The perceived impact of self-measurement kiosks on healthcare professionals

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Abstract

New technologies are being used in health care globally with the goal to improve the care and lower the burden of health care professionals. The self-measurement kiosk, which is mostly being used (or prepared to be used in the future) in hospitals, is one of these innovations, which gives patients the ability to measure their own blood pressure, blood oxygen saturation and heart rate without the healthcare professional needing to perform these measurements. This study aims to assess what the perceived effect of the self-measurement kiosk is on healthcare professionals, especially regarding their workload, stress level and job satisfaction, since this is a gap in existing literature. Six interviews with healthcare professionals from hospitals in the Netherlands were conducted between April and July 2024 to do the analysis, of which one respondent is a doctor's assistant, two are nurses and three are internists. The job demands-resources model is used to help make sense of the results of the interviews. The study reveals that the healthcare professional experience a lowering in their workload, but do not experience an effect on their stress level and job satisfaction. The results have also shown that the perceived impact of the self-measurement kiosk on healthcare professionals is dependent on a lot of different factors, for example the specific tasks that the healthcare professional is performing in the hospital. Furthermore, the accuracy of the measurements of the self-measurement kiosk and implementation strategies need to be improved in order for the healthcare professionals to be more willing to adopt the self-measurement kiosk. The scientific relevance of this study is an analysis about the perceived impact of self-measurement kiosks on healthcare professionals from four different hospitals in the Netherlands. Three out of six professionals have not directly worked with the self-measurement kiosk themselves. They do have seen the self-measurement kiosk in practice and know how it works, on which the interviews are based. The practical relevance is to see if healthcare professionals could benefit from this new technology. Furthermore, the self-measurement kiosk might alleviate healthcare professionals' workload and therefore assist in the crisis of the shortage of healthcare professionals, which makes this study relevant for the whole society. The healthcare professionals in this study indicate a reduction in their workload and think that when the self-measurement kiosk will be improved and implemented on a larger scale it could also help in the shortage of healthcare professionals in the future.

1 Introduction

In recent years, hospitals are progressively implementing technological advancements aimed at enhancing patient care delivery that is more accessible and efficient. Among these innovations, self-measurement kiosks are also being introduced into the healthcare landscape. The self-measurement kiosks offer patients the ability to measure their parameters like blood pressure, saturation and temperature, without the need for direct supervision by healthcare professionals. Studies have shown that kiosks can save time for patients and staff, because patients do not have to wait for a healthcare professional to measure their parameters and healthcare professionals simply do not have to measure this themselves anymore, which gives them room to spend this time in another way (Chung et al., 2016; Oliveira et al., 2023). Other important impacts of the kiosk are yet to be discovered. For example, the stress level and job satisfaction of healthcare professionals and how the self-measurement kiosk could impact the shortage of healthcare professionals. The latter is important, because there is already a shortage of healthcare professionals and this problem might increase in the future (Chung et al., 2016).

While the potential benefits of the usage of the self-measurement kiosks, like reduced waiting times and increased efficacy and user satisfaction (Oliveira et al., 2023) are widely recognized, there are a lot of different dimensions that need to be researched, in order to find out what the impact of implementing self-measurement kiosks in healthcare actually is. The different dimensions are for example the impact on the quality of care, efficiency, efficacy, patient satisfaction and healthcare professionals. The latter will be the focus in this thesis. When it comes to the impact the self-measurement kiosk has on healthcare professionals - specifically regarding their workload, stress level and job satisfaction – there is a clear gap in the literature, which needs to be researched (Letafat-nejad et al., 2020). On the one hand, this gap finds itself in the lack of information available on the self-measurement kiosk as a new technology. On the other hand, the impact of technologies in healthcare on healthcare professionals is also not researched extensively, especially not with the specific variables that are examined in this study. These variables are chosen to be researched, because they reflect the well-being of healthcare professionals, which affects healthcare practices and therefore also patient care (Bamforth et al., 2023). Moreover, the impact of self-measurement kiosks on the future availability of healthcare professionals needs thorough investigation. On the one hand, since the shortage of healthcare professionals is becoming more and more visible these days, it is important to examine whether the self-measurement kiosk could (partially) solve this problem, through reducing workload of healthcare professionals so they can take on other tasks which could result

in less personnel needed. A considerable number of healthcare professionals are leaving the profession as a result of job stress and unsatisfactory working circumstances (Ministerie van Volksgezondheid, Welzijn en Sport, 2020a). The aging population is also contributing to an increase in the need for healthcare professionals, according to the Dutch Ministry of Health, Wellbeing and Sports (Ministerie van Volksgezondheid, Welzijn en Sport, 2020a). Furthermore, the COVID-19 pandemic is making the already severe scarcity of healthcare professionals worse (VN, 2021).On the other hand, in some studies it has been suggested that healthcare professionals are anxious about losing their jobs and their roles in healthcare becoming redundant due to more technology (Nieboer et al., 2014). Furthermore, technostress, which is described by Dragano & Lunau (2020) as the inability to cope with new computer technologies in a good way, could be an issue, which juxtaposes potential positive effects (Dragano & Lunau, 2020).

This thesis aims to address this gap in knowledge – the perceived effects of the self-measurement kiosk as a specific technology on healthcare professionals' workload, stress level and job satisfaction - by conducting a qualitative research study. Specifically, it will explore how the use of these kiosks in clinical settings affect healthcare professionals' workload, stress level and job satisfaction. Additionally, it also examines the willingness of healthcare professionals to adopt the self-measurement kiosk in their work and which factors might influence this. Lastly, it will also look at what influence the self-measurement kiosks might have on the shortage of healthcare professionals in the future. By shedding light on these important dimensions, this research aims to give useful insights for healthcare professionals, policymakers, healthcare administrators – which can be hospital managers or medical directors - and other stakeholders involved in the adoption and implementation of the self-measurement kiosk. In the end, it aims to make a contribution to the current conversation on how to optimize healthcare delivery systems and support healthcare professionals in creating a sustainable and encouraging work environment in the age of digital healthcare innovation and replacing human labor where necessary and possible, due to the shortage of healthcare professionals.

Therefore, the following research question is asked: '*What is the perceived impact of using self-measurement kiosks in hospitals on health care professionals?'*

The research question can be brought down into several sub questions:

1. What is the perceived impact of self-measurement kiosks on the workload of health care professionals?

2. What is the perceived impact of self-measurement kiosks on the level of stress of health care professionals?
3. What is the perceived impact of self-measurement kiosks on the job satisfaction of health care professionals?
4. Which factors influence healthcare professionals' willingness to make use of self-measurement kiosks?

To understand the process of adopting self-measurement kiosks in healthcare practices and how this influences healthcare professionals, interviews were held with healthcare professionals from hospitals in the Netherlands that have experience with the self-measurement kiosk. Based on assumptions from the job demands-resources model, interviews with healthcare professionals are conducted. All of the sub-questions and assumptions, and the main variables they contain, are developed based on the job demands-resources model. The theory section gives a clear insight of how this model is used in the specific context of this thesis.

1.1 Scientific and societal relevance

Hospitals all over the world are busy with implementing technologies in their healthcare systems, both for administrative purposes and actual treatment purposes. Meaning that new technologies are created and implemented to fasten certain processes, like documentation (administrative purposes) but also to make patients more autonomous in their time in a hospital, more aware of their health conditions, and create more time and less need for healthcare professionals in tasks like measuring blood pressure or saturation (treatment purposes). However, implementing new technologies is not always easy, especially when it comes to something as important as people's health, because a lot of different aspects needs to be taken into consideration. These aspects are for example the medical aspect, the financial aspect, the managerial aspect and the social aspect. The self-measurement kiosk is a technology of which not yet a lot of literature is available. Some hospitals are already using such a technology, but the impact on healthcare professionals is not yet investigated. The scientific relevance finds itself in the importance of finding out if self-measurement kiosks have positive influences on the workload, stress level and job satisfaction of healthcare professionals, since the workload and stress level for healthcare professionals is currently high and the job satisfaction rather low, which even results in healthcare professionals leaving their profession in healthcare (Ministerie van Volksgezondheid, Welzijn en Sport, 2020a). According to Anjum et al. (2019) a substantial disparity in stress levels between the general public and physicians, with physicians reporting far higher levels, about 28% as opposed to approximately 18% in other professions.

Furthermore, it is important to see what drives their willingness to adopt these and how it influences the shortage of healthcare professionals in the future. This research will unfold its practical relevance by examining if and how the self-measurement kiosk can be helpful for healthcare professionals, especially regarding their workload, which can hopefully lead to having enough healthcare professionals in the hospitals to still care for patients.

The quality, productivity, efficacy and costs in healthcare are all significantly impacted by job satisfaction. In fact, it is a measure of the welfare and quality of life of the workforce within the organization. Improved understanding of the performance and job satisfaction of healthcare personnel is essential for the success of organizations and can have a direct impact on the quality of care given to patients (Karaferis et al., 2022). Considering that this thesis is written from an Public Administration perspective, this research will unfold its societal relevance by helping hospitals as organizations and policymakers. Hospitals are seen here as public organizations fulfilling public services. Not only for the hospitals, but also for policymakers it is important to see what we can learn from implementing the self-measurement kiosk, how this influences the well-being of healthcare professionals, and how that can influence public health services. For public organizations in general, the scientific relevance of this research is that they will be able to get an understanding of how implementing new technologies in the organization can affect the workers, which could be a reflection of the results and outcomes of the services of that organization. When knowing if and in what way the introduction of new technologies influence the well-being and performance of healthcare professionals, public organizations can learn from this to see if there is a need to change their strategies in order to maintain optimized public services.

1.2 Structure of the thesis

This thesis will firstly dive into the state of research to see what is already known about self-measurement kiosks (or other new technologies) in healthcare and their impact on the healthcare system, patients and – for this thesis specifically – healthcare professionals. After that the job demands-resources model that is used will be explained and assumptions are stated. Next, the methods chapter describes the way in which the research is done, including the setting, case study, study design, data collection and how interview questions came about. The data analysis and results will follow, which will be aimed at answering the research- and sub questions. The thesis is finalized with a discussion and conclusion section and future research purposes.

