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How Does Shortage of Health IT Professionals Impact on the Digital Health Transformation?

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Abstract. Background: The need for software suppliers to react swiftly to the plethora of application requests and constantly shifting market requirements is one of the major problems facing the health IT business in the context of digital health transformation. This can only be achieved when the necessary staff and resources are available. Objectives: The objective of this work is to identify challenges health IT companies are confronted with related to personnel capacities and skilled workers. Methods: Using a questionnaire distributed through newsletters and social media among representatives of software companies and hospitals we collected information on current hurdles of health software providers and their strategies to overcome these in order to address the demands of the digital health transformation. Results: The main findings of the survey are that scarce resources in software development are among the reasons for not achieving strategic goals on time in the health IT sector and for not being able to react flexibly to market changes. A strategy to overcome missing expert knowledge and own resources without free capacity is to hire external resources. Conclusions: With the ever-changing landscape of digital health, it is essential to have skilled workers with knowledge on the peculiarities of clinical workflows. The existing shortage of skilled workers leads to a reduction of innovative power in the health IT sector, potentially slowing down the digital health transformation.

Keywords. Skilled worker, healthcare, survey, digital transformation, agile

1. Introduction

The COVID-19 pandemic has evolved to be a catalyst for increased adoption and use of digitalization in the healthcare domain and beyond [1]. It accelerated the transition to digital health across all healthcare sectors, enabling the provision of cutting-edge healthcare services. Such transition requires not only patients and health professionals who are able to interact with the digital technologies, but also IT professionals that are aware of the peculiarities of medical software, and of clinical workflows, and who can consider this in the development of solutions. However, we can recognize a shortage of skilled workers in the health IT sector. Reuters reported in April 2022 that more than half of Germany's companies are struggling to fill vacancies due to a lack of skilled workers [2].

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One of the main issues facing the health IT industry is the necessity for software suppliers to respond quickly to the abundance of application requests and continuously changing market needs. This can only be ensured when the necessary staff and resources are on hand, or when these resources can be recruited from external providers. The objective of this work was to find out with which challenges health IT companies are confronted with related to personnel capacities and skilled workers and how they deal with them. A survey was conducted among software providers with a relation to the healthcare sector to answer this question. So far, analysis of shortage of skilled workers in healthcare focused on healthcare professionals [3,4]. To the best of our knowledge, no study yet analyzed shortage of skilled health IT workers and its impact on the digital transformation in healthcare. This paper focuses on the situation in Switzerland.

2. Methods

To answer our research question, we conducted an online survey among software companies in Switzerland delivering solutions for the healthcare sector. Being aware that participants will not have time to spend a long period of time answering the questionnaire, we targeted a number of questions that would take no longer than 10 minutes to complete. No question was made to be filled obligatory. The final questionnaire comprised 13 questions and was published through Microsoft Office Forms. The first question considered the position of the person who filled the questionnaire in the company. The following five questions collected information on the basic characteristics of the software company: size of the company, lifetime, whether it is specialized for software solutions in the healthcare sector, type of company, and main customer group. The following questions concerned shortage of skilled workers and strategies of the company to address them. Two questions asked for general reasons of limited innovations in the health IT sector and hurdles. Possible answer types were multiple choice and 6-item Likert-Scales.

A pretest was conducted to get an impression of the amount of time needed to answer the questions, and to study the understandability of the questions. Four persons working in the medical IT domain were recruited and asked to fill the questionnaire (1 person working as product owner and 1 working in marketing and product management for a medical software company, 1 application manager and 1 medical informatics working in a hospital). An average of 6.45 minutes was needed to answer all questions. No changes to the originally developed questionnaire were needed since understandability was confirmed. The link to the final questionnaire was shared through social media channels (LinkedIn) and a newsletter of the Swiss software company *healthinal* (https://www.healthinal.com). The survey was open to be filled from July 24, 2022 to November 10, 2022.

