (EQF 6 and 7).

Admission to Italian universities requires a baccalaureate degree (EQF 5) and is possible from the age of 18.

As with all health professions in Italy, nurses are required to complete 150 credits of continuing education every three years.

Vocational training in Italy has a regional character and instead deals with pathways for social health workers (OSS - EQF3) and family assistants (EQF2).

In both cases, the pathways are intended for adults who have obtained at least an EQF1 qualification and have completed compulsory schooling in Italy (up to the age of 16).

The figure of the socio-sanitary operator was introduced in Italy in 2001 with the agreement between the State and the Regions of 22/02/2001, replacing the previous auxiliary occupations that carried out their tasks in the socio-sanitary field.

It consists of 1000 hours of classroom training and 440 hours of work experience, with 30 hours dedicated to digital skills.

The family assistant is a family and personal support worker who can assist a frail elderly person, a disabled person, a person temporarily or permanently deprived of autonomy in the activities of daily living.

The vocational training course set up by the Piedmont Region for the unemployed includes 200 hours of classroom training and 60 hours of work experience, with 8 hours dedicated to digital citizenship skills.

MISSION 6 ITALIAN NATIONAL RECOVERY AND RESILIENCE PLAN

Source: https://export.gov.it/news-e-media/news/missione-6-pnrr-opportunita-le-imprese-italiane

Proximity, innovation, equity: these are the key words of the health mission, the sixth area of intervention of the national recovery and resilience plan (PNRR), which has allocated 15.63 billion euros, or 8.16% of the total, to this mission to support major reforms and investments for the benefit of the national health service, to be implemented by 2026. In total, however, the extraordinary resources for the implementation of the PNRR and the renewal of the Italian public health system exceed 20 billion euros. This includes the resources committed by Italy through the national plan for investments complementary to the PNRR (PNC), which allocates an additional €2.89 billion to health.

The covid-19 pandemic has indeed confirmed the universal value of health, its nature as a fundamental public good and the macroeconomic relevance of public health services. However, the pandemic itself has highlighted some critical aspects of a structural nature that could be exacerbated in the future by the increased demand for care resulting from current demographic, epidemiological and social trends.

In Italy, there are significant territorial disparities in the provision of services, particularly in terms of prevention and support in the field; insufficient integration between hospital services, territorial services and social services; long waiting times for the provision of certain services; a lack of ability to achieve synergies in the definition of strategies for responding to environmental, climatic and health risks.

The experience of the pandemic has also highlighted the importance of being able to rely on an adequate use of the most advanced technologies, on a high level of digital, professional and managerial skills, on new processes for the provision of services and care, and on a more effective link between research, data analysis, care and its planning at system level.

The strategy of the PNRR aims to address all these critical aspects in a synergistic way.

AREAS OF INTERVENTION

The interventions of the PNRR's health mission, to be achieved by 2026, are divided into two main areas
Redesigning the territorial healthcare network, with professionals and services available throughout the country, for healthcare that is close to the people;
Innovating the hospital technology park, digitising the national health service, investing in research and training health workers for safer, fairer and more sustainable healthcare.
With this in mind, the interventions of the health mission are divided into two components, each with a reform and specific investments.

COMPONENT 1 - NEIGHBOURHOOD NETWORKS, FACILITIES AND TELEMEDICINE FOR TERRITORIAL HEALTH CARE
The interventions of this component are aimed at strengthening the services provided in the territory through the reinforcement and creation of territorial facilities and garrisons (such as community homes and community hospitals), the reinforcement of home care (to reach 10% of the population over 65 years of age, especially those with chronic diseases or who are not self-sufficient), the development of telemedicine and remote assistance (with the activation of 602 territorial operating centres) and a more effective integration with all social health services.

COMPONENT 2 - INNOVATION, RESEARCH AND DIGITALISATION OF THE NATIONAL HEALTH SERVICE
The measures included in this component will allow for the renewal and modernisation of existing technological and digital facilities and equipment for diagnosis and treatment, with the purchase of 3,133 new major pieces of equipment, and of hospital infrastructure, e.g. With earthquake-resistant upgrades. Hospital infrastructure, such as earthquake-proofing; completing and disseminating the electronic health record (fascicolo sanitario elettronico - FSE); and improving the capacity to provide and monitor the essential levels of care (livelli essenziali di assistenza - LEA) through more effective information systems.
Significant resources will also be devoted to scientific research and the promotion of technology transfer, and to strengthening the skills and human capital of the NHS, including through improved training of medical and administrative staff.

Definition of ecosystem

From the responses collected, health and social care workers have a greater awareness of the different areas of digital health and describe it as a set of activities:

"[HealthTech is] the application of digital technologies to support the health system to make service delivery more effective, streamline communication between health facilities and citizens, simplify booking systems and much more."

"All management, organisational and clinical care processes aimed at prevention, diagnosis, treatment and rehabilitation, supported by IT and telecommunications systems."

Their definitions of digital health highlight the different areas of application and benefits for both practitioners and patients:

"[HealthTech makes it possible] to bring people living in disadvantaged areas closer to health services and to improve diagnostic and surgical techniques by overcoming human limitations".

The overview of applications is also reflected in the words of representatives of companies operating in the sector, who describe it as follows

"The ecosystem of services available to health professionals and citizens".

Representatives of training organisations, on the other hand, have a more limited view of the different activities that digital health encompasses. In the health and social sectors, they associate the ecosystem only with telemedicine activities, linking their descriptions to the tools that practitioners use directly for their profession.

On the contrary, IT/ICT training providers are more aware of the complexity of the sector and their definition is closer to that of healthcare and IT/ICT companies:

"[HealthTech is] the ability to connect aspects of healthcare through IT, from booking to referrals to the application of AI for probabilistic evaluation in the medical field."

General info – IT companies

<u>Regional IT companies</u>

- **CSI Piemonte**: CSI-Piemonte (Consorzio per il Sistema Informativo) is a consortium of public bodies that has been working in the field of information and communication technologies since 1977. The fields in which it works correspond to public policy areas: from healthcare to production activities; from cultural heritage to administrative systems; from territory to vocational training and

employment. Its services and projects adopt different technological solutions, including network infrastructures, databases, information systems and web services.

- **DEDALUS**: The Dedalus Group is the leading provider of healthcare and diagnostic software in Europe and one of the largest in the world. The shareholder structure guarantees stability and great financial capacity thanks to the presence of Ardian, the largest private equity fund in Europe and the fourth largest in the world. Since 2016, Dedalus has accelerated its expansion strategy by focusing on a growing demand for ICT solutions and "Clinical Transformation and Innovation" in the overall healthcare ecosystem. Present in more than 40 countries, today Dedalus has a strong presence in Germany, Italy, France, the UK and Ireland, Northern Europe, Austria, Switzerland, Spain, China, Brazil, Australia, New Zealand and several locations in Latin America, the Middle East and Africa.
- **ENGENEERING**: Engineering is the Digital Transformation Company, leader in Italy and continuously expanding worldwide, with about 15,000 employees and more than 70 offices in Europe, the United States and South America. The Engineering Group, made up of more than 70 companies in 14 countries, has been supporting companies and organisations in continuously evolving the way they work and operate for more than 40 years, thanks to a deep knowledge of business processes in all market segments, and exploiting the opportunities offered by advanced digital technologies and proprietary solutions.
- **BAXTER ITALIA**: Baxter global product portfolio enables healthcare professionals to be more efficient and effective in treating patients at the hospital bedside, in the operating theater, in critical care units, at home and in the dialysis clinic. Baxter works alongside its partners to find new and smarter ways to improve patient outcomes, prevent complications before they become life-threatening and increase access to care, while reducing total costs.
- **Sined s.r.l.**: SINED s.r.l. is a company specialising in the information management of healthcare facilities.
- **T4MED**: Project's partner; IT company with health focus, with a large expertise in the field of advanced telemedicine and healthcare service delivery.
- **INNOVO**: A management and organisational consulting firm for the national, regional, and corporate health care markets. It provides decision support to companies through a mix of management consulting and advanced business analytics tools using data-driven approach. Innovo helps managers of healthcare companies interpret business data and communicate them, yielding results in a short time and limiting the risk of errors. The main area of expertise is healthcare, public and private.
- **BioPmed - Piemonte Health Innovation Cluster**: Cluster that creates connections between key players in the area to generate value and innovation in the field of human health and life sciences.

HealthTech solutions & training

Which areas of HealthTech do your solutions address?

Areas	How many times was it picked?
Research and development (i.e. precision medicine)	3
Care delivery (telemedicine, monitoring)	3
Finance operations (back-office automation)	2
Wellness and disease prevention (i.e. wearable activity trackers)	1
Screening and diagnosis (genomics, digital diagnostics)	1
Collection of clinical data	1
Training	1

Interviews show that companies in the sector are currently focusing on telemedicine and tele-monitoring solutions but are also concentrating their research on diagnostics and precision medicine.

In fact, Piedmontese healthcare companies have already implemented or are implementing projects related to the provision of remote healthcare services but have only recently and to a small extent started to use digital diagnostic and precision medicine tools.

- What kind of trainings do you offer concerning HealthTech?

Companies are limited to providing training courses on their applications, aimed at training the professionals who will use their products once purchased by the various healthcare facilities.

Often, the courses are limited to user instructions and do not provide an overview of the system.