2 State of research

2.1 Technology in healthcare

With real-time individualized monitoring, therapeutic care and other digital technologies replacing the conventional approach to healthcare management, digital health is completely changing healthcare organizations. Digital tools can help healthcare professionals make better diagnoses, treat illnesses and provide personalized healthcare to patients. They can also give patients more control over their health. The digital tools also present a number of chances to support chronic condition management, early detection of life-threatening illnesses and prevention outside of traditional healthcare settings (Senbekov et al., 2020).

Self-measurement kiosks are a rather new technology within health care practices. Therefore, not a lot of literature is available about this technology yet. However, in this section the most important sources are discussed. Some background information is about new technologies in healthcare in general, for example telemedicine, health care applications and virtual clinical trials (Haleem et al., 2021; Gordon et al., 2020; Senbekov et al., 2020). The purpose of the state of research is to find out how these technologies impact health care professionals, regarding their workload, stress level and job satisfaction, but also how they impact efficiency of health care practices and could help in the challenge of an increasing deficit of health care professionals in the future. This background information will help in the research about the self-measurement kiosk as a specific technology impacting healthcare professionals.

The most important new digital technologies in healthcare are electronic health records (Farre et al., 2019), clinical decision support tools (Sutton et al., 2020), artificial intelligence applications (Mirbabaie et al., 2022), telemedicine (Haleem et al., 2021), wearable device apps (Patel et al., 2021) and health apps (Gordon et al., 2020). One new technology, which is supposed to be very promising in the future, that Senbekov et al. (2020) mention in their articles is ‘virtual clinical trials’. A virtual clinical trial is defined here as ‘a system when physical sites and direct interaction with patients are not required any more’ (Perin et al., 2020 & Persky, 2020). When looking at technologies in healthcare, there are in general three categories that can be created in which new technologies in healthcare can be placed. In this thesis, these categories are named as a) technology for treatment of patients, b) technology for administrative purposes and c) technology for data collection purposes. The virtual clinical technologies analysed here would be in the data collection category. These technologies are used with the purpose to retrieve remote patient health information through tablets, smartphone apps and wearables

(Narayanasetty & Jallu, 2021). Even though the virtual clinical trials that are being analysed in this article are based on the patient being at home and collecting their health data remotely, it is still about collecting data from the patient without the health care professional having to do this in direct contact with the patient. The self-measurement kiosk is also an example of a technology in the third category. The virtual clinical trials therefore do show some similarity with the self-measurement kiosks that are studied in this thesis. The most important benefits of these virtual clinical trials are the cost-effectiveness in comparison to conventional clinical trials and the opportunity for patients to be involved in their treatment.

2.2 Influencing factors of new technologies in healthcare

One of the problems that healthcare professionals and hospitals face when implementing more and more digital technologies, is the amount of data that needs to be processed (Bogoviz et al., 2019). However, Bogoviz et al. (2019) found that there is a way that this problem can be minimized, by designing digital tools that give healthcare professionals the opportunity to immediately receive the data in the form of reports, graphs and tables. Another problem is the (un)availability of new technologies. This problem obviously differs per country and/or institution, but could be an issue for the quality of healthcare (Mason et al., 2017). With some technologies, it is even important for the patients to be in possession of specific digital tools in order to receive healthcare treatment, for example the use of an application on their phone. Up until now, when looking at the self-measurement kiosks, they are only being used in the hospitals themselves. This means that patients do not have to purchase any digital tools and use these at home to receive treatment. The next barrier goes hand in hand with the previous problem, which is the (un)availability of knowledge on how to use these new technologies. Even though, technologies can be available, healthcare professionals and the receiving patients will have to know how to work with these new technologies, what the results tell us, and what kind of treatment needs to be performed based on that data (Peansupap & Walker, 2005).

Safety issues are also an important challenge. A lot of data is being collected when using digital tools in healthcare. It is necessary that the data that is stored and processed is well protected and does not compromise the safety and privacy of the patients. According to Patra et al. (2021) the most significant obstacle facing Internet of Things (IoT)-based healthcare is guaranteeing data security and privacy. User data is susceptible to identity theft, misuse and fraud, raising major privacy issues. Effective data collection and analysis is hampered by inconsistent data processing and communication standards. Malicious attacks and data leaks are another risk that users face, particularly when third-party apps access their personal data. Concerns about data

breaches also arise when data is kept on cloud servers (Patra et al., 2021). In their article, Awad et al. (2021) also talk about the need for data security and protection in new healthcare technologies as a challenge for their adoption. They have found that without data security, it becomes harder to implement new technologies in healthcare and especially to get patients to adopt to it.

The willingness of healthcare professionals to work with digital technologies could also be a barrier. Physicians have been hesitant to embrace polyclinic computerization (Awad et al., 2021). The difficulty that many specialists had when learning new digital skills caused delays in patient care and a decline in the quality of appointments, meaning that more time was spent on adjusting to new digital tools during patient appointments which resulted in more laborious patient consult (Awad et al., 2021). Utilizing digital technologies in healthcare is more challenging and there is a greater chance of making a mistaken choice in the beginning phase of using that technology, because there is not enough knowledge yet on how to use the technology properly. Furthermore, some healthcare professionals value the time with their patients and are not willing to lose this direct contact to digital technologies. Yaacoub et al. (2020) as well as Awad et al. (2021) even mention the danger of some doctors potentially finding themselves unemployed when all their work is being replaced by digital tools, especially in remote areas, which is simply wrong in the current demographic situation. It will take a lot of time in order to gain trust from healthcare professionals and have them switch to more integration of digital technologies in healthcare. Another important note that Awad et al. (2021) make is to keep in mind what digitalizing healthcare could mean for healthcare services in the future, especially pointing at dramatic implications in case of system failures in the digital technologies.

According to Morilla et al. (2017) the success of technologies in public healthcare is up for discussion, but more so than the technology itself, it depends on how healthcare services are set up. By encouraging patient participation in healthcare decisions, new technologies like telemedicine modify the doctor-patient interaction. Implementing these new technologies has been difficult despite large investments because of problems with reimbursement, legal, regulatory and quality of care concerns. Adoption by doctors and patients, which is impacted by perceived ease-of-use and perceived usefulness is essential to its success. Thus, for implementation to be successful, doctors must be involved and their relationship with technology must be understood (Morilla et al., 2017).

Regarding the patients, there need to be enough trust in digital technologies. According to Awad et al. (2021) some patients rely on classical medicine and healthcare and do not yet see the benefits of using digital technologies. A way to shift their interpretation on digital tools would be by showing them real life examples of how digital tools can actually assist doctors and therefore fasten and improve their treatment process. When patients can actually see how much time it can spare and that it is a reliable source, their trust in the kiosk will most likely grow (Awad et al, 2021).

Lastly, legal regulation and law on digital technologies in healthcare is an important point. This again differs per country and region, but could be a significant barrier in the implementation of digital tools. Especially since some regions do not yet have clear laws and regulations, it hinders them from using digital technologies and improving healthcare (Kotha, 2020). Some countries have guidelines in which specific rules and regulations are stated about treatment in healthcare and since some technologies are rather new and advanced, it will take a lot of time, money and effort to do the scientific research and prove that the technology in question can be approved. The costs that this research and implementation brings along can get rather high. According to Rayan et al. (2021) based on empirical data, it appears that the construction of an IoT healthcare network would not be funded by state or private healthcare providers when there is no evidence and experience from other healthcare systems or countries. All of the barriers mentioned in this paragraph stagnate the process of implementing new technologies in healthcare. Also, according to Awad et al. (2021) the provision for potentially high entry costs when it comes to implementing new digital technologies in healthcare is a problem for a lot of healthcare structures.

2.3 Impact of using digital technologies

2.3.1 Impact on the healthcare system

When looking at new technologies in health care in general, not yet considering the self-measurement kiosks, the existing literature shows that these could be beneficial. According to Senbekov et al. (2020), the implementation of new technologies in health care provide better accessibility and flexibility for the receivers of health care. In their article, they mostly talk about the impact that Artificial Intelligence (AI) has and will have in the future on medical diagnoses and treatments. According to Amisha et al. (2019) the areas where AI in healthcare is most used, are managing data of patients, the development of drugs, performing surgery and remote consultation. All of these can be fastened and made more efficient with the use of AI, instead of having healthcare professionals do this themselves (Amisha et al., 2019). It also

leaves more room for healthcare professionals to focus on the other parts of healthcare which cannot be replaced by AI. Another important form of a new technology that is mentioned by Senbekov et al. (2020) is big data systems in the management of medical practices. According to Dash et al. (2019) big data can improve the quality of care, increase the efficiency of the service, lower health care costs and medical errors. Because of the enormous amounts of medical information that needs to be processed by hospitals and health care professionals, big data offers a way to improve and fasten these processes.

In their book, Osipov and Skryl (2021) mention the importance of Internet of Things as a new technology in healthcare. Especially during the corona pandemic Internet of Things was tested out extensively, mostly assisting in monitoring the well-being of patients, tracking their locations and measuring temperature and blood pressure, which takes these tasks out of the hands of healthcare professionals. Through identifying the weaknesses of the current healthcare system, we can find out why new technologies are introduced so extensively in healthcare lately. According to Oborin et al. (2018) and Kotha (2020), the main weakness of healthcare systems at the moment is the lack of healthcare professionals and specialists. This is also one of the reasons that the self-measurement kiosks, which will be analysed in this thesis, is being introduced in hospitals. The time that healthcare professionals spend on measuring temperature, blood pressure or heart rate could be spent better, which gives doctors and nurses more time for other activities with their patients or even an opportunity to see more patients in one day. This means that the self-measurement kiosk might be able to make the healthcare system more efficient, which means that doctors will be able to see more patients in the same time than they could before. The second weakness is the problem of human error. According to Bogoviz et al. (2019) a perfectly prepared and exercised operation could be spoilt by the tiniest problem, like doctors not washing their hands thoroughly enough.