3. Results

3.1. Characteristics of study participants and their affiliations

62 persons answered the questionnaire. 45.2% are working in the management of a company, 24.2% as project leaders, 9.2% as consultants, 6.5% as developers, 4.8% are working in sales and 1.6% are working as requirements engineers. 8.1% (n=5) assigned

themselves to other areas of operation (nurse, owner of the enterprise, product manager, business partner management, application manager). 21% are working in a micro-enterprise (less than 10 employees); 25.8% are employed by a small business (10-49 employees), 12.9% are working for a medium-size enterprise (50-249 employees) and 40.3% for a large enterprise (250 and more employees). Most of the enterprises (48/62, 77.4%) exist already more than 10 years; 9.7% were founded 5-10 years ago and 12.9% less than 5 years ago. Main customers of the companies are hospitals (44/62, 71%), practices (33/62, 53.2%), nursing homes (22/62, 35.5%), pharmaceutical industry (14/62, 22.6%), medical technology provider (10/62, 16.1%), pharmacies (11/62, 17.7%), laboratories (9/62, 14.5%). Other customers were mentioned including healthcare associations, official political organizations like ministry of health, and patients. 48.4% of the companies are specialized in healthcare IT; 51.6% reported that their enterprise is not specialized in that domain. One question on the type of enterprise or organization was answered only by 31 participants and using free text in a very unharmonized manner with different levels of granularity. Therefore, we resist on reporting these results.

3.2. Answers related to shortage of skilled workers

Opinions regarding the statement "In the past, scarce resources in software development have led to strategically important corporate goals not being achieved on time" were highly diverse with a slight tendency to agreement (14.8% strong agree, 19.7% agree, 21.3% rather agree, 18% rather disagree, 6.6% strongly disagree, 19.7% disagree). Similarly, opinions regarding the statement "In the past, sufficient resources were available in software development to react flexibly to market changes" were diverse with a trend to disagreement (strong agree (6.3%), agree (14.6%), rather agree (27.1%), rather disagree (20.8%), strongly disagree (6.3%) and disagree (25%)). Most participants (77.4%) confirmed that they used external resources (e.g. freelancer or software provider) for developing their software solutions in the past; 21% did not. 1 answer was missing for this question. Missing expert knowledge, larger efficiency and own resources without free capacity were among the most frequent reasons (Table 1).

Table 1. Reasons for hiring external resources (total numbers of replies since the fields were not mandatory and a varying number of persons answered the single questions)

	Totally disagree	**Disagree**	**Rather disagree**	**Rather agree**	**Agree**	**Totally agree**
Missing expert knowledge (14 answers missing)	6	5	6	**10**	**14**	**7**
Less costs (20 answers missing)	4	11	8	11	7	1
More efficient (17 answers missing)	0	1	1	**14**	**18**	**11**
Own resources without free capacity (15 answers missing)	0	0	1	**10**	**20**	**16**
Open vacancies could not be filled (17 answers missing)	5	4	10	4	18	4

Reasons for not hiring external resources included that companies want to have everything under control, do not want dependencies to others and want to keep the knowledge within the company (Table 2). Others reported that there was no need to hire external resources.

Table 2. Reasons for not hiring external resources (total numbers of replies since the fields were not mandatory and a varying number of persons answered the single questions)

	Totally disagree	Disagree	Rather disagree	Rather agree	Agree	Totally agree
Too expensive (50 answers missing)	2	1	3	5	1	0
Want to keep everything under control (52 answers missing)	1	0	1	2	5	2
Shorter ways of communication (47 answers missing)	0	2	2	0	3	4
No need (50 answers missing)	0	2	1	2	4	3
Know how to be kept in the company (51 answers missing)	0	1	3	2	3	2
No dependency to resource provider (51 answers missing)	0	1	1	5	3	1

In particular, shortages in skilled workers were recognized in the areas of user experience and user interface design (38.7%), requirements engineering (40.3%), software engineering (41.9%), operation and maintenance (19.4%).

3.3. Hurdles for software innovations in healthcare

Proprietary interfaces (29%) and outdated technology (21%) were among the biggest challenges of software development in the healthcare domain. Two other important aspects were related to usability and user experiences (unsatisfactory user experience (11%), unprofessional user interfaces (11%)). Additional challenges were rather linked to management aspects, i.e. increasing costs for operation and maintenance (9%), and limited innovation power (13%). Other aspects that hamper software innovations in healthcare mentioned included limited agreements, missing political innovation pressure and too many individual interests, number of producers, too many software applications and their uncontrolled growth, data privacy and security aspects, complexity, missing understanding of clinical and healthcare processes. The participants rated:

1. missing business models (59.7%),
2. limited know how on healthcare processes (53.2%), and
3. limited knowledge on incentives, pains and gains of the customers (43.5%)

as the main reasons for failing software innovations. Wrong incentives, political hurdles, physicians as decision makers, and insufficient IT resources were mentioned as additional hurdles.