General info – Educational institutions

Regional educational institutions

- **APRO FORMAZIONE** (EQF 3-5): Vocational school located in Alba and Canelli; within its Healthcare sectors provides training for socio-healthcare operators.
- **CENFOP Piemonte**: CENFOP Piedmont, is part of the National CENFOP, an association that gathers Italian vocational training organisations.
- **Fondazione ITS ICT** (EQF 5): Highly specialised technological schools, focused on post-graduate courses that offer highly qualified technical training on IT professions
- **Fondazione ITS Biotecnologie Piemonte** (EQF 5): The Fondazione Istituto Tecnico Superiore Biotecnologie e Nuove Scienze della Vita is a non-academic tertiary training school that, in line with the guidelines of Piedmont's socio-economic development and production system, trains highly specialised young technicians in the fields of chemistry, bioeconomics, biotechnology and biomedical technologies.
- **FORMA Piemonte**: "FORMA-PIEMONTE" is the regional articulation of the "FORMA" Association, which has similar representativeness at a national level since it discusses Professional Training policies with the Government and Parliament and signs the National Category Contract. This association was created with the priority objective of strengthening the identity of Piedmontese Vocational Training with reference to education policies.
- **IISS PIERA CILLARIO FERRERO** (EQF 3-4): This high school offers courses to graduate in 'Health and Social Work Services'. Graduates are competent to work in social facilities operating in the local area and can work in childcare, elderly, handicapped and all para-hospital facilities.
- **Liceo Scientifico Statale "Leonardo Cocito"** (EQF 3-4): This scientific high school offers an enriched applied sciences course in the computer science programme: 4 curricular hours instead of 2 in the first two years, which allow for a considerable strengthening of certain skills, including LOGIC-COMPUTATIONAL THINKING and "CODING", preparatory to the study of high-level languages and with the possibility, in the three years, of tackling the basics of ROBOTICS and "OBJECT-ORIENTED" PROGRAMMING. Among the extensions of the educational offer is the possibility of obtaining international certifications for the English language (also thanks to school links and work experiences abroad).
- **Istituto Superiore Statale "G. Govone"** (EQF 3-4): The "Biology with a Biomedical Bend" pathway is active from school year 2020/21 in the TRIENNIO of the Liceo Classico "Govone" in Alba. The course, which can be accessed from the third year by all students, provides for a total of 50 hours per year (150 in the three-year course) of face-to-face lectures held by teachers and doctors and laboratory

activities in hospitals or health and university facilities and periodic evaluation tests on the course undertaken, established at national level.

- **ITIS VALLAURI** (EQF 3-5): Higher Education Institute offers the area seven courses of study: Mechanics Mechatronics, Mechanics Energy, Electrical Engineering, Information Technology, Administration Finance and Marketing, Tourism, Liceo Scientifico delle Scienze Applicate.
- **Liceo scientifico "F. Vercelli"** (EQF 3-4): The Liceo Scientifico opzione Scienze Applicate (High School of Applied Sciences) offers a wide-ranging education that particularly focuses on scientific knowledge, also through a laboratory approach to experimental science and robotics. It encourages the acquisition of the knowledge and methods of mathematics, physics and natural sciences, also with reference to the links between scientific thought and philosophical reflection. It guides the student to grasp the interactions between the different forms of knowledge, maturing particularly advanced skills in the studies relating to scientific-technological culture, with particular reference to the mathematical, physical, chemical and biological sciences and computer science with their applications. Thanks to its multidisciplinary preparation, it enables students to continue their studies in all university faculties and post-secondary vocational courses as well as to take part in numerous public competitions.
- **IISS Alberto Castigliano** (EQF 3-4): This high school offers courses to graduate in 'Health and Social Work Services'. Graduates are competent to work in social facilities operating in the local area and can work in childcare, elderly, handicapped and all para-hospital facilities.
- **Politecnico di Torino** (EQF 6-8): The Polytechnic of Turin offers a degree course in biomedical engineering. The course includes subjects from both industrial engineering and information technology. Those working in the field of biomedical engineering must have skills in mechanics, electronics, information technology and materials science, combined with a good knowledge of anatomy and physiology. This knowledge is then used in the teaching of biomedical engineering. This enables them to interact with healthcare professionals and propose technological solutions for increasingly effective and safe care pathways (diagnosis, therapy, monitoring).
- **Università deli Studi di Torino** (EQF 6-8): The University of Turin has activated, starting from the academic year 2023-2024, the Master's degree course in 'Artificial Intelligence for Biomedicine and Healthcare'. The new course - which aims to train artificial intelligence experts in the biomedical and healthcare fields - is aimed at students with significant experience in computer science, mathematics and biology.
- **Università del Piemonte Orientale** (EQF 6-8): IT and health university of the south-eastern part of Piedmont. The three-year Bachelor of Science in Nursing hosted in ASL CN2 Hospital (Verduno) is a branch of the University of Eastern Piedmont (UPO).

HealthTech courses

Which courses on healthcare, IT/technology and HealthTech are being offered? See description of the Educational institutions

Most EQF 3-5 education and training institutions do not offer specific courses on HealthTech. Digital health devices (e.g. domotic dummies) can be used in the health sector, but the number of devices available is not sufficient for all students to use them.

In high schools, computer science is studied with applications other than health, and the lack of collaboration with health institutions was highlighted as a limitation to updating curricula or developing effective school-to-work pathways.

To what extent to teachers feel comfortable teaching courses with new technologies?

The COVID-19 pandemic and the resulting lockdown forced all Italian school teachers to experiment with distance learning and to test the use of digital equipment in their courses.

Despite this long experience, there is still a prejudice among older teachers against the use of new technologies in the classroom.

Moreover, not all schools have sufficient equipment to make it available to all students on a continuous basis.

Teachers in IT/ICT institutions are naturally more inclined and comfortable to use new technologies in their teaching.

To what extent are teachers excited to provide new technologies in education?

Despite the apparent initial reluctance to use new technologies, teachers are generally inclined to integrate them into their teaching, not least to stimulate new generations of students and involve them in the use of tools that are part of their everyday lives.

- What is happening in the field of educational programmes, and what stands out?
- Which obstacles are being mentioned in *not* offering any programmes related to HealthTech?

Vocational training institutions are trying to adapt their programmes by integrating training modules related to practical applications of digital health - an example is the course for diagnostic equipment maintenance technicians.

The situation is different in secondary schools, where IT modules are often linked to general computer use (ICDL) and general overviews of the subject, without a specific sectoral focus.

In high schools, computer science is studied with applications other than health, and the lack of collaboration with health institutions was highlighted as a limitation to updating curricula or developing effective school-to-work pathways.

General info – Health care providers

Regional health care providers

- **ASL CN1**: Local Healthcare Agency, ASL CN1 was created in 2008 from the unification of the three previous Aziende Sanitarie: 15, 16 and 17.
- **ASL CN2**: Local Healthcare Agency; Azienda Sanitaria Locale CN2 manages health services in the Alba and Bra area, which includes 76 municipalities. It serves a population of 173,225 residents as at 31/12/2020.
- **ASL TO3**: Local Healthcare Agency, ASL TO3 was created on 1 January 2008 from the merger of the former ASL 5 of Collegno and ASL 10 of Pinerolo, to which the Venaria Reale District (former ASL 6 of Ciriè) was added.
- **ASL TO4**: Local Healthcare Agency, on 1 January 2008, the new Local Health Unit TO4 of Ciriè, Chivasso and Ivrea was created from the union of the former ASL 6 of Ciriè, 7 of Chivasso and 9 of Ivrea.
- **ASL VCO**: Local Healthcare Agency, it has a territorial extension of about 2,332.32 square kilometres, 96% of which are mountainous, has an average population density of 73 inhabitants/sq.km. and comprises 81 municipalities, unevenly distributed over the Verbano, Cusio and Ossola territory, with a total population, as of 31.12.2019, of 167,973.
- **Azienda Ospedaliera Santa Croce e Carle**: The Azienda Ospedaliera (AO) S. Croce e Carle Cuneo has always been considered 'the hospital' of the city of Cuneo and one of the reference structures of the Azienda Sanitaria Locale Cuneo 1 (ASLCN1). It is an institution of national importance and high specialisation, which means that, especially for certain specialities, the S. Croce e Carle AO of Cuneo is a point of reference for people who also come from outside the province and region.
- **CONSORZIO MONVISO SOLIDALE**: The Consorzio Monviso Solidale is a public body made up of 56 municipalities which governs the local system of social interventions in the territory (Fossano area).
- **CONSORZIO SOCIO-ASSISTENZIALE ALBA-LANGHE E ROERO**: The Consorzio Socio-Assistenziale Alba - Langhe - Roero is a public body made up of 64 municipalities which governs the local system of social interventions. (Alba area)
- **AOU Città della Salute e della Scienza di Torino**: Established in 2012, this University Hospital Agency brings together four Regional Hospitals (Molinette, CTO, Regina Margherita Children's Hospital and Sant'Anna Hospital), and is the largest healthcare hub in Italy, with 9.500 employees. The hospital facilities are located in the south-eastern area of Turin, currently located in Circoscrizione 8 (formerly in Circoscrizione 9 until 2016), within the Nizza Millefonti district, rich in health facilities and hospitals, among which the Molinette one stands out.

- **GE.S.A.C.**: GE.S.A.C. is a social cooperative of multiple types with the main purpose of carrying out activities aimed at the rehabilitation and reintegration of disadvantaged persons in accordance with Article 1 of Law 381/1991.
- **Cooperativa EMMAUS**: The Social Cooperative Progetto Emmaus is a social cooperative, a non-profit personal services organisation. Founded in the mid-1990s in Alba, it operates in the field of personal services, from children to the elderly, with a focus on the areas of disability and psychiatry. All services are managed directly and in collaboration with commissioning bodies.
- **Cooperativa sociale Anteo**: The Anteo cooperative specialises in the management and implementation of complex social and healthcare services and manages more than 2000 beds throughout Italy, including homes for the elderly and services for the disabled.
- **ARIS (Associazione Religiosa degli Istituti Sociosanitari)**: Aris has been involved in the management of Christian-inspired social-health facilities for more than 50 years, offering around 26,000 beds in the country, including hospital and residential facilities, and around 10,000 beds for semi-residential and outpatient services.