2.3.2 Impact on patients

In their article about the impact of technology on communication between cancer patients and their healthcare providers, Elkefi & Asan (2021) demonstrate how healthcare information technologies can boost patient confidence, improve care delivery and ease collaborative decision-making, which is an essential component especially in cancer care. By enabling patients to participate more actively in their treatment choices, technologies like patient portals, text messaging and interactive decision aids help patients and physicians build deeper, more trustworthy relationships. Online resources have also increased accessibility to healthcare by automating care procedures and bridging geographical distances (Elfeki & Asan, 2021).

Ramaswamy et al. (2020) state similar findings about patients' confidence being greatly increased by digital healthcare technology. Through better information availability, improved connection with healthcare practitioners and the ability to participate actively in their care, these technologies empower patients.

Patients portals, for instance, make it simple for people to access their lab results, treatment plans and medical information, helping them to stay informed about their health. Patients who feel more in control of their healthcare decisions can benefit from this transparency by feeling less anxious and more confident about their treatment. Better connection between patients and physicians is made possible via secure messaging via these portals, which guarantees that patients can ask questions to healthcare professionals and receive timely answers, enhancing their confidence in the medical process (Lancastar et al., 2018; Mair et al., 2000). Furthermore, it has been demonstrated that telemedicine improves patient satisfaction by increasing accessibility and convenience of healthcare. According to Kraai et al. (2011), patients frequently express high levels of satisfaction with telemedicine since it enables them to get timely care without having to worry about traveling, preserving continuity of care even during difficult circumstances.

The impact of digital tools in healthcare on patients comes down to a number of important impacts that can be categorized. The first one is *enhanced access to information.* Patients may easily access their medical information, educational resources and direct communication with healthcare professionals thanks to digital solutions like patient portals, mobile health apps and telehealth services (Lancastar et al., 2018). Patients are better able to comprehend their medical situations, ask knowledgeable questions and actively participate in the decisions about their care as a result of this transparency. Patients are more inclined to accept their treatment plans and have faith in their own abilities to control their health when they are well-informed (Kraai et al., 2011). With the self-measurement kiosk, patients receive a receipt on which their parameters are displayed. This way, not only the doctor gets the results in their system, but the patient can already take a look at the results and contemplate about what they could mean for their health (Kraai et al., 2011; McLean et al., 2013).

Next to enhanced access to information, *personalized care* is also an important point. Large-scale patient data may be collected and analysed thanks to digital technologies, which makes it possible to create more individualized treatment plans. For example, wearable technology can continuously track vital signs and other health indicators, giving physicians and patients useful

information. Patients feel seen and heard when care is personalized, which boosts their trust in the treatment they get (Kraai et al., 2011).

Furthermore, *improved communication* is a result of digital technologies in healthcare. According to Lancastar et al. (2018) patients and healthcare professionals can communicate through telehealth systems and secure texting. Patients may readily contact their doctors with any questions or concerns they might have, which lowers worry and strengthens the bond between patient and healthcare professional. The knowledge that their healthcare professional is only a message away can greatly increase a patient's feeling of confidence and security. The self-measurement kiosk does not necessarily provide a service where a patient can communicate with their healthcare professional, but through the knowledge they get when using the self-measurement kiosk and being more involved in their own health, it becomes easier for the healthcare professional to explain medical treatments based on the results that the patients have seen themselves.

Lastly, digital tools in healthcare lead to more *shared decision-making* (Kraai et al., 2011; Mair et al., 2000). With the use of interactive tools and digital decision aids, patients can better communicate with their healthcare professional and other people in the hospital by understanding the risks, benefits and options associated with each treatment plan. Higher levels of confidence and satisfaction are closely correlated with the patient's active participation in their care, which is reinforced by this shared-decision making process (Kraai et al., 2011). When using the self-measurement kiosk, patients will be more actively involved in measuring parameters (part of their initial treatment), which already makes them more involved in the treatment itself. When they also come to the point where they understand the results or what led to these results, the shared decision-making can be increased.

2.3.3 Impact on healthcare professionals

The impact of digital technologies (specifically the self-measurement kiosk) on healthcare professionals is the main focus point of this study. Positive and negative outcomes are frequently interpreted in pairs, for example, greater information availability versus missing or inadequate information and improved workflow efficiency versus complications and workflow interruptions (Wosny et al., 2023). It seems like digital technologies can both have a positive and negative impact on healthcare professionals, depending on the tool that is implemented and in what way it is implemented. The challenges and opportunities of implementing new technologies, with a closer look at the self-measurement kiosk are described below.

Opportunities

The opportunities for healthcare professionals when implementing digital technologies are also important to note. The first advantage is that the workload can be lowered and some processes can be sped up (Strudwick et al., 2022). When looking at the self-measurement kiosk, healthcare professionals would not have to measure patients' vitals anymore, which takes work out of their hands and leaves time for other tasks to be done. Therefore, time pressure will also be reduced for healthcare professionals. According to Strudwick et al. (2022) digital tools such as Electronic Health Records automate regular activities like drug ordering, patient scheduling and paperwork, and in this case measuring patients' vitals, and thereby streamlining administrative tasks. This shortens the time spent on these tasks, freeing up medical staff members to concentrate more on providing direct patient care.

When digital technologies take over tasks from healthcare professionals that do not necessarily require a professional (for example measuring patients' vitals) they have more time to spend on tasks that cannot be taken over by technology or someone else and therefore really need healthcare professionals to perform them. Administrative tasks (which are usually taken away by digital tools) are less meaningful for healthcare professionals, and finding meaning in one's work serves to offset stress and there will be a lower chance of getting a burnout (Atkinson et al., 2018). Therefore, digital tools in healthcare could reduce stress levels for healthcare professionals and increase job satisfaction.

Another advantage is advanced clinical decision-making. Integrated into electronic health records, clinical decision support systems give medical staff evidence-based, real-time guidance during patient contacts. By analysing patient data and recommending treatment alternatives, warning physicians about possible drug interactions and advising preventive measures, these technologies enhance the precision and standard of care. It also makes the chance of making mistakes by a healthcare professional smaller, because small things are less likely to be overseen and therefore automatically brought into consideration into the treatment plan (Strudwick et al., 2022). When healthcare professionals have to overlook all the small details themselves, there is a bigger chance to overlook something and make mistakes in analysing and diagnosing (Strudwick et al., 2022).

Better communication and coordination is also an opportunity that healthcare professionals get when digital tools are being implemented. According to Ramaswamy et al. (2020) healthcare professionals may easily share patient information thanks to digital communication networks. By ensuring that all parties involved in a patient's care are in agreement, this promotes

improved coordination across healthcare teams. Improved communication can result in more rapid decision-making and a treatment plan that is more unified (Ramaswamy et al., 2020).

Challenges

The first challenge for healthcare professionals when digital technologies are implemented in healthcare, is that they will have to adjust to this changing environment. According to Isidori et al. (2022) there are a couple of skills that healthcare professionals need to master when the usage of digital technologies is rising. These skills include technical skills to use telemedicine, skills regarding the usage of mobile communication devices and remote patient-monitoring applications and skills to assess data from these new technologies. When looking at the self-measurement kiosk, it is important for healthcare professionals to understand how these kiosks work, what they tell the patient, how to explain the results to their patients and how to base treatment on these results.

According to the studies of Bardram et al. (2005), Hardstone et al. (2004) and Tang et al. (2008), the usage of digital technologies and the increasing use of computers by healthcare professionals has led to a decrease in conversations among healthcare professionals and took away in-depth discussions about the needs and conditions of patients, even though medical consultations between professionals can be highly beneficial and prevent major mistakes from happening because of the different viewpoints that went into a decision about patient treatment. Connecting this to the self-measurement kiosk, there is a chance that healthcare professionals will be consulting less with each other because the measurements of the parameters does not have to be done anymore.

Another important challenge to consider when implementing new digital technologies, is that the personal contact between patient and healthcare professional reduces. According to Gómez et al. (2015), for some healthcare professionals, this contact is really important and sometimes the reason for choosing a career in healthcare. Especially doctor's assistants or nurses, who normally do the measurements that the self-measurement kiosk will do for them now, will see their patient less than before. This can affect the job satisfaction of the healthcare professional (Gómez et al., 2015).

Stress and burnout are phenomena of which healthcare professionals often suffer. Even though new technologies in healthcare could reduce stress, according to Wu et al. (2021) and Chandawarkar et al. (2021) the optimal use of health information technologies and inefficient work processes that come along, can lead to stress, feelings of frustration and also result in less

job satisfaction. This is the phenomenon of technostress, which is defined as ‘a modern disease in adaption caused by an inability to cope with the new computer technologies in a healthy manner’ by Craig Broad (Dragano & Lunau, 2020, p. 408). Burnout is a response to ongoing work-related stress and is characterized by tiredness, cynicism and inefficacy and can be impacted by personal factors as well as organizational elements (Maslach et al., 2001). Burnout among clinicians can have detrimental effects on the quality of care and can lead to a number of unfavorable outcomes, such as dysfunctional interactions with coworkers, substance misuse or self-medication, sadness and sometimes even suicide. (Stehman et al., 2019) Another concerning consequence of burnout amongst healthcare professionals is the association with physicians leaving healthcare practice and therefore impacting the healthcare system of that country (Pantenburg et al., 2016). The shortage of healthcare professionals is already an ongoing problem and this could worsen that (Degen et al., 2015).