4. Discussion

4.1. Principal results

Scarce resources in software development are among the reasons for not achieving strategic goals on time in the health IT sector and for not being able to react flexibly to market changes. A strategy to overcome missing expert knowledge and own resources without free capacity is to hire external resources. For being able to create software innovations in healthcare – as the digital health transformation requires - it is necessary to have employees available that have sufficient knowledge on healthcare processes and

on the challenges their customers (i.e. the healthcare professionals) are confronted with in their daily business. Although data exchange standards like HL7 FHIR exist already since several years, proprietary interfaces are still a hurdle or software innovations in this field.

4.2. Limitations of the study

This study comes along with some limitations. The survey was only answered by representatives in Switzerland which were retrieved by a convenience sampling approach. Therefore, we cannot generalize the results reliably, but we were able to explore the challenges of staff shortages in the health IT domain. Most probable, similar results would be found for other countries like Germany or Austria. The study is limited in a way that basically the network of the company *healthinal* was invited to answer the questions. *healthinal* supports healthcare providers and software companies with development, UI/UX design and consulting. The newsletter was therefore received by customers of *healthinal* and partners. Another approach would have been to distribute the survey through other organizations or to use the Health Tech Cluster Switzerland as distributor who has 259 members in the domain of health technologies. The questionnaire had the limitation that no question was made obligatory. For this reason, we had a varying number of answers which made the analysis difficult. Some questions were only answered by half of the participants. Answers to one question remained unconsidered because of a limited set of answers.

4.3. Practical implications and conclusions

The lack of knowledgeable software firms and trained health IT personnel can be a major barrier to the digital transformation of healthcare since the creation and adoption of new digital technologies and systems in the healthcare industry may be slowed considerably by these issues. Therefore, finding strategies to improve software businesses' expertise and finding solutions to the shortage of skilled health IT personnel could aid in accelerating the digital revolution of healthcare.

Kokol et al. noticed an important role of agility in the digital transformation in healthcare [5]. The idea behind agility is to be able to respond quickly and efficiently to changes in the market and in customer needs. By embracing agility, software companies can be better equipped to handle the challenges of the health IT sector and develop innovative solutions that meet the needs of healthcare professionals and patients. Additionally, agile methodologies can help to improve the efficiency, quality and value of the software development process. A shortage of skilled workers hampers agility.

There are several solutions that can help in addressing the shortage of skilled health IT workers and increase the know-how of software companies in the healthcare sector. Some of these solutions include:

- Partnering with academic institutions to create training and educational programs that focus on health IT.
- Offering incentives and training programs to attract and retain skilled workers in the healthcare sector.
- Encouraging collaboration and partnerships between software companies and healthcare organizations to share knowledge and expertise.

- Investing in research and development to support the development of new technologies and solutions in health IT.
- Creating and promoting standards for data exchange and interoperability in healthcare to facilitate the development of innovative solutions.
- Government support and regulations which promote digitalization and innovation in healthcare sector.
- Hiring external experts to fill knowledge gap on specific areas.
- Attracting and retaining talent by creating a good company culture, flexible working hours and good compensation.
- Leveraging remote work and digital communication to expand the pool of potential talent.

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References

[1] J. Amankwah-Amoah, Z. Khan, G. Wood, G. Knight. COVID-19 and digitalization: The great acceleration. *J Bus Res.* 2021 Nov;136:602-611.

[2] Reuters, *More than half of German companies report labour shortages*. Last update:12. January 2023, https://www.reuters.com/markets/europe/more-than-half-german-companies-report-labour-shortages-2023-01-12/

[3] A. Zugasti Murillo, L. Aguilar Sugrañes, J. Álvarez Hernández. Transformación digital en la relación entre industria y colectivo sanitario [Digital transformation of the relationship between industry and healthcare professionals]. *Nutr Hosp*. 2022 Mar 29;**38**(Spec No1):14-18. Spanish.

[4] A. Kruszyńska-Fischbach, S. Sysko-Romańczuk, T.M. Napiórkowski, A. Napiórkowska, D. Kozakiewicz. Organizational e-Health Readiness: How to Prepare the Primary Healthcare Providers' Services for Digital Transformation. *Int J Environ Res Public Health*. 2022 Mar 27;**19**(7):3973.

[5] Kokol P, Blažun Vošner H, Kokol M, Završnik J. Role of Agile in Digital Public Health Transformation. *Front Public Health*. 2022 May 12;10:899874. doi: 10.3389/fpubh.2022.899874.