HealthTech solutions & training

Which topics within HealthTech are mostly covered/used in the region?

Answer indicated	How many times was it picked?
Care delivery (telemedicine, monitoring)	10
Research and development (i.e. precision medicine)	3
Wellness and disease prevention (i.e. wearable activity trackers)	3
Finance operations (back office automation)	3
Screening and diagnosis (genomics, digital diagnostics)	1
Electronic Health File	1

The interviews confirm that many telemedicine and tele-monitoring projects are already in place.
Institutions managing facilities for the elderly would like to be able to improve their services, but complain about a general difficulty of interoperability between their digital systems and those of healthcare facilities.
There is a general trend towards diagnostic and precision medicine applications, especially for the administration of medication to chronically ill patients.

To what extent are there any courses/training in HealthTech?

In general, health and social service providers train their staff on the different applications they use. In addition, university hospitals are developing specific eHealth training courses. Respondents who do not provide training cite a lack of staff time for training and a lack of funding.

Collaboration with educational institutions

How would you rate your contact with educational institutions?

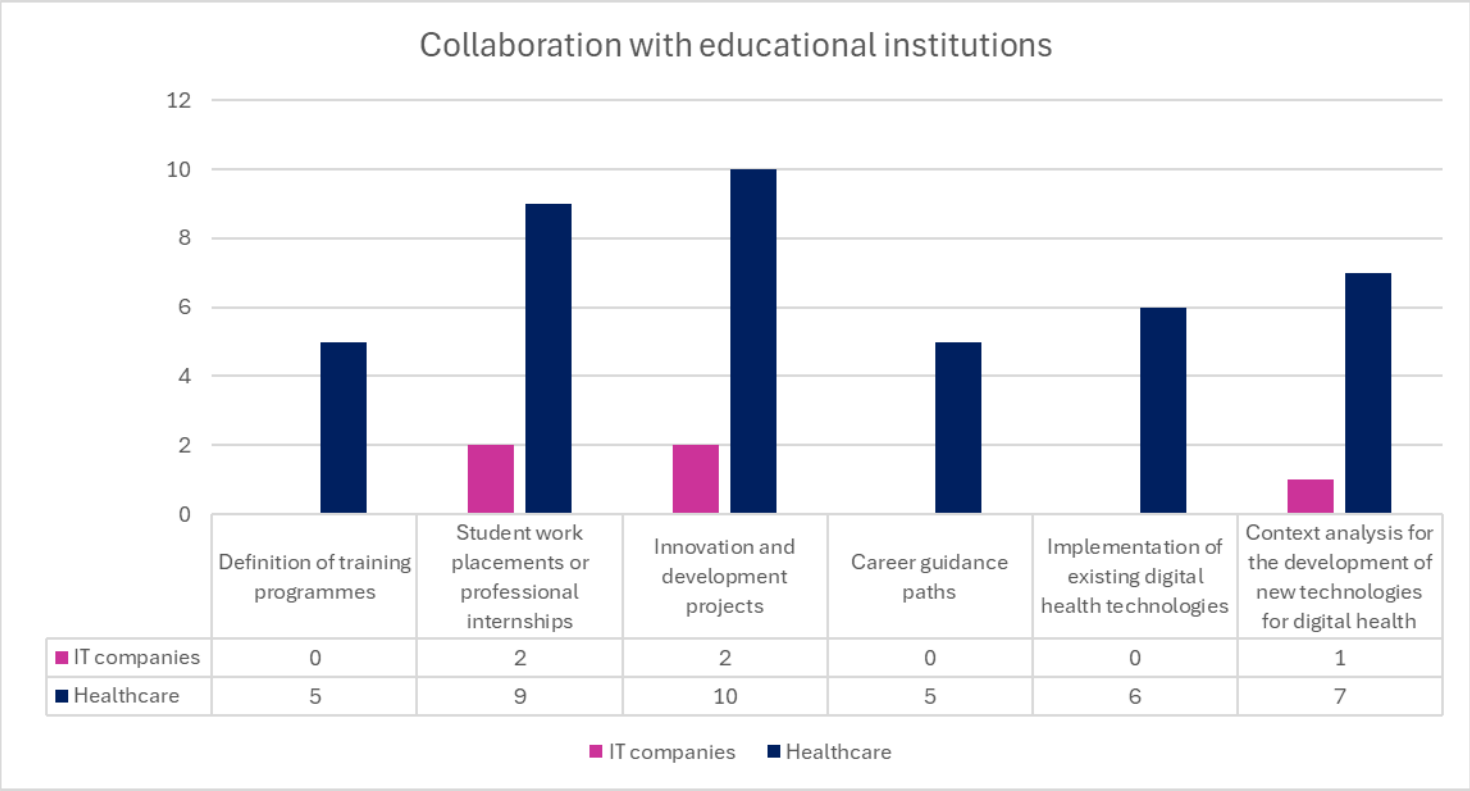
Number indicated	How many times was it picked by Healthcare providers?
1 (very bad)	
2	1
3	2
4	5
5 (very good)	3
Number indicated	How many times was it picked by IT companies?
1 (very bad)	
2	
3	
4	2
5 (very good)	1

Most healthcare facilities and IT/ICT companies collaborate exclusively with universities.

Healthcare facilities and companies collaborate with EQF 3-5 education and training institutions only for student placements and to a very limited extent in healthcare. Apprenticeships are mainly aimed at IT/ICT students.

On which aspects do you collaborate with educational institutions?

Most respondents are interested in collaborating on projects to innovate, guide and implement existing technologies.



Health service providers also indicated that they are particularly interested in collaborating on contextual analyses for the development of new technologies: this shows that it is crucial for health and social service providers that new technologies respond to the real needs of professionals and solve their professional problems on the basis of an analysis of their needs.

On the other hand, career guidance activities are only of interest to health care providers, where staff shortages are causing many problems.

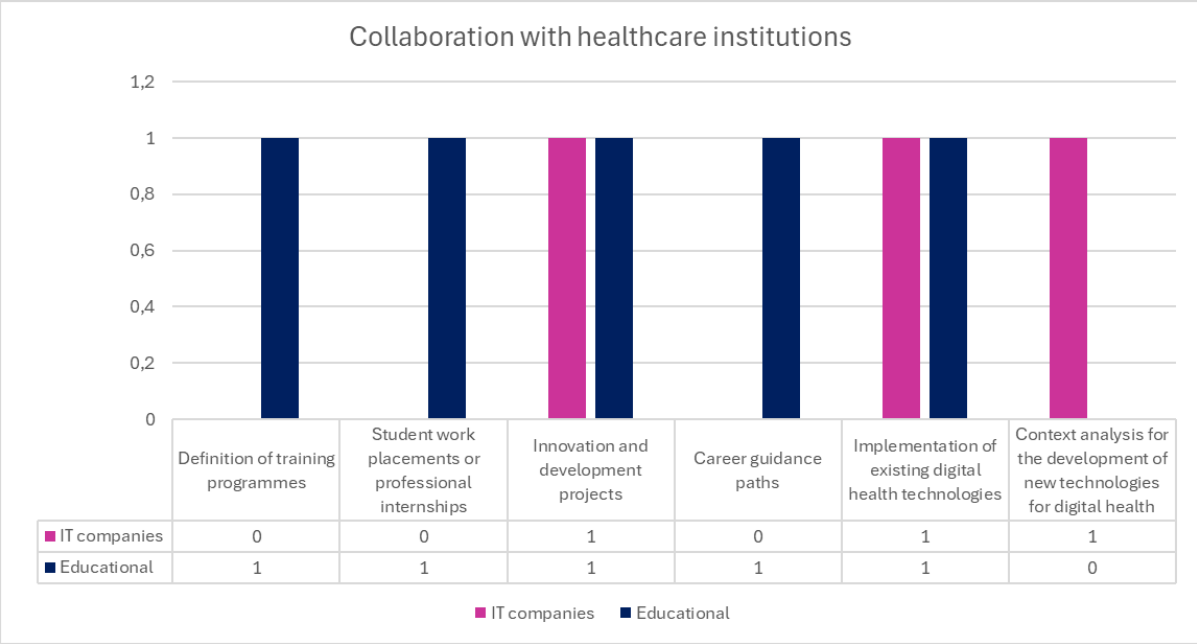
Collaboration with healthcare providers

How would you rate your contact with healthcare providers?

Number indicated	How many times was it picked by IT companies?
1 (very bad)	
2	
3	1
4	1
5 (very good)	1
Number indicated	How many times was it picked by educational institutions?
1 (very bad)	1
2	1
3	2
4	1

5 (very good)	

On which aspects do you collaborate with healthcare providers?



Which collaborations are happening in relation to healthcare providers?

Co-operation between enterprises and health and social service providers is mainly commercial, whether in the implementation of existing solutions or in the development of new products.