A big impact on burnout of healthcare professionals is workload. According to Melnick et al. (2021) and Ye (2021) workload can be increased when digital tools are implemented, because of documentation requirements. As well as it could lower the workload of healthcare professionals, sometimes it is not kept in mind that the rapidness of the technological change is creating new challenges for healthcare professionals. They need to be more data-oriented and also get a lot more data at their plate. Before the technology was implemented, not everything was measured, but when the technology is there, sometimes things are over measured. However, that also means that healthcare professionals need to analyse all that data (Ye, 2021; Bajwa et al., 2021).

Existing literature has shown that technologies in healthcare can both have positive and negative impacts on the healthcare system, patients and healthcare professionals. New technologies can make the healthcare system more efficient and speed up certain processes. Patients will get enhanced access to information, personalized care, improved communication and shared decision-making. Considering the healthcare professionals, digital technologies in healthcare offer several benefits, including reduced workload, faster processes and improved clinical decision-making. The self-measurement kiosk might be able to take away administrative tasks, freeing up time for direct patient care and potentially reducing stress and burnout among healthcare professionals. However, challenges include the need for new technical skills, reduced personal patient contact and the risk of increased stress due to technostress. Additionally, the shift towards digital tools can lead to less professional collaboration and potentially impact job satisfaction. The gap of finding out how the use of the

self-measurement kiosk as a specific technology impacts the workload, stress level and job satisfaction of healthcare professionals still remains. Hence, this study will focus on filling that gap.

3 Theoretical framework

In order to answer the sub questions of this thesis, the job demands-resources model has been selected to form the basis of the assumptions and help in the analysis. This model can help to find out how demands and resources in a particular situation at work – for this thesis in healthcare – intertwine and what the result is for the well-being of the healthcare professional at work (job satisfaction or burnout/stress).

3.1 Job demands-resources model

The job demands-resources model (Demerouti et al., 2001) aims to explain how job demands and job resources influence each other and whether this results in job satisfaction or burnout/stress. The model distinguishes job demands and job resources, which are two important factors in this research. Demerouti et al. (2001, p. 501) define job demands as 'those physical, social or organizational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs.' Examples of job demands include excessive workloads, strenuous physical tasks, conflicts with colleagues and uncertainty about job stability. According to Hockey's (1997) compensatory control model, the JD-R model suggests that when job demands are high, extra effort is required to meet work objectives and prevent a decline in performance. This inevitably leads to physical

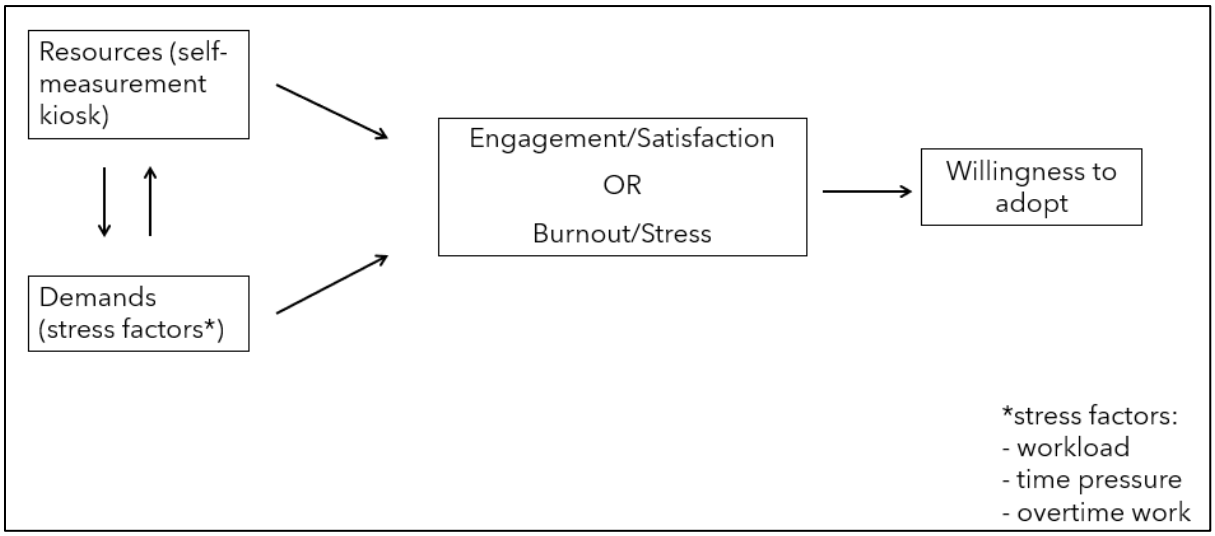

Figure 1 - Job demands-resources model

and psychological strains, such as fatigue and irritability. Employees may recover from expending additional energy and enduring associated costs by taking breaks, switching tasks or engaging in less demanding activities. However, inadequate recovery can result in prolonged stress that gradually depletes the employee's physical and mental resources. Job resources are defined as 'those physical, social or organizational aspects of the job that may do any of the following: (a) be functional in achieving work goals; (b) reduce job demands and the associated physiological and psychological costs; (c) stimulate personal growth and development'. Examples of job resources include getting feedback, autonomy in tasks (job control) and support from colleagues or superiors (Hockey, 1997).

In the context of this thesis, the goal is to find out if the self-measurement kiosk – a new introduced technology in healthcare – could find itself in the *job resources* category and positively influence health care professionals regarding their workload, stress level and job satisfaction. When looking at the different dimensions in which *job resources* find its origin, the self-measurement kiosk would be an organizational aspect of the job. It can be seen as an organizational feature that can help healthcare professionals in their job.

Considering the four sub questions, the variables *workload, stress level, job satisfaction* and *willingness to adopt* will need to be implemented into the job demands-resources model. The variables *workload* and *stress level* can be put in the 'demands' side. However, because *stress level* can also be an outcome in the job demands-resources model, an article by Anjum et al. (2019) is used to select the demands. The study fits the context of this thesis very well, as the setting (healthcare professionals) is the same. The medical profession is widely acknowledged as one of the most demanding, with its primary source of stress stemming from the profound responsibility it entails, dealing directly with people's lives. Research highlights a notable discrepancy in stress levels between doctors and the general population, with doctors experiencing a significantly higher level, around 28% compared to approximately 18% in other professions (Anjum et al., 2019). This elevated stress among healthcare practitioners substantially impacts the quality of medical care provided. The persistent exposure to such high levels of stress not only inflicts personal anguish but also poses a threat to the standard of patient care. Therefore, it is really important to study stress levels of healthcare professionals and to find out if the self-measurement kiosk is able to reduce these percentages.

The authors describe 4 stress factors and their underlying structure, with several stress determinants:

1. Factor 1: Job demand & performance stressors (workload, time pressure, inadequate staffing, difficulty in balancing work-home life, overtime work)
2. Factor 2: Career & reward prospects (employment opportunities, slow promotion process, pay level, government policies for doctors, service structure, career prospects)
3. Factor 3: Workplace environmental stressors (no positive feedback for good work, lack of participation in decision making, inadequate office facilities)
4. Factor 4: Interpersonal stressors (gender discrimination, harassment, working relationships)

The assumption is that the following stress determinants can be influenced by the introduction of the self-measurement kiosk in healthcare, and are therefore selected as the 'demands' in the model.

1. *Workload* (belonging to factor 1): it is the assumption that after the introduction of the self-measurement kiosk the workload of healthcare professionals will be decreased, because the self-measurement kiosk can take away some of the tasks that are currently still performed by healthcare professionals. On the other hand, it could also be the case that the workload will be increased because healthcare professionals are needed to perform other tasks – that might be harder and create more workload – because of the time that is bought by using the self-measurement kiosk.
2. *Time pressure* (belonging to factor 1): the time pressure that healthcare professionals experience can be taken away when the self-measurement kiosk is used, because it gives them more time with their patient which they do not have to spend on measurements.
3. *Overtime work* (belonging to factor 1): because of the usage of the self-measurement kiosk, healthcare professionals save some time with every patient. This time can be build up and hopefully result in not having overtime work.

Since the variable *stress level* can be both a demand and an outcome in the job demands-resources model, the three variables *workload, time pressure* and *overtime work* are selected as demands (because together they define stress level, based on the findings of Anjum et al. (2019)), and burnout/stress is a potential outcome.

The variable *job satisfaction* is one of the outcomes of the job demands-resources model. The *self-measurement kiosk* is a potential resource, of which the impact is tested – which means that it can potentially also be a demand. The *willingness to adopt* depends on the outcome of the model, whether it results in a positive outcome (satisfaction/engagement) or a negative outcome

(stress/burnout). When it results in a positive outcome, the *willingness to adopt* will most likely be higher. When it results in a negative outcome, the *willingness to adopt* will most likely be lower. A graphical representation of the job demands-resources model (in the context of this thesis) is shown in figure 1.

Each of the four sub questions in this thesis covers a variable. The variable *self-measurement kiosk* is present in all of these four questions, while the remaining variables, which are *workload, stress level, job satisfaction* and *willingness to adopt the self-measurement kiosk* are divided over the questions. All of these variables find their own place in the job demands-resources model and are connected to each other. For example, if the resources (*self-measurement kiosk)* are dominant over the demands *(workload*, *time pressure* and *overtime work),* the outcome will be *job satisfaction*. According to the job demands-resources model, this means that the use of the self-measurement kiosk will lead to a higher *job satisfaction* and the *willingness to adopt the self-measurement kiosk* will be high.. The theory will be used and connected to the interview results with the healthcare professionals, but the four sub questions will be covered separately, even though the job demands-resources model suggests that the answer to one sub question is able to answer all the other questions as well. These variables are incorporated into interview questions, in order to get a deeper understanding of the perceived impact of the self-measurement kiosk on the remaining variables.