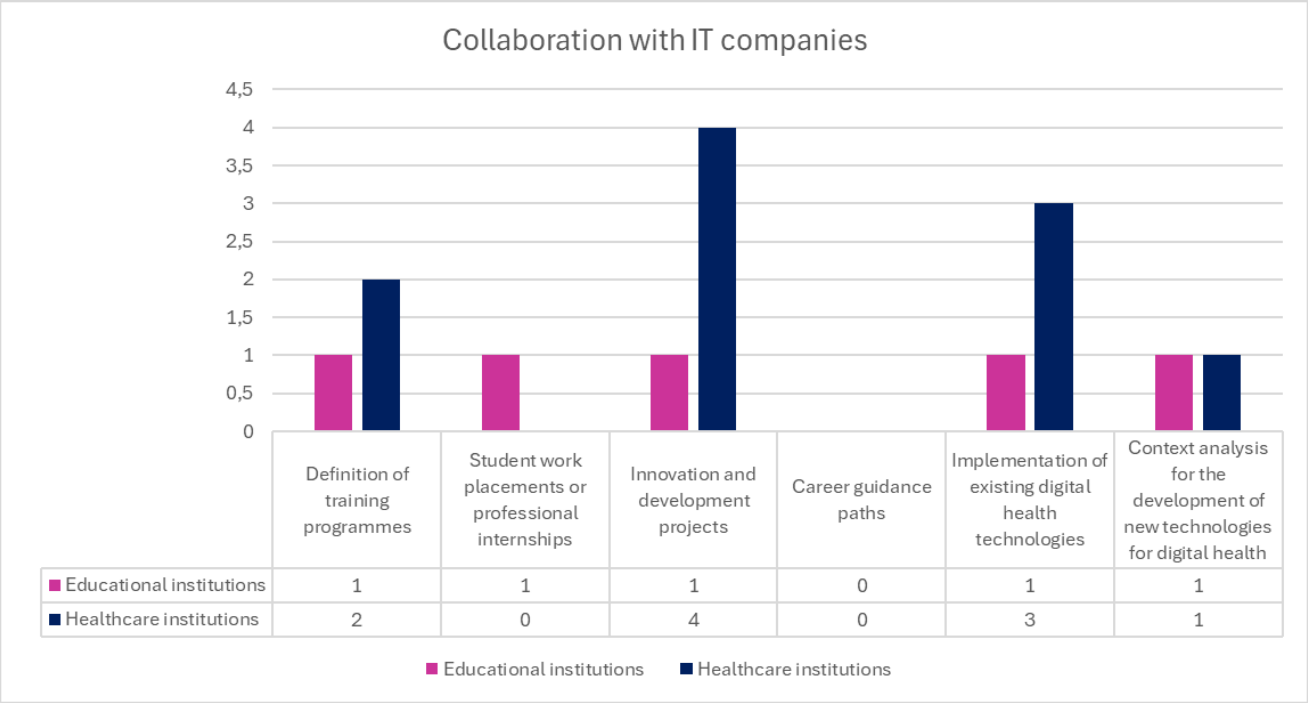
EQF 3-5 education and training institutions have direct relations with health service providers almost exclusively when they provide IT/ICT training. In the social/health sector, institutions complain of difficulties in developing school-to-work pathways in social/health institutions and difficulties in finding moments of confrontation to update training pathways.

Collaboration with IT companies (with affinity with HealthTech)

How would you rate your contact with IT companies?

Number indicated	How many times was it picked by Educational institutions?
1 (very bad)	1
2	2
3	2
4	
5 (very good)	
Number indicated	How many times was it picked by Healthcare providers?
1 (very bad)	
2	1
3	3
4	6
5 (very good)	1

On which aspects do you collaborate with IT companies?



Collaboration between IT/ICT enterprises and education and training institutions (EQF 3-5) is only present in cases where the institutions deal with IT/ICT pathways. Even in this case, collaborations are rather limited and not strictly related to HealthTech.

Schools would like to expand cooperation in order to update programmes, create more apprenticeships, develop guidance pathways and create a network of contacts that does not currently exist.

The relationship between companies and healthcare providers, on the other hand, is closer: mainly driven by commercial reasons, it relates to the implementation of existing technologies and collaboration on development and innovation projects that healthcare providers are undertaking.

Healthcare providers would like to expand this collaboration by improving context analysis and training programmes, and by participating in further innovation and development projects. However, excessive bureaucracy and a lack of funding and human resources limit this possibility.

Best practices

Among the respondents, the implementation of the electronic health record stands out.

This implementation, which is still ongoing, is described as one of the fundamental steps for the digitalisation of regional healthcare:

"In the field of digital health, as already mentioned, a concrete contribution has been made by CSI Piedmont, which has made data and information available and usable to those who need it, in the appropriate format and within the required timeframe, putting technology at the service of people. It has created a single regional archive in which the citizen is uniquely identified. It has connected the various local health authorities and hospitals in Piedmont to ensure that they share as much data and information as possible. It has created the Register of Healthcare Institutions and Patients, which guarantees the quality of data and is the basis for the development of all e-health services".

Career in HealthTech

Which trends are being mentioned as the most important trends in HealthTech?

Answer indicated	How many times was it picked?
Telemedicine for territorial healthcare	17
Telemedicine, home automation and digital solutions for home care	16
Digitalisation of clinical operations and healthcare processes	14

Advanced diagnostics	12
AI to support primary care	11
Digital health and prevention	8
Robotics and augmented reality for medical use	5
Digital therapeutics	3

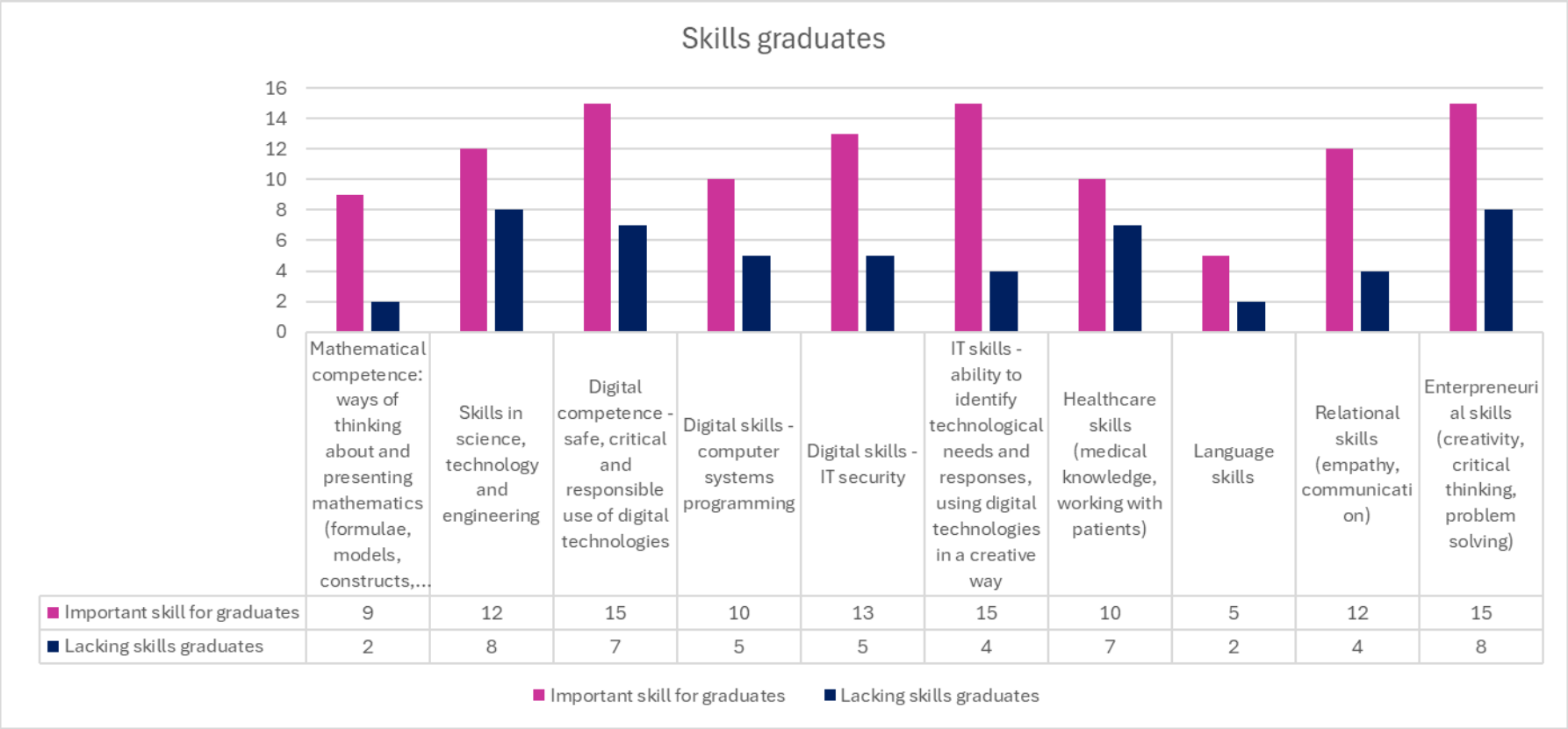
The responses of the interviewees confirm those of the representatives of the IT/ICT companies: the leading sector is telemedicine and tele-monitoring, thanks to the various projects undertaken by local healthcare companies. These solutions make it possible to decentralise care, to provide it in different places or at home, to reduce the pressure on hospitals and to connect different care facilities. They also meet the needs of rural or very large areas by enabling the development of territorial healthcare.

At the same time, solutions for advanced diagnostics and the use of AI in healthcare are also emerging, but with closer links to the medical profession.

Interestingly, management systems, which are essential for optimising logistics and data analysis, are also mentioned among the trends.

Industry trends are part of university training pathways, but are not part of the training pathways of EQF 3-5 institutions.

What are the most important skills for students who want to pursue a career in HealthTech and which skills do students tend to miss when they finish EQF4?



These findings corroborate statistical data on Italian skills. According to EUROSTAT, only 6.7% of young Italian graduates have a degree in STEM subjects, compared to a European average of 12-13%. To promote STEM education, the Italian government launched a STEM Week in 2023, involving educational and training institutions of all levels, with laboratory activities and orientation paths for students.

In addition, the Ministry of Education and Merit has issued specific guidelines: all education and training institutions, from pre-school to high school, state and parity, are invited to update the three-year plan of the educational offer and the institute curriculum by providing specific actions to strengthen the development of mathematical-scientific-technological skills.

In terms of digital security skills, the Italian National Statistics Institute found that in 2023, 27.9% of citizens aged 16-74 had no digital skills in this area.