The first sub question ‘What is the perceived impact of self-measurement kiosks on the workload of health care professionals?’ concerns the variable *workload.* According to the literature, the self-measurement kiosk should reduce *workload* of healthcare professionals, because it assists them in performing measurements of patients’ parameters (Strudwick et al., 2022). The following assumption is stated:

A1: *The workload of healthcare professionals will be reduced when implementing the self-measurement kiosk.*

After the relationship between the *self-measurement kiosk* and *workload* has been clarified, workload will fall under one of the factors of stress level. The other two factors are *time pressure* and *overtime work.* These three factors together form the basis of the variable *stress level*, with the corresponding sub question ‘What is the perceived impact of self-measurement kiosks on the level of stress of health care professionals?’. The following assumption about *stress level* of healthcare professionals is stated:

A2: *The stress level of healthcare professionals will be reduced when implementing the self-measurement kiosk, based on the three stress factors workload, time pressure and overtime work.*

The third sub question 'What is the perceived impact of self-measurement kiosks on the job satisfaction of health care professionals?' covers the middle part of the job demands-resources model and questions whether the job demands or the job resources are dominant and if this would result in job satisfaction or burnout/stress. If the self-measurement kiosk (resource) helps to cope with the stress and workload of healthcare professionals adequately, job satisfaction will arise. If the self-measurement kiosk does not help to cope with the stress and workload of healthcare professionals adequately, stress or burnout will arise. The following assumption about this sub question is stated:

A3: *The self-measurement kiosk helps to cope with the stress and workload of healthcare professionals adequately and therefore job satisfaction arises.*

The fourth and last sub question 'Which factors influence healthcare professionals' willingness to make adopt the self-measurement kiosks?' is about the variable *willingness to adopt the self-measurement kiosk.* If the job resources are dominant over the job demands and the outcome is job satisfaction, the willingness to adopt will be higher. If the job demands are dominant over the job resources and the outcome is stress/burnout, the willingness to adopt will be lower. The assumption for this sub question is:

A4: *The job resources are dominant over the job demands and therefore job satisfaction arises, which results in a higher willingness to adopt the self-measurement kiosk.*

The job demands-resources model is the theoretical framework used in this study. The variables *workload, time pressure* and *overtime work* are the demands and the variable *self-measurement kiosk* is a potential resource, of which the perceived impact is tested. Based on what the impact of the self-measurement kiosk is on the workload, time pressure and overtime work of healthcare professionals, the outcome in the job demands-resources model will be job satisfaction or burnout/stress. The assumptions, based on the four sub questions, are that the self-measurement kiosk reduces the workload and stress level of healthcare professionals and increases job satisfaction. As a result, the willingness to adopt the self-measurement kiosk by healthcare professionals will also be high.

4 Methodology

4.1 Research design

To address the research objectives, a qualitative research approach is used including empirical data from interviews with healthcare professionals. Because the objective of this study is to find out the perceived impact on workload, stress level and job satisfaction – which are variables that are hard to observe – this research is done through semi-structured interviews. The research is cross-sectional, so the data is from one single point in time. The self-measurement kiosk was either already available at the hospital where the respondents work or there were no plans yet for the self-measurement kiosk to be implemented. Therefore, a longitudinal research approach where the workload, stress level and job satisfaction of the healthcare professional would be compared with and without the presence of the self-measurement kiosk was not possible. Initially, this research would be in cooperation with the funxlab of mProve. mProve is an organisation which consists of seven cooperating hospitals in the Netherlands, of which the funxlab is the overarching innovation centre, where for example new technologies in healthcare are being discussed, analysed and sometimes implemented, like the self-measurement kiosk. The aim was to conduct between 15-20 interviews, for an inclusive study that could fit the timeframe of four months, which seemed feasible at the time, because the contacts from the funxlab could assist in recruiting respondents. However, when approaching healthcare professionals from these hospitals, it turned out that not yet a lot of healthcare professionals had experience with the self-measurement kiosk (meaning they have not worked with it before) or the self-measurement kiosk was not yet implemented in the hospital, because of the novelty of this technology. Therefore, instead of 15-20 interviews, the participation rate came down to N=6. The interviews were individual and conducted online via Microsoft Teams. With the interviews, a deeper understanding will be created of the perceived impact that self-measurement kiosk have on healthcare professionals, by talking to the healthcare professionals directly. According to Jain (2021) interviews offer more personalized exchange of information compared to surveys and they give more room to the researcher to add comments or supplementary questions in order to obtain more inclusive answers. Healthcare professionals can be doctors, nurses and doctor's assistants, but in this case also professionals that have organizational tasks regarding the implementation of the self-measurement kiosk.

4.2 Study population

Respondents were recruited from several hospitals in the Netherlands, including Laurentius, Jeroen Bosch, Zuyderland, Albert Schweitzer, Rijnstate, Isala, Haga, ETZ, Radboud UMC and

MST. The respondents were approached by e-mail and asked to participate in the interviews. It became clear that not a lot of hospitals actually have the self-measurement kiosk present in their hospital. They had heard of it or a pilot was planned, but not in time for the purpose of this thesis, of which the timeframe was initially four months to do the research, but was extended till six months because the data collection was not complete yet. In total six respondents were willing to participate in the research. The six respondents are based in four different hospitals in the Netherlands. These are Isala in Zwolle (two respondents), Laurentius in Roermond (two respondents), Haga in Den Haag (one respondent) and Radboud UMC in Nijmegen (one respondent). Three of the respondents are internists (of which two of them also partly have a management role), two of the respondents are originally nurses, but both of them perform a management role at the moment and one of the respondents is a doctor's assistant. The self-measurement kiosk is implemented in Laurentius, Haga and Radboud, but not in Isala. Up until now, there is no plan to implement the kiosk there. The two respondents from Isala do know what the self-measurement kiosk is and how it works, because they have been in meetings about the self-measurement kiosk and are in contact about it with colleagues in hospitals where the self-measurement kiosk is implemented. With all six respondents an online interview was conducted. Respondents were included in the study if they are a healthcare professional in a hospital in the Netherlands. In first instance, an inclusion criteria was that the self-measurement kiosk needed to be present in the hospital where the healthcare professional works, however it became clear that the implementation rate of the self-measurement kiosk is low and therefore healthcare professionals that know what the self-measurement kiosk is and how it works and/or have attended managerial meetings about the self-measurement kiosk were also included. I aimed for a mix of managerial and non-managerial healthcare professionals, in order to have a heterogenous sample and to present potential differences between these type of healthcare professionals.

Table 1 - Interview respondents

Participant	Hospital	Background profession	Experience with SMK (self-measurement kiosk)
1	Laurentius	Project manager transmural care (originally nurse)	SMK is present Managerial experience
2	Laurentius	Internist and managerial role (cluster management)	SMK is present Managerial experience Practical experience
3	Haga	Doctor's assistant	SMK is present Practical experience
4	Isala	Internist	SMK is not present Knowledgeable about SMK
5	Isala	Nurse and performs research within the hospital	SMK is not present Knowledgeable about SMK
6	Radboud UMC	Internist and performs research on care innovation	SMK is present Managerial experience

4.3 Data collection

To collect the data, a qualitative approach was used. In order to investigate the perceived impact that self-measurement kiosks have on health care professionals – and their workload, stress level and job satisfaction – semi-structured interviews were conducted. Examples of interview questions can be found in the paragraph 'Operationalization of the variables'. A complete interview guide can be found in the appendix. The interview questions were open questions out of which deeper background information can be found and more information can be deducted. The interviews were held online through Microsoft Teams with each of the respondents. The duration of the interviews were between 30 and 60 minutes. The interviews were all recorded and later on transcribed.

4.4 Operationalization of the variables

There are five variables in this thesis. These variables are listed below. The variable *self-measurement kiosk* is the new technology in healthcare that is researched and a potential resource. The variables *workload* and *stress level* are demands. The variable *job satisfaction* is a possible outcome in the job-demands resources model. And the variable *willingness to adopt*

self-measurement kiosk is a variable that can be influenced by the outcome of the job demands-resources model. The variable *self-measurement kiosk* is the variable that needs to be researched and can be a potential resource in the job demands-resources model. The variables *workload* and *stress level* are selected as job demands through an article by Anjum et al. (2019), as described in the Theory section. The variable *job satisfaction* is selected through the theory on the job demands-resources model, of which *job satisfaction* is a possible outcome. The last variable *willingness to adopt self-measurement kiosk* is selected because literature suggests that this is an important factor when it comes to the success of the implementation of a new technology in healthcare (Awad et al., 2021). All five variables are included in the interview guide as well as in the codes in Atlas.ti. Some of the variables have sub variables, which are also included in the interview guide and the codes in Atlas.ti, for example the variable *stress level* includes *time pressure* and *overtime work.* The five main variables are further explained in this paragraph, with examples of interview questions regarding these variables.

1. **Self-measurement kiosk**:

   The self-measurement kiosk is the main variable in this research. It is the potential job resource in the job demands-resources model. The variable *self-measurement kiosk* is present in all four sub questions of the thesis, and may or may not influence the other variables (*workload, stress level* and *job satisfaction).* In order to answer the sub questions, we need to know if the self-measurement kiosk is present in the hospital where the healthcare professional works, how far the implementation is and what their experience is with the kiosk. The interview questions covering this are 'Could you provide more information about the self-measurement kiosk, such as its functions and purposes, and on which department(s) it is predominantly used in the hospital you work in?' and 'What is your experience with the self-measurement kiosk?'

2. **Workload of health care professionals**:

   The variable *workload* is part of the first sub question. The interview question concerning this variable is: 'How does the self-measurement kiosk affect your workload/the workload of healthcare professionals?'

3. **Stress level of health care professionals**:

   The *stress level* is a variable in the second sub question. It involves the three stress factors *workload, time pressure* and *overtime work.* Together with 'stress level' in general, the interview results will be analysed. Because *workload* is a variable which

came across in existing literature a lot and seemed to be an important factor when it comes to the self-measurement kiosk, this variable is covered on its own in sub question 1. However, since it is also seen as a stress factor according to Anjum et al. (2019), it both functions as a variable on its own and as a sub dimension of *stress level*. For the variable stress level and the remaining sub dimensions *time pressure* and *overtime work*, the following interview questions are used: 'How does the self-measurement kiosk influence your stress level at work?', 'How does the self-measurement kiosk affect the time pressure on you or other healthcare professionals?' and 'Do you/healthcare professionals often work overtime? And how can the self-measurement kiosk influence this?'

4. **Job satisfaction of health care professionals**:

   The variable *job satisfaction* is part of sub question 3. In order to get a broader understanding of job satisfaction, respondents are also asked about the advantages and disadvantages of the self-measurement kiosk in general. The interview questions covering this are: 'What are, according to you, the advantages of the self-measurement kiosk?', 'What are, according to you, the disadvantages of the self-measurement kiosk?' and 'How does the self-measurement kiosk affect your job satisfaction?'

5. **Willingness to adopt self-measurement kiosk**:

   The *willingness to adopt self-measurement kiosk* is a variable in the last sub question. It is the objective to find out if healthcare professionals are willing to adopt the self-measurement kiosk and what factors influence that. The interview questions for this variable are: 'Are you/healthcare professionals in your hospital willing to adopt the self-measurement kiosk?' and 'What factors contribute to whether you/they want to adopt the self-measurement kiosk or not?' .

4.5 Data analysis

The interviews were transcribed into text for the data analysis. Since every respondents' first language is Dutch, as well as the interviewer, all interviews are conducted in Dutch. The codes, however, are in English and the quotes present in the results section are also translated into English. The tool that is used for coding is Atlas.ti, which can break down the interview into codes, for a clearer overview of the analysis. In total there are 17 codes. These codes are 'Advantages self-measurement kiosk'. 'Attitude towards self-measurement kiosk', 'Disadvantages self-measurement kiosk', 'Experience with self-measurement kiosk',

‘Function(s) professional’, ‘Growth opportunities through time saving’, ‘Implementation problems’, ‘Job satisfaction of healthcare professional’, ‘Overtime work’, ‘Self-measurement kiosk deficiencies’, ‘Self-measurement kiosk operation’, ‘Shortage of healthcare professionals’, ‘Stress level of healthcare professional’, ‘The future of the self-measurement kiosk’, ‘Time pressure’, ‘Willingness to adopt self-measurement kiosk’ and ‘Workload of healthcare professional’. Initially, deductive coding was used for this research. The interview questions were thoroughly read through, the codes are based on the theoretical framework. After two interviews were conducted, the data was analyzed to see if there were codes missing. Additionally, to ensure reliability, the thesis was presented to a group consisting of students and professors in the Public Administration and the Health Science sector. Two out of six interviews were done at the time of the presentation. Through feedback from this group, multiple perspectives were combined and new ideas have emerged about the data and the thesis. As a result, extra codes have also been added. The data was observed carefully in order to see if there were codes missing that were not yet created. Three codes were not pre-established codes, but created after interacting with the data. The first code is ‘Attitude towards self-measurement kiosk’, which is created because it became clear that having a positive or negative attitude towards the self-measurement kiosk could be viewed separately from it having an influence on the stress level or job satisfaction of the healthcare professional. Additionally, after carefully analyzing the interviews, the answers from the healthcare professionals could give a clear idea about their attitude towards the self-measurement kiosk. The second code is ‘Implementation problems’, which was created because it became clear that the way this kiosk was implemented could have an effect on how healthcare professionals perceived this new technology and whether or not it influences their well-being. The last created code is ‘Self-measurement kiosk deficiencies’, which seemed to be an important topic for all the healthcare professionals in this study and is an important influencing factor on the variable *willingness to adopt self-measurement kiosk*. These codes cannot be directly connected to one of the interview questions, however came up in most of the answers of the respondents and were therefore included in the analysis. Table 1 displays all the codes, with their frequency and an example of a quote. The sub codes are separate codes, but fall in the category of the main code. For example, the attitude towards self-measurement kiosk can be brought down to the perception of the advantages and disadvantages of the self-measurement kiosk.

Table 2 - Codes in Atlas.ti

Categories	**Sub codes**	**Frequency**	**Quote example**
Attitude towards self-measurement kiosk		9	'I think it is an ethical problem ultimately. And again, it is not that we are against self-measurement kiosks, but then the self-measurement kiosk must measure better.' (respondent 4)
	Advantages self-measurement kiosk	17	'So that is of course now the advantage here that there is no or less personnel effort needed.' (respondent 2)
	Disadvantages self-measurement kiosk	19	'Measurements are not always technically perfect.' (respondent 2)
Function(s) professional		11	'Yes, I work at the Haga Hospital, in the gynecology department, I am a doctor's assistant.' (respondent 3)
	Experience with self-measurement kiosk	14	'From the team leadership of outpatient clinics I was involved in the

			self-measurement kiosk project.' (respondent 1)
Workload of healthcare professionals		22	'Well, as I said, I think it takes work out of your hands.' (respondent 6)
	Overtime work	9	'See, so the self-measurement kiosk is not something that will make me avoid working overtime or something.' (respondent 2)
	Time pressure	6	'It just really saves a lot of time. Sometimes there are a few people in front of the kiosk, but there is never a really long line, while in the past or two years ago, there were really a number of people standing in front of the doctor's assistant's room to wait, that all took much longer.' (respondent 3)

	Shortage of healthcare professionals	13	‘But more because you automate things or take things out of their hands, they do get room for other work, especially for nurses. Of course that is also a very big issue, because there are already shortages there.’ (respondent 5)
	Growth opportunities through time saving	16	‘Yes, it just saves time, which just gives you extra time for other things.’ (respondent 3)
Stress level of healthcare professional		6	‘No that did not affect my stress.’ (respondent 2)
Job satisfaction of healthcare professional		11	‘Yes, I think there is only a very limited influence there. My job satisfaction is also determined by other things and is not by the presence or absence of a self-measurement kiosk.’ (respondent 6)
Self-measurement kiosk operation		3	‘Yes, the self-measurement kiosk is a device with

			various functionalities to record certain parameters. We take the blood pressure, oxygen saturation, weight and pulse is then also automatic' (respondent 1)
	Self-measurement kiosk deficiencies	13	'We have so often that a device can measure beautifully when someone keeps their arm still and standardized. But when someone is terminally ill and tosses and turns, it just does not work.' (respondent 6)
	Implementation problems	2	'It is very good to introduce technological innovation, but you will have to involve doctors at an early stage.'
	The future of the self-measurement kiosk	17	'And when the tool is used and it also creates space to innovate further, then I really think that that can be

			added value.' (respondent 2)
Willingness to adopt self-measurement kiosk		13	'Because then they will use it if they can demonstrate that added value.' (respondent 5)

4.6 Ethics

Because this study contains interviews with questions about personal information about healthcare professionals – like stress level and job satisfaction – an ethics approval is obtained through the Ethics Committee of the University of Twente. Also, prior to participation in each interview, informed consent is asked to the participant as well as consent to record the interview and transcribe it later on. It still remained challenging to analyze and document the data in a way that the respondents' identity was kept anonymous. However, by numbering the respondents and characterizing them by matters that are only about the self-measurement kiosk – and not their personal characteristics - their privacy is safeguarded.

5 Results

In the theory section, four assumptions were stated, which will be explained in this results section, based on the interviews that are conducted for this research. The results will be connected to the theory used, in order to see if the assumptions were correct or can be disregarded. The most important takeaway from the interviews is that healthcare is a really broad subject and there are a lot of different healthcare professionals, who also have different perspectives. Therefore, it is rather hard to generalize the results into one final answer on the research question. Because of the diversity in opinions and perspectives, there is a lot to learn from the interviews and how the self-measurement kiosk (and possibly other new technologies in healthcare) affect healthcare professionals and what the deficiencies in the implementation and operation of the self-measurement kiosk are.

5.1 Workload of healthcare professionals

The first sub question of this thesis is '*What is the perceived impact of self-measurement kiosks on the workload of health care professionals?'.* Four out of six healthcare professionals speak of a slight to big reduction of the workload. However, they have not all worked with the self-measurement kiosk themselves directly. Two out of these four have direct experience with the self-measurement kiosk (they have had patients that used the self-measurement kiosk). The other two healthcare professionals work in hospitals where the self-measurement kiosk is present, but do not work with it regularly but do see the effects from a managerial perspective. The remaining two healthcare professionals work in the same hospital and are more hesitant about the impact of the self-measurement kiosk on the workload. They both think that it could be helpful in some departments in the hospital, for example in pre-operative consults, but are not sure what it will do for healthcare in general. One of these healthcare professional mentions that it will increase their own workload; 'Well, for me it will definitely be increased' (respondent 4). The self-measurement kiosk is not present in the hospital they work in, but the two healthcare professionals do know what the self-measurement kiosk is and does.

Not only the experience with the self-measurement kiosk and the department in which it is implemented in the hospital seems to make a difference in the effect it has on the healthcare professional, but mostly the function of the professional is extremely important and can make a significant difference in the attitude towards the self-measurement kiosk, as it follows from the interviews. The healthcare professional that was most positive about the self-measurement kiosk is a doctor's assistant at the gynaecology department. The following quote from the interview represents her perspective on the self-measurement kiosk regarding the workload: 'Yes, very positive. It just really saves a lot of time. Sometimes there are a few people in front of the Alfi scan (their self-measurement kiosk; Alfi is the brand), but there is never a really long line, while in the past or two years ago, there were really a number of people standing in front of the doctor's assistant room to wait, that all took much longer' (respondent 3). The other respondents spoke more neutral about the self-measurement kiosk: 'If you look at a part of the patients, than you would say a slight reduction [in workload]' (respondent 2).