Among the non-digital skills, with the exception of those related to health, which can be acquired through specific and sectoral training, there is a gap in skills related to creativity, critical thinking and problem solving, with negative consequences for teamwork and project management.

Statements concerning HealthTech education

Please note: *Italy evaluated all students not only VET, since HealthTech/Healthcare pathways are EQF 6-7*

	Average	Not agree at all	Slightly disagree	Nor agree, nor disagree	Slightly agree	Totally agree
The curricula of vocational education and training institutions are well adapted to the knowledge and skills needed	**3,3 / 5**	1	1	8	7	1
Most students in educational	**3,5 / 5**	1	1	6	8	2

and training institutions are able to adapt to innovation in the HealthTech sector						
Upon completion of their studies, students have a good view of career opportunities in HealthTech	**3,1 / 5**	1	3	8	4	1
Sufficient courses are offered to professionals to update their knowledge on HealthTech	**2,8 / 5**	2	3	9	2	1

The responses show that companies and health care providers are unaware of existing training courses, except in principle. This applies to both initial and continuing training for employees.

With the exception of those directly involved in training, either as students or trainers, knowledge of the topics covered, updates and structure of the courses is very limited.

SWOT Analysis

Strengths (Internal: Project partners)
• Piedmont has best practices in several fields related to project. • HealthTech applications are fast growing in the Region - +300% in the last 5 years. • HealthTech industry is well developed. • Partners have years of concrete experience in the territory.

Weaknesses (Internal: Project partners)
• National and regional legislations are in delay in integrating EU laws. • National and regional legislations contain inconsistencies (I.e., regulations about caregivers). • Black labour market both in rehabilitation sector and concerning caregivers. • Low recruitment services of home care. • Lack of IT teachers trained about healthcare. • Lack of Long-Life Learning for extra hospital professionals. • Low IT literacy of healthcare professionals and patients. • Insufficient infrastructure (I.e., internet network coverage).

Opportunities (External)
• HealthTech is fundamental and needed because of the rural territory. • Healthcare culture is an Italian emphatic characteristic. • EU recovery fund resources available now. • HealthTech can be a way to make the social and health professions more attractive and the tasks performed by these professionals less burdensome.

Threats (External)
• Political influence that can interfere. • Foreign multinationals have taken over Italian companies. • Foreign multinationals win public tenders in Italy. • EU recovery fund resources available now.

Attachment 4: regional report The Netherlands

Introduction region analysis

This report provides an overview the healthcare technology ecosystem in the Northern Netherlands region.
For this report, both a questionnaire that was widely distributed (within the stakeholders of the Technological Care Academy (TZA) was used, as well as interviews that were conducted. To get a balanced picture, both educational institutions (mainly VET), healthcare institutions and IT companies (with an affinity for healthcare) were contacted. After completing the interviews, the initial outcomes were reviewed with over 20 stakeholders in a regional meeting on February 8, 2024 and further refined and supplemented where necessary.

	Educational institutions	Healthcare organizations	IT companies
Questionnaires completed	7 *Average self-assessed experience with healthcare technology 3/5*	10 *Average self-assessed experience with healthcare technology 3.2/5*	8 *Average self-assessed experience with healthcare technology 4.6/5*
Interviews completed	8	9	6

Table 1: Number of questionnaires completed and interviews conducted by stakeholder group. Note there is overlap between stakeholders who were interviewed and completed the questionnaire.

The survey in conducted in late 2023/early 2024. Topics covered included current healthcare technology experience, healthcare technology opportunities, stakeholder collaboration and career opportunities.

The purpose of this report is to get a picture of the current healthcare technology ecosystem in the Northern Netherlands and where the areas for improvement are. These points for improvement can then be taken into account in the design of the rest of the project, for example in determining the themes for the microcredentials to be developed and in setting up the hackathons to be organised. Due to the limited responses, this report does not provide an overall picture, but can only provide a general picture.

This report is part of the Erasmus+ project "Centre of Vocational Excellence - Care about IT". In this project, fifteen educational institutions, healthcare institutions and IT companies (with an affinity for healthcare) from Italy, Finland, Estonia and the Netherlands are jointly working on:

- Improved (international) cooperation between industry, healthcare institutions and educational institutions (both teachers and students) in the field of healthcare technology.
- Improve the attractiveness of careers in healthcare technology.
- Improve knowledge and skills around healthcare technology for all stakeholders involved.

The Dutch partners cooperating in this project are Noorderpoort, Drenthe College, Netwerk ZON, Bossers & Cnossen BV and Katapult. More information about CoVE Care about IT can be found at https://careaboutit.eu/.

Northern Netherlands Region

Care technology is a topic that has long been on the radar in the Northern Netherlands region, consisting of Groningen, Friesland and Drenthe. This is endorsed by the many collaborations focused on healthcare technology. An example is the Noordelijk Platform Zorgtechnologie (NPZ), a knowledge network and partnership between ZorgpleinNoord, Hanzehogeschool (Digital Health lectorate and Centre of Expertise Healthy Ageing), NHL Stenden (lectorate Digital Innovation in Care and Welfare, FAITH), Anders werken in de Zorg Fryslân, TZA Drenthe and Groningen, Practoraat Zorg en Technologie, the Health Hub Roden, Zorg Innovatie Forum and program leaders of regional cooperation projects around care technology at care and welfare organizations.

Definition of healthcare technology

Since healthcare technology has no set definition, respondents were asked to define healthcare technology.

Most respondents gave a definition consisting of the following components:

All **technologies that** can make targeted contributions to **healthcare,** aimed at making our healthcare system **more efficient and effective** .

The type of respondent does not seem to affect the given definition of healthcare technology.

IT companies (with an affinity for healthcare) - general

The Northern Netherlands has a wide variety of IT companies with an affinity for healthcare. From VR technology to remote monitoring, highly innovative technologies are being worked on. Technologies people are working on can be found in the chart below.

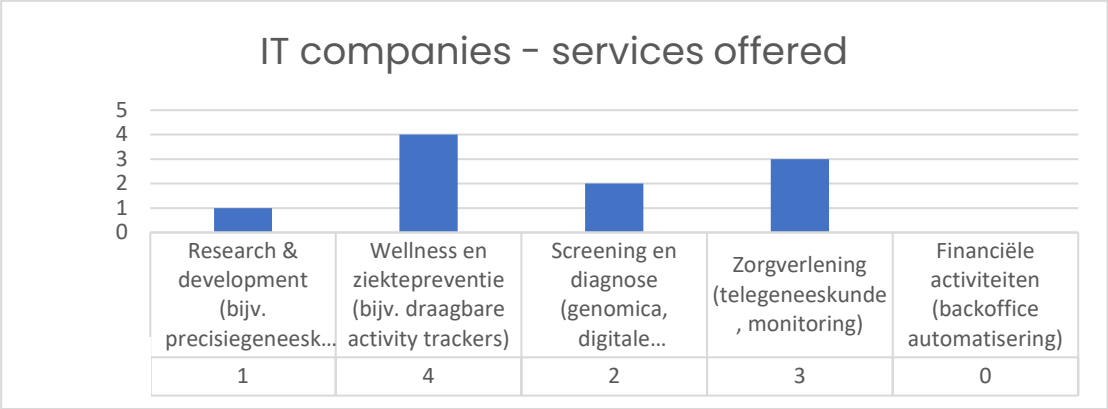


Chart 1: Technologies offered.

As seen in Chart 1, IT is primarily focusing on wellness and disease prevention (e.g., wearable activity trackers), healthcare delivery (telemedicine, monitoring) and screening and diagnosis. In addition, companies indicated an increasing focus on AI applications and Serious Gaming for healthcare. This is expected to boom in the coming years.

Additional comments from IT companies:

- Training is also offered. Mainly on how to use the product/service offered by the IT company.
- The business community would like to work on this theme together (e.g. giving courses), but is often unable the right contacts for this. A solution to this could be for educational institutions and care organizations to free up more space to appoint a permanent contact person for IT companies in the region .

Educational institutions - general

The three major VET educational institutions in the region are Drenthe College, Noorderpoort and Alfa College. Each educational institution offers both healthcare and ICT courses from EQF levels 2 to 4. Within healthcare education, the integration of IT/technology is playing an increasing role. This means that new knowledge and skills are also required for teachers. Therefore, the following two questions were asked:

To what extent do care teachers feel confident teaching subjects/projects/courses that use new technologies?

How enthusiastic are care teachers about using new technologies in teaching?

As the score of 2.2/5 shows, teachers do not feel sufficiently confident in teaching with new technologies, this also applies to healthcare technology applications. Also, with the score of 2.6/5 surrounding enthusiasm for healthcare technology applications, there is still plenty to gain.

Additional Notes:

- Teachers, on average, are relatively protocular by nature and do not want to deviate from the current standard curriculum content. One solution could be to employ i-coaches/tech-coaches. However, they must then be given sufficient hours to actually provide the necessary help.
- Management can play a role in creating both trust and enthusiasm. Changes can already be seen in the management of care training programs. They already see the importance of healthcare technology in education and want to invest in it, but this can be taken further. For example, by encouraging flexibility in education and structurally emphasizing the added value of healthcare technology. Dare to pioneer, there is much more room within the rules of the inspection than you think. In addition, the CoVE gives the (financial) space to experiment. Encouraging taking additional courses/training around healthcare technology can also be a good addition.
- Healthcare technology need not be offered as a separate course, but should be woven throughout the curriculum for healthcare and wellness students.

For IT students, specific minors around healthcare technology should be available, also focusing on the intensified cooperation between (students from) VET/HBO.

Healthcare organizations - general

There are many healthcare organizations operating in the region, each with different specializations and sizes. These range from large academic hospitals such as the UMCG to nursing homes. In all these care organizations, there is an increasing focus on the use of healthcare technology.