The respondent that mentioned their workload will be increased with the self-measurement kiosk, is an internist vascular medicine, which means he mostly treats (high) blood pressure. Blood pressure is a parameter that the self-measurement kiosk measures. According to this internist, the self-measurement kiosk is not able to provide a scientific measurement on which doctors can base their treatments. And especially because blood pressure is so important in his

profession, he decides to not trust the measurements of the self-measurement kiosk. He mentions that it could reduce workload in other departments: ‘Look, where it could reduce the pressure is perhaps in a preoperative consultation or the anaesthesia department. There it could indeed reduce the burden of care just a little bit’ (respondent 4). Even though the internist thinks that it is possible that the self-measurement kiosk reduces workload in some areas in health care, he is also worried that it can create more burden in other areas at the same time. The example he gave illustrates this issue: ‘But I also know. There they are going to measure the blood pressure, a single measurement with one meter that is not validated. Then higher blood pressure will come out of that, but then they will consult with internists again, right? I have to operate on a patient, but the blood pressure is high. What should I do now? So then it creates work in another place, it creates work again’ (respondent 4). Remarkable is that two other respondents are also internist and they did not mention any of these concerns regarding the self-measurement kiosk. The overarching difference between this internist and the other two internists is that the other two internists are also taking on management roles (cluster management and care innovation) within the hospital next to being an internist. The nature of their professions could be the underlying reason for the differences in viewpoints regarding the self-measurement kiosk.

Another important note that is brought forward by almost all respondents is that even though some time is spared with the use of the self-measurement kiosk, which results in a workload reduction, the time that is spared is still being used in a different way. It follows that the time that is being spared by using the self-measurement kiosk cannot be used for personal time for healthcare professionals; ‘It is not so that you do nothing during that time, but then spend the time on the patient in a different way, right? There is always something else to do, it is not significant enough for that’ (respondent 2). However, this time can be used in favor of the patient, because it creates more time for the patient to interact with the healthcare professional and become more aware about their own health, which is also a good development.

Based on the interviews with the healthcare professionals, it can be concluded that almost all respondents think that the use of the self-measurement kiosk results in a reduction of the workload. The amount of workload reduction is different according to every professional and some of the respondents believe that the workload reduction is only seen in some departments in healthcare (e.g. preoperative consultation), but definitely not all (e.g. vascular medicine). The reason for this is that the self-measurement kiosk does not measure the parameters accurately enough, which can result in having to do more tests by specialists themselves. Therefore, the

assumption *A1: The workload of healthcare professionals will be reduced when implementing the self-measurement kiosk* is perceived to be right by these healthcare professionals to the extent that the self-measurement kiosk does help in reducing workload for healthcare professionals, but the parameters need to be measured more precisely and be scientifically acceptable in order to be able to implement it in all areas in healthcare and still see a reduction in workload.

5.2 Shortage of healthcare professionals

Reducing the workload of healthcare professionals is one of the purposes that is tried to be obtained with implementing new digital technologies, like the self-measurement kiosk. Another goal that hospitals and policy makers are trying to reach is to alleviate the problem of the shortage of healthcare professionals, which is already an ongoing problem, but is expected to be an even bigger problem in the future. When some of the tasks of healthcare professionals can be taken over by technology, the idea is that some personnel will be spared and the problem of shortage of healthcare professionals can be solved in that way. Therefore, respondents were asked about their view on this and if they think that the usage of the self-measurement kiosk will indeed lead to less healthcare professionals needed. All respondents share the same viewpoint on this matter and think that the self-measurement kiosk in itself is not enough to replace healthcare professionals. As said before, they do think that the workload is reduced and some healthcare professionals can be assigned to other tasks, but the input of the self-measurement kiosk is simply not enough to replace healthcare professionals overall, at least not yet. The following quotes demonstrate their viewpoint: 'I do not think it has led to fewer secretaries now' (respondent 2). ; Yeah well I do not know about the shortage itself. I do not think this will help' (respondent 5). However, the respondents do think that if the self-measurement kiosk will be improved in its accuracy and implemented on a larger scale, it could have an influence on the shortage of healthcare professionals: 'Yes, I think so, but then you really have to do it on a massive scale' (respondent 6).; 'Yes, I think that overall, if you implement it, I think it will be the case that it could reduce personnel costs' (respondent 4).

5.3 Stress level of healthcare professional

The second sub question is: '*What is the perceived impact of self-measurement kiosks on the level of stress of health care professionals?'.* When asked the general question if the use of the self-measurement kiosk reduces the stress level of the healthcare professional, three out of six professionals mention that the self-measurement kiosk does or would not have an impact on their stress level at work. These three healthcare professionals are all internists. It was mainly

brought forward that they do not always do these measurements themselves, so they already handing this over to other healthcare professionals, like doctor's assistants. And the other reason for it not to be able to reduce stress level at work is that the self-measurement kiosk is simply not advanced enough to make a difference in their stress level at work. One of the other three respondents, who is a doctor's assistant, mentioned that her stress is indeed reduced by using the self-measurement kiosk: 'It is less stress indeed, less thinking about whether something has to be faster or whether you are behind, which makes it much more enjoyable' respondent 3). Since it is usually the doctor's assistant's job to measure the parameters of a patient, it is very helpful to them when this is done by the self-measurement kiosk. One of the other respondents who is a nurse in origin, but exercises a management role (project manager transmural care) at the moment, also states that the use of the self-measurement kiosk should result in a reduction of stress level for the doctor's assistants, but not necessarily for the specialists.

The factor *time pressure* with regards to the self-measurement kiosk is viewed differently among the interviewed healthcare professionals. Most of them think that the time pressure is reduced by using the self-measurement kiosk: 'It is just more pleasant to work, a little less busy. You do not have to work yourself to death as much, so to speak', thus respondent 3. However, another respondent mentions the counter side of this and is concerned that the use of the self-measurement kiosk might give extra time pressure than when it is not used: 'You do not always gain time or something, because on the one hand you get maybe even more measurements that you have to assess' (respondent 5). Another respondent adds to this viewpoint and thinks that the self-measurement kiosk sometimes gives measurements that are divergent or surprising for the specialist, which leads to them needing to run more tests and analysing the results, which can take more time and possibly build up the pressure.

Regarding the last factor, *overtime work*, all respondents have answered that the self-measurement kiosk does not help in having to work less overtime; 'We work a lot of overtime, but the self-measurement kiosk has no effect on that. That share is too small for us' (respondent 2). There is only one respondent who thinks that it could help at the anaesthesia department: 'Yes, especially I think in anaesthesia there really has been a considerable, yes, change in their agenda management' (respondent 1).

The second sub question 'What is the perceived impact of self-measurement kiosks on the level of stress of health care professionals?' is analysed by three stress factors, namely *workload, time pressure* and *overtime work.* When being asked directly about their stress level with the involvement of the self-measurement kiosk, almost all respondents mentioned that they do not

see any significant difference in their stress level. There is one respondent who did notice a big difference in their stress level at work and the other two respondents are not too sure about whether it would reduce their stress. It is remarkable that the respondent who did notice a reduction in their stress level when using the self-measurement kiosk is a doctor's assistant, the two respondents who are hesitant are nurses and the three respondents who did not notice any difference are internists. The specific profession of the healthcare professional seems to be a decisive factor in whether or not the use of the self-measurement kiosk reduces their stress level.

When looking at the specific factors, it was already concluded that almost all respondents believe that the use of the self-measurement kiosk reduces their workload (or at least in some areas of health care). Regarding time pressure, four out of six respondents think that it will reduce time pressure and two out of six respondents are rather concerned about the self-measurement kiosk creating extra work in some places, due to inaccurate measurements or simply more measurements to assess (when you measure something, you also have to analyse the measurements and find out what the results mean). Lastly, all respondents are convinced that the self-measurement kiosk does not help in working less overtime, except maybe in anaesthesia according to one respondent. Based on the results of these interviews, the second assumption *A2: The stress level of healthcare professionals will be reduced when implementing the self-measurement kiosk, based on the three stress factors workload, time pressure and overtime work* cannot be considered correct, because the healthcare professionals are not convinced enough by the self-measurement kiosk and its abilities to reduce *time pressure* and *overtime work* and therefore *stress level* in general. Figure 2 displays the results for the demands *workload, time pressure* and *overtime work,* with a potential perceived impact of the resource *self-measurement kiosk.*