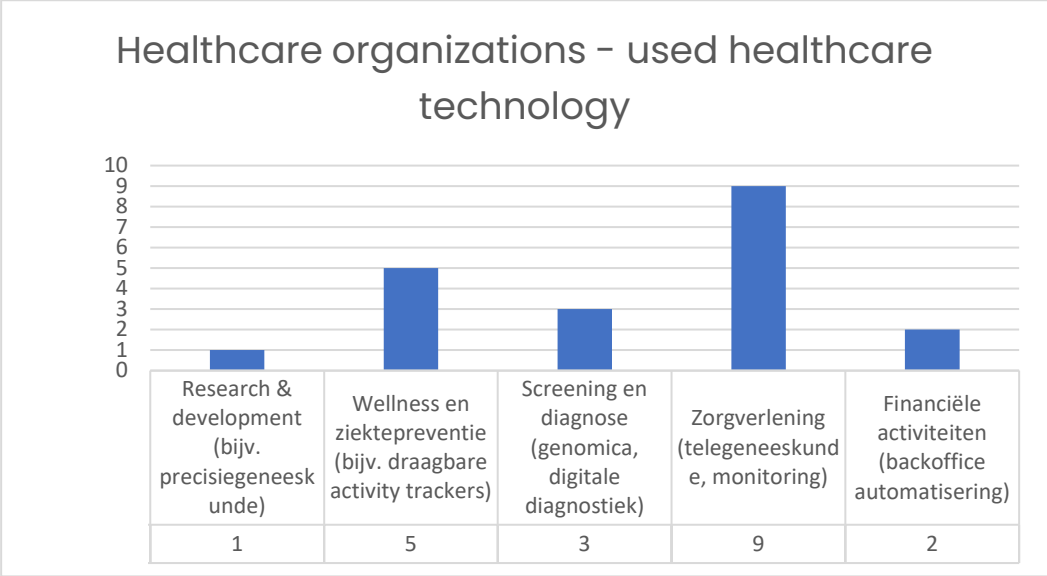


Chart 2: Healthcare technology used by healthcare organizations.

Graph 2 shows that many different aids are used. Some examples mentioned by the interviewees: "Within X care technology is deployed based on client demand: for example a structure robot (Tessa), a sleep aid (somnox), for moments of rest (robot cat or dog), at residential locations an inspiration box can be borrowed with the aim of improving lifestyle through more exercise and eating differently. Domotics are also used at the residential locations."

" Eavesdropping devices in night care, home automation, computer-based technology, smart tools, etc."

" Many home measurement programs to guide and treat patients remotely."

Several technologies are named in which healthcare organizations would like to engage in the future:

- Speech-driven monitoring/reporting
- XR Technologies
- Chatbots for communication with patients/neighbors
- Remote care.

Additional Notes:

- Resistance is experienced from both clients/patients and staff: "It's always been done this way, it works well, so why change it now?" Change management is most important here. Create a sense of urgency among employees. Emphasise that healthcare technology can reduce workload while maintaining or improving the quality of care given.
- Students can introduce new technological applications during an internship/project. To do this, however, students must have sufficient exposure to healthcare technology during their training. Students can contribute to innovation in professional practice through critical thinking.
- There is still little commitment to courses around healthcare technology.

Collaborations

Within this project, the focus is on the collaboration between educational institutions, IT companies and healthcare institutions. Therefore, we specifically looked at the current collaborations between the different stakeholders and how that can be further improved.

Collaborating with educational institutions

Collaboration with educational institutions is already in place by most interviewees. Current cooperation is given an average rating of 3.5/5. Mainly with VET level EQF 3/4 and bachelor level EQF 6 collaborations are taking place. Below are the issues on which cooperation is taking place.

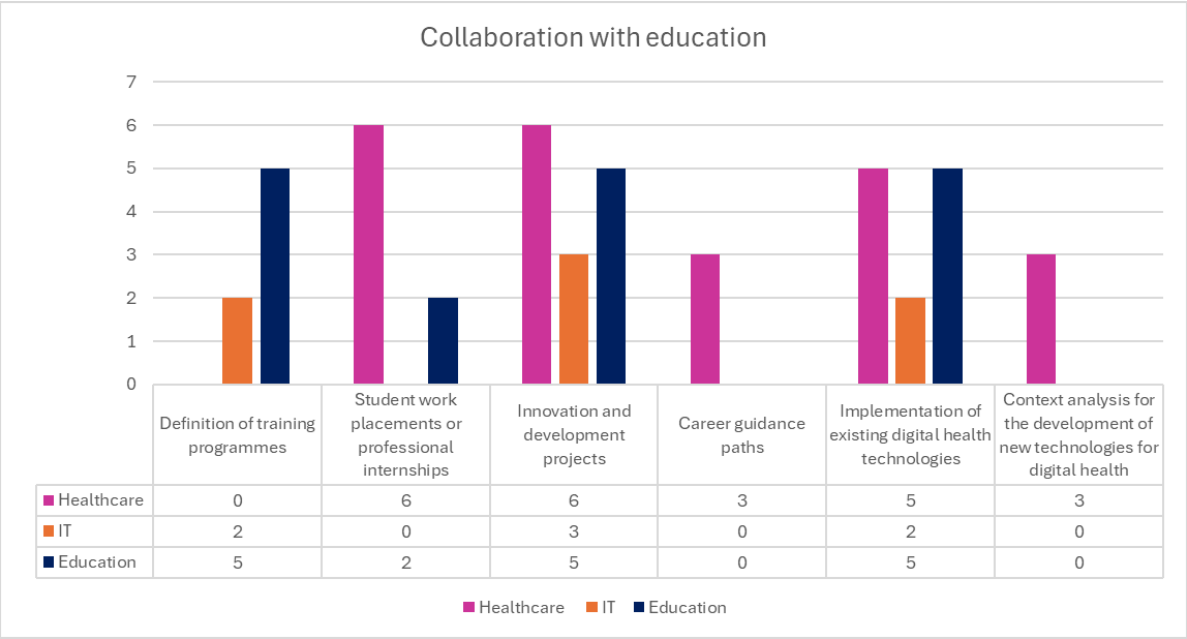


Chart 3: Collaboration with education by all stakeholder groups.

Points where people would like to collaborate more are:

Theme	How often mentioned
Innovation and development projects	19
Implementation of existing digital HealthTechnologies	17
Establishing curricula/educational programs.	13
Context analysis for the development of new technologies for digital health	8
Pathways for career counselling	4
(Taster) internships	2

Table 2: themes on which stakeholders want more cooperation with educational institutions

As can be seen above, the main areas where there is a desire for greater cooperation are in establishing curricula/educational programs, innovation and development projects, and implementation of existing digital HealthTechnologies. These are areas where there is already the most collaboration currently, but this collaboration could be more intense.

Current cooperation with educational institutions

An overview of perceived current collaboration with educational institutions, from the perspective of 1) other educational institutions, 2) IT companies, and 3) healthcare organizations.

Perspective other educational institutions:

- People are positive about the TZA (Technology and Care Academy)/Health Hub Roden in which educational institutions collaborate. Cooperation with hbo is limited. There are often other priorities that take precedence. There are opportunities here, however, because healthcare technology is growing in the higher education sector.
- Teachers often see many bumps in the road when trying to collaborate across institutions.

Perspective IT companies:

- Educational institutions are often uncharted territory. People do not know it well and do not know how it works.
- The speeds of the VET and the business community do not match well. They often do not speak the same language and the VET is seen as an unreliable, solo partner. Agreements are often not kept and the cooperation agreement is quickly abandoned when the situation changes.
- Cooperation now is often a supplier relationship. People are figuring out how to create a structural collaboration.

Perspective healthcare organizations:

- There is now much collaboration on internships, and innovation and development projects with varying degrees of success. Often also depending on the enthusiasm of the teacher.
- It is more difficult to establish long-term collaborations with VET since there is little flexibility in the schedule.

Points for improvement cooperation with educational institutions

Areas for improvement were also asked about cooperation with educational institutions, again from the perspective of 1) other educational institutions, 2) IT companies and 3) healthcare organizations.

Perspective other educational institutions:

- Just start new initiatives and adjust where necessary.
- Build on existing partnerships. Don't start too many new initiatives.
- More joint definition of curricula and development projects.
- More time to collectively craft a vision and remove partitions between organizations.

Perspective IT companies:

- Clear conversations with each other about a shared vision, expectations and responsibilities.
- Opportunities are seen in the area of innovation projects. Looking carefully at what problems are involved and then coming up with solutions together with education (and also healthcare organizations).
- IT companies are also open to guest lectures, please take advantage of this.

Perspective healthcare organizations:

- As a school, provide one contact person instead of several teachers. This will ensure streamlined communication.
- Look closely at what is happening in practice and, in consultation with healthcare organizations, adjust your education accordingly. To keep this well up to date, constant communication is important.

Collaborating with healthcare organizations

Mainly from education, there is already a lot of intensive cooperation with healthcare organizations. For IT companies, this is to a slightly lesser extent, but cooperation is increasingly sought. The current level of contact is rated a very high 4.2/5.

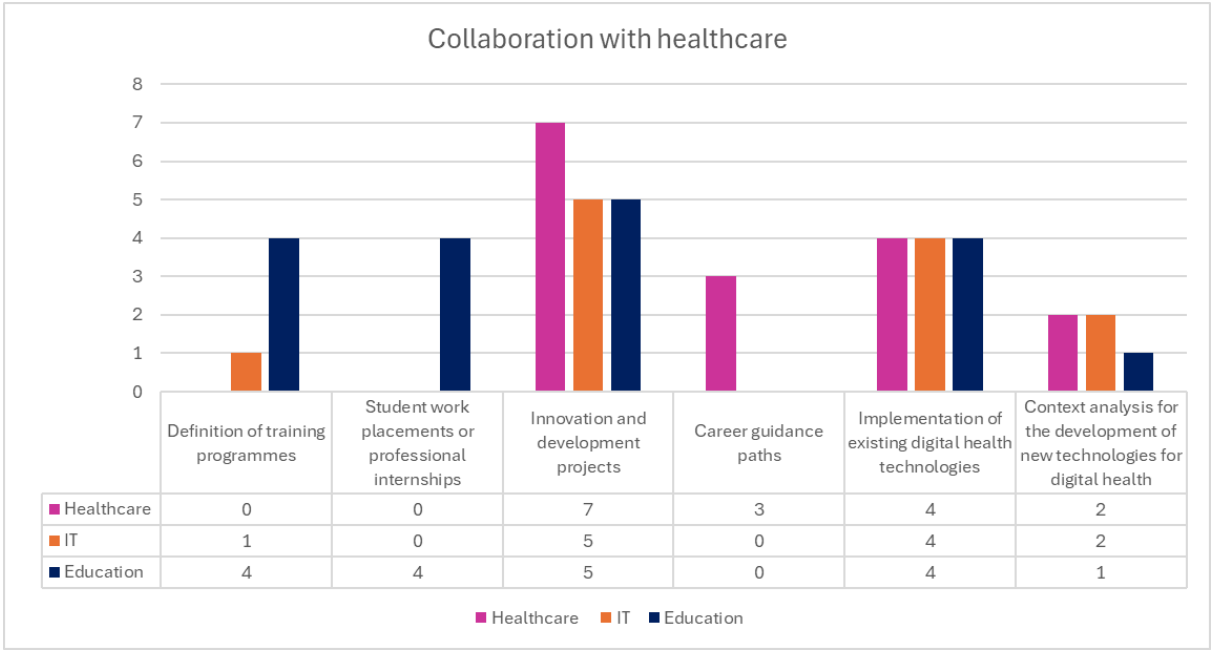


Chart 4: Collaboration with healthcare organizations by all stakeholder groups.

Points where people would like to collaborate more are:

Theme	How often mentioned
Establish curricula/educational programs.	10
(taster) internships	8
Innovation and development projects	**17**
Pathways for career counseling	7
Implementation of existing digital HealthTechnologies	**15**
Context analysis for the development of new technologies for digital health	**17**

Table 3: themes where stakeholders want to collaborate more with healthcare organizations

Again, the points on which there is already cooperation, that people want to cooperate even more. Many interviewees mentioned that care organizations are very important for a good context analysis, since they know the professional practice best and therefore have important information to arrive at good innovation and development projects and implementation.

Current collaboration with healthcare organizations

An overview of perceived current collaboration with healthcare organizations, from the perspective of 1) educational institutions, 2) other healthcare organizations, and 3) IT companies.

Perspective educational institutions:

- Healthcare organizations experience a lot of pressure which makes it difficult to make good arrangements from education because they have so little time.

Perspective other healthcare organizations:

- There is already good cooperation in the TZA, for example.
- Not yet every healthcare organization sets aside enough time to learn from other healthcare organizations, even though there is much to learn from each other.

Perspective IT companies:

- It is often difficult to set up the good, sustainable cooperation because now it is often thought from the supplier-customer perspective.

Points for improvement cooperation with educational institutions

Areas for improvement were also asked about collaboration with healthcare organizations, again from the perspective of 1) educational institutions, 2) other healthcare organizations and 3) IT companies.

Perspective educational institutions:

- There are an awful lot of opportunities to make education better when there is even stronger cooperation with professional practice. Mainly in the area of bringing professional practice into education there are opportunities.

Perspective other healthcare organizations:

- More things can be tackled jointly, for example, joint innovation projects. These projects are often time- and money-intensive, but by taking this up jointly it is more manageable.

Perspective IT companies:

- Step away from supplier-customer thinking, think more about the opportunities for collaboration that exist.
- Don't be too skeptical about the intentions of IT companies.

Collaborating with IT companies

Collaborations with IT companies are common. Often, for educational institutions and for healthcare organizations, this is a supplier-customer relationship rather than an equal partnership. IT companies collaborate among themselves sporadically. The current level of contact is rated 3.1/5. Significantly lower than for educational institutions and healthcare organizations.

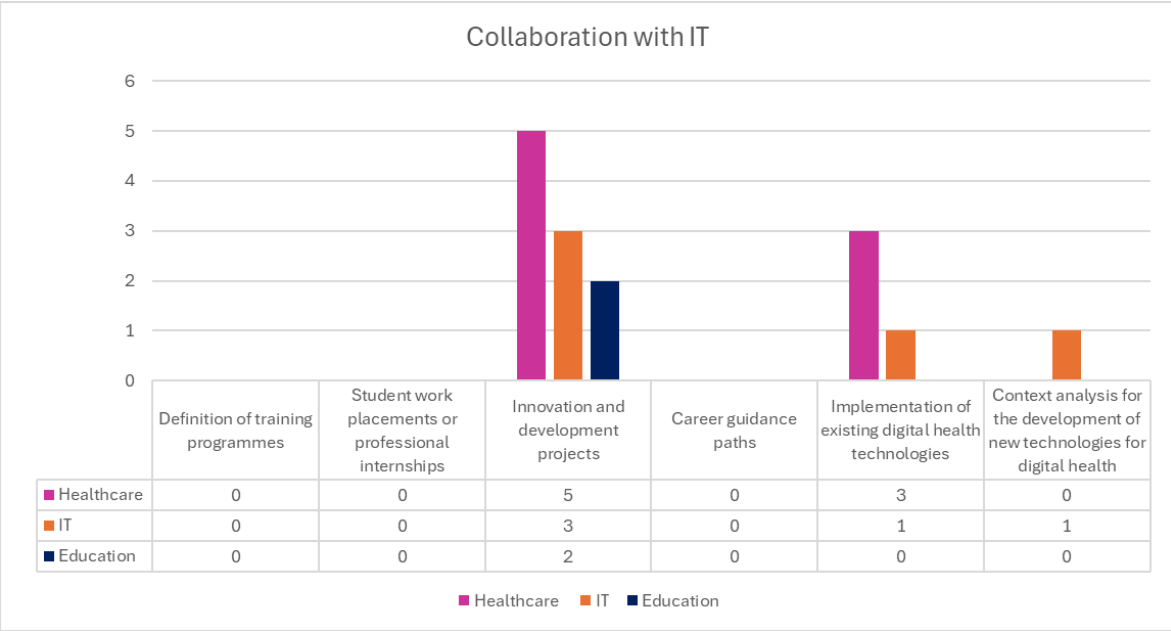


Chart 5: Collaboration with IT companies by all stakeholder groups.

The chart above shows that cooperation is highly concentrated in the area of innovation and development projects.

Points where people would like to collaborate more are:

Theme	How often mentioned
Implementation of existing digital HealthTechnologies	9
Innovation and development projects	6
Establish curricula/educational programs.	5
Context analysis for the development of new technologies for digital health	4
(taster) internships	2
Pathways for career counseling	2

Table 4: themes on which stakeholders want to collaborate more with IT companies

Again, in the areas where there is already cooperation, there is a desire to cooperate even more intensively on these. These include the development of innovation and development projects and the implementation of existing digital HealthTechnologies.

Current cooperation with IT companies

An overview of perceived current collaboration with IT companies, from the perspective of 1) educational institutions, 2) other IT companies and 3) healthcare organizations. What was noticeable is that people had much less of an idea/ experience of this than with the other two stakeholder groups.

Perspective educational institutions:

- IT companies, compared to educational institutions, are very financially minded.
- Teachers often do not see IT companies as suitable cooperation partners due to the difference in language and setting.

Perspective other IT companies:

- Collaboration with other healthcare technology IT companies will be established when the opportunity arises.

Perspective healthcare organizations:

- IT companies are seen as suppliers.

Areas for improvement in cooperation with IT companies

Areas for improvement were also asked about cooperation with IT companies, again from the perspective of 1) educational institutions, 2) other IT companies and 3) healthcare organizations.

Perspective educational institutions:

- Have good conversations beforehand about what you expect from each other, how you plan to work/communicate together.
- IT companies would add value to current partnerships around healthcare technology, as they can say a lot about the feasibility of proposed technological solutions.

Perspective other IT companies:

- IT companies could also work better together, particularly within partnerships around healthcare technology. Whereby solutions are thought about jointly.

Perspective healthcare organizations:

- There are great opportunities to work together, especially in terms of innovation and feasibility. For this, both sides need to be more open to see what the possibilities are.
- In the area of jointly implementing and evaluating new and existing technologies in healthcare, IT companies and healthcare organizations can work together more.

Best practices
Many best practices can be found within the region in the area of healthcare technology. In particular, the many partnerships were frequently mentioned here. Herewith some best practices are highlighted:

1) Technology & Care Academy Groningen & Drenthe
   The Technology & Care Academy (TZA) guides awareness, acceptance and adoption of healthcare technology in practice. It is seen as very positive that there is a well-structured exchange of information and that many parties are involved in this initiative.
2) Increasingly better use of apps
   There is increasing use of apps by caregivers in the region to reduce pressure on caregivers. Consider the existing apps for home care and informal care.
3) Putting the client first
   In consultation with the client, Cosis examines whether the use of technology is helpful and which technology should be used.

Challenges

The following business challenges are examples of issues that organizations would like to research with students and faculty. These challenges can be used in both regional and international hackatons.

- Growing old well in Nijeveen

Growing old consciously is important. How can we combine living, care and welfare and strengthen each other? How can you match the demand for help from older residents and the offer of help from volunteers?

- Furnishing night care with shortage of staff
  New light on night care: Explore night care optimization with a broad perspective and develop new approaches.
- Waiting time in emergency department
  How can we make good use of waiting time in the ER and give patients more control over their situation? Design a prototype.
- Virtual home care
  In what ways can you encourage healthcare professionals to adopt Virtual Home Care? Develop a way to entice healthcare professionals.
- Frisian GP care in 2050
  What will Frisian family medicine look like in the future? Develop an inspiring prototype.

Careers in HealthTech

Trends identified as most important within healthcare technology are:

Theme	How often mentioned
Telemedicine for territorial health care	20
Telemedicine, home automation and digital solutions for home care	16
Robotics and augmented reality for medical use	15
AI in support of primary care	15
Digital health and prevention	15
Advanced diagnostics	6
Digitization of clinical operations and care processes	6
Digital therapeutics	4

Table 6: trends within healthcare technology

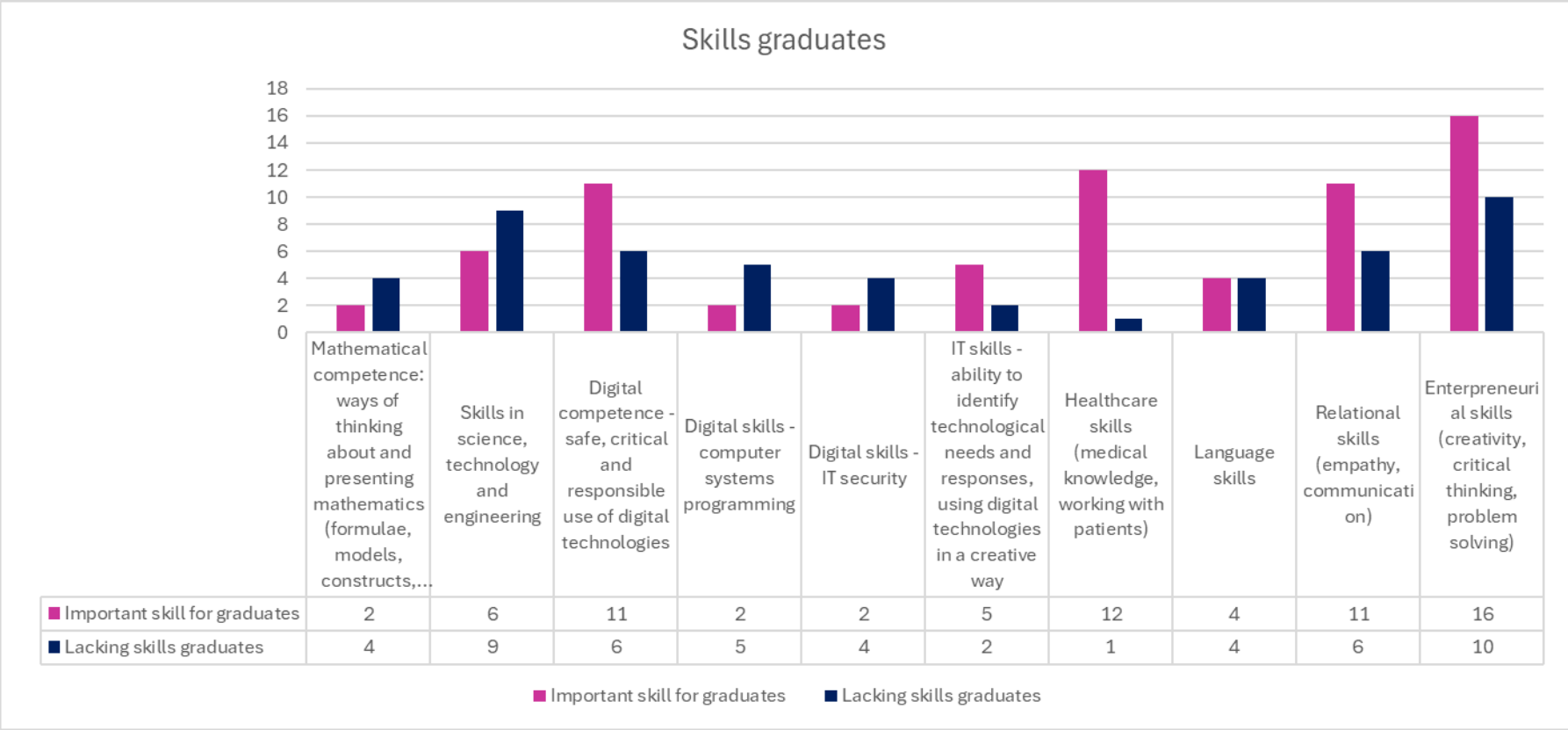
The trends seen as most impactful within healthcare technology are mainly in remote monitoring and care delivery and the use of AI/robotics. Developments in these areas are moving very quickly and it is believed that AI in particular can also have a great impact on

how care is delivered. Currently, these trends are still very little incorporated into education because these developments are happening so fast and it is also still very new for teachers.

To find out what skills are needed in light of developments to work in healthcare and HealthTech in the future, this was asked out.

Key skills career

If students would like to have a career in healthcare technology, these knowledge and skills are seen as important:



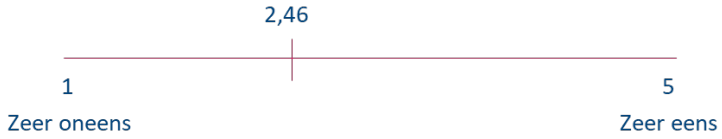
	Mathematical competence: ways of thinking about and presenting mathematics (formulae, models, constructs,...	Skills in science, technology and engineering	Digital competence - safe, critical and responsible use of digital technologies	Digital skills - computer systems programming	Digital skills - IT security	IT skills - ability to identify technological needs and responses, using digital technologies in a creative way	Healthcare skills (medical knowledge, working with patients)	Language skills	Relational skills (empathy, communication)	Enterpreneurial skills (creativity, critical thinking, problem solving)
Important skill for graduates	2	6	11	2	2	5	12	4	11	16
Lacking skills graduates	4	9	6	5	4	2	1	4	6	10

Chart 6: skills graduating VET (healthcare) students

Based on the skills, it was asked whether one knows about courses and training in the field of HealthTech, as well as whether the curricula adequately match the required skills.

It is clear what courses/training are offered related to HealthTech:

The curricula of VET training institutions are well aligned with the required knowledge and skills:



Most alumni of VET programs are able to adapt to innovation in the HealthTech sector:

VET graduates are aware of career opportunities in the HealthTech sector:

Plenty of courses are offered for professionals to keep their knowledge of HealthTech up to date:

Health care skills (medical knowledge, working with patients) are seen as very important. Students are already well trained in these. Skills that are also seen as very important, but in which students are not currently well trained are notably:
- *Digital skills* - safe, critical and responsible use of digital technologies, relational skills (empathy, communication) and;
- *Entrepreneurial skills* (creativity, critical thinking, problem solving).

In this regard, respondents said students should not be trained too much in a particular care technology, but should learn how to think creatively/problem-solving. Let students become familiar with the possibilities of (healthcare) technology and how to use it responsibly. To date, this has often been insufficiently incorporated into the curriculum. In addition, students and teachers are often unaware of the opportunities for a career in healthcare technology. As a result, students do not get the right insights into the field, and unknown makes unloved. It was also indicated that students may be forerunners in the field of healthcare technology when they graduate. This is only possible if teachers are also forerunners and push students to become so.

SWOT analysis

SWOT Analysis is a method to evaluate strengths, weaknesses, opportunities and threats for the purpose of strategic planning. Herewith a SWOT analysis of the HealthTech ecosystem in the Northern Netherlands region:

Strengths: • Network in Healthcare and Technology (Practor) --> good at and used to working together • Innovative sector • Engaged teachers	*Weaknesses*: • Education does not sufficiently connect to the labor market --> is falling behind it • Teachers' resistance to technology

• Good qualifications --> level 4 is high! • VET Central	
Opportunities: • Increasing focus on technology • Need from the labor market → Life long learning • Reduce costs/workload in healthcare through technology • Technology is available	*Threats*: • Demographic shrinkage • Healthcare gets an increasingly bad image • Cuts in institutions → counseling students in trouble • Lack of and resistance to IT knowledge among employees/supervisors/teachers/customers

Table 7: SWOT analysis healthcare technology ecosystem northern Netherlands

Main conclusions

For the continuation of the project, these are the ten points to be included:

- There are already very good partnerships in the field (e.g. Health Hub Roden, TZA), build on this and join together where possible.
- Cooperation with IT companies from healthcare organizations and educational institutions is often still limited. IT companies are seen as suppliers, but they can be so much more than that: they can help to set up a good curriculum in education and help think about innovations and implementation in healthcare organizations.
- Mistakes in communication and expectation management in collaborations between different types of stakeholders create friction. So discuss expectations and "obligations" well in advance.
- Teachers often do not feel comfortable with technology. By focusing on readily available support for teachers, they will feel more confident.
- Acceptance of care technology among caregivers and care recipients varies. Emphasise that care technology improves the quality of care, and reduces workload.

- Both in education and in healthcare institutions, management can play a major role in creating support for healthcare technology. To date, this has been handled differently. This must become a priority for management.
- When developing new materials around healthcare technology, focus primarily on modules around creative/problem-solving thinking and familiaris
- Educate students with the possibilities of (healthcare) technology and how to use it responsibly.
- Make sure healthcare technology is woven throughout the curriculum, that way it becomes the standard.
- Show students what is possible in terms of a career in healthcare technology. Unknown makes unloved, so by showing what is possible, students are more likely to pursue this field.
- Emphasise that a different role of the teacher is needed when it comes to digital skills. The role of the teacher is not that of transferring knowledge, but of challenging students to think critically and develop problem-solving skills.