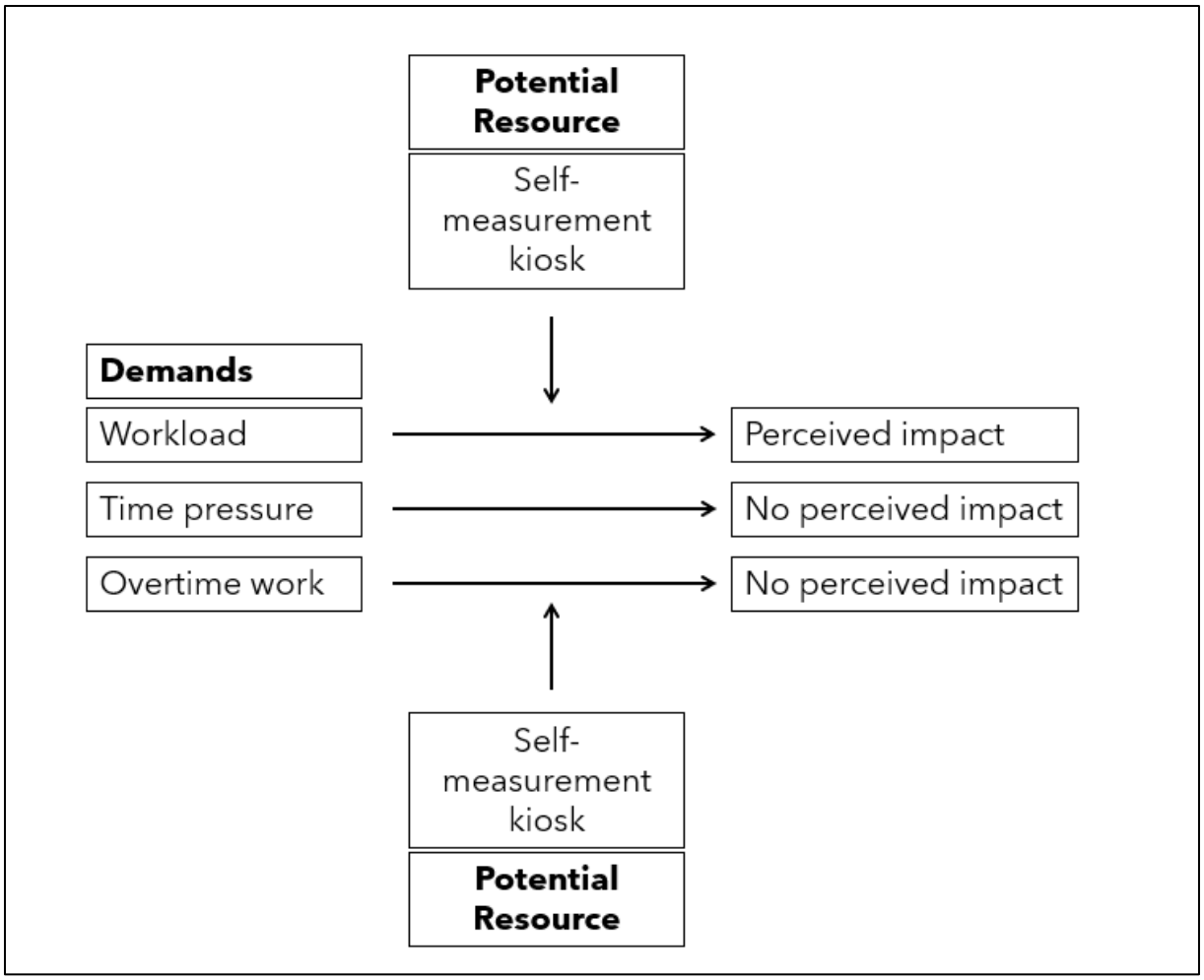

Figure 2 - The self-measurement kiosk as a potential resource

5.4 Job satisfaction of healthcare professional

The job satisfaction is part of the third sub question, which is: *'What is the perceived impact of self-measurement kiosks on the job satisfaction of health care professionals?'* According to the job demands-resources model if the self-measurement kiosk (resource) helps to cope with the stress and workload (demands) of healthcare professionals adequately, job satisfaction will arise. If the self-measurement kiosk does not help to cope with the stress and workload of healthcare professionals adequately and the demands transcend the resources, stress or burnout will arise. In order to find out if job satisfaction arises through the use of the self-measurement kiosk, according to the job demands-resources model, we would need to look at the factors *stress* and *workload* and see if the self-measurement kiosk helps to reduce these. These factors are covered in the first two sub questions. From the first sub question, it became clear that the healthcare professionals think that the self-measurement kiosk has an impact on the *workload* of healthcare professionals, in the way that it reduces their workload (but not necessarily in every area of healthcare). Regarding *stress level* some respondents think that the *time pressure*

is reduced by the use of the self-measurement kiosk, but it has no effect on their *overtime work.* Therefore, the self-measurement kiosk did not seem significant enough to reduce the stress level of healthcare professionals at work. When considering the job demands-resources model, it follows that the self-measurement kiosk does not cope with the stress and workload of healthcare professionals adequately, which would mean that job satisfaction will not arise. According to the job demands-resources model, this means that burnout/stress would arise, however it is also not the case that the demands (workload, overtime work, time pressure) are dominant over the resources (the self-measurement kiosk). The result being that the self-measurement kiosk is not yet at the place where it can create job satisfaction, because it is not significant enough to get the stress factors out of the way.

When looking at the interviews, a similar result comes forward. To the question 'Does the self-measurement kiosk have an effect on your job satisfaction?' three out of six respondents answered that it has no effect; 'No, no impact. No' (respondent 2); 'No, I think that there is a limited impact. My job satisfaction is defined by other things and not the presence or absence of a self-measurement kiosk' (respondent 6); 'But that I would say, well, that makes my job twenty times nicer, no I do not think so' (respondent 1). One respondent answered that it would decrease the job satisfaction, because the device is ultimately not beneficial for their patients.; 'Decrease. Because it is not good for my patient' (respondent 4). Another respondent thinks that the self-measurement kiosk makes it easier for the healthcare professionals to do their job, but is not sure if it has a direct effect on their job satisfaction.; 'I could imagine that with a preoperative screening the workers like it when it is done by a machine instead of themselves' (respondent 5). The last respondent is rather positive and indicates that it indeed makes her job more pleasant.; 'It is less stress indeed, less thinking about how some things need to go faster or that you are behind and that makes it more pleasant' (respondent 3). Even though the respondents have different viewpoints, most likely again because of their specific function in healthcare (doctor's assistant, nurse, specialist), the self-measurement kiosk does not seem to have a(n) (positive) perceived impact on job satisfaction. Figure 3 presents the findings on *job satisfaction.*

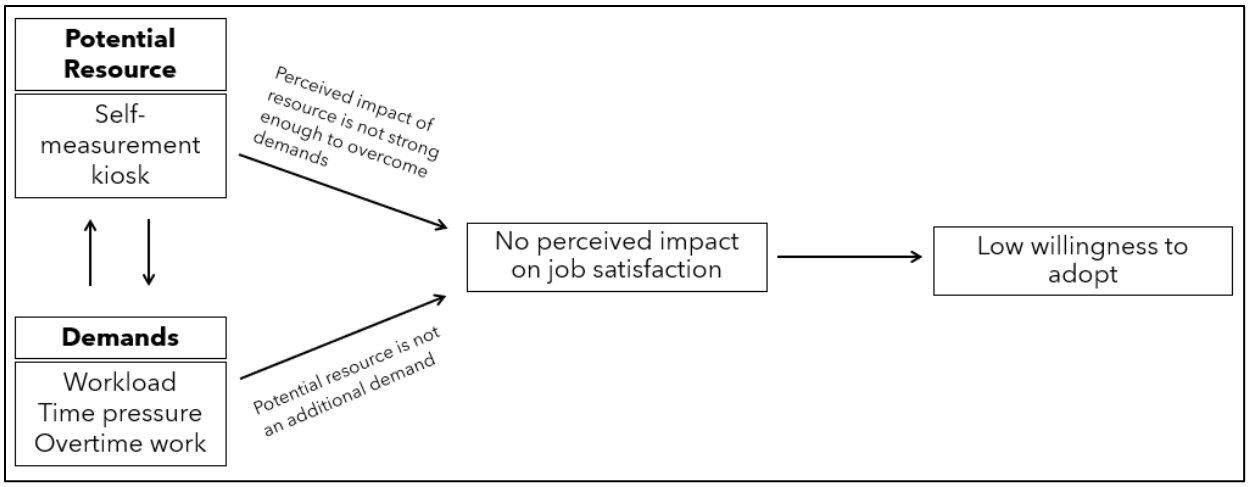

Figure 3 - Job satisfaction based on demands and potential resource

5.5 Advantages of the self-measurement kiosk

Following from the interview respondents, there are two main advantages of the self-measurement kiosk. One of the advantages is applicable on healthcare professionals and the other advantage concerns the patients. All respondents immediately mentioned the advantage that the self-measurement kiosk can spare them time in their work and the time with their patients. The fact that there is no staff needed anymore to measure the parameters of patients is a big advantage for the healthcare professionals: 'So that is of course now the advantage here that there is no or less personnel effort needed' (respondent 2); 'Yes, that you can automate a certain action that requires a healthcare professional, I think that is the advantage of such a kiosk' (respondent 5); 'But also a piece of labor shortage indeed, then a device can already do it. And definitely given the future, that this can be secured. For example if the assistant is very tight, then these kinds of things sometimes get skipped' (respondent 1, grammar adaption by author). One of the respondents also mentioned how the self-measurement kiosk is possibly able to reduce costs because less personnel is needed and time is saved: 'It is a cost saving, so cost saving in the sense that it saves me time at my clinic, so theoretically I can see more patients' (respondent 4).

The other advantage, regarding the patients, is also important for the healthcare professionals. The fact that patients get more autonomous in their health process and get more involved is a benefit for both the patient and the healthcare professional: 'We also find the patient's self-management very important. Like the patient is going to do that himself, right? It even involved taking measurements. They can already see what the measurements are and think about the results and they can formulate questions for the doctor about that' (respondent 1). It is important for the healthcare professionals that their patients become more aware of their health and more

knowledgeable about these parameters, which also is beneficial if the patient needs to measure these parameters at home sometimes.

5.6 Disadvantages of the self-measurement kiosk

Next to the advantages that the use of the self-measurement kiosk brings along, there are also a few notable drawbacks that need careful consideration. Following the results from the interviews, these disadvantages can be placed in three categories: healthcare professional challenges, organizational issues and patient care.

The first concern that one of the respondent has is that with the use of the self-measurement kiosk it is possible that the healthcare professional becomes lazier. Because measuring the patients' parameters is now automized, it is possible that healthcare professionals do not want to do the measurements themselves when it is necessary. 'Yes, I think that the moment that people no longer have to do certain things, and I am thinking of doctor's assistants for example, and that may sound a bit negative, but it is not meant that way, but that it is no longer on their plate. So the moment that you ask them to weigh someone, then it is already a problem, right?' (respondent 2). This is for now just an assumption, but the healthcare professional is concerned that it might lead to this in the future. The other disadvantage regarding the healthcare professionals is that when the process of measuring patients' parameters becomes automated through the kiosk, it is possible that in the future the healthcare professionals do not know how to measure these parameters themselves anymore or there is no equipment available to do that. The concern is to become too dependent on the self-measurement kiosk, even though it is a technological device that could fall out at any moment. The following quote represents this concern: 'You could also say, suppose it breaks down one morning, who can still measure blood pressure? Or do we have replacement equipment? Well, that will not be a problem for the first few years, but at some point nobody will remember how to do it again' (respondent 6). This is also in line with what is said in the article by Awad et al. (2021), who talked about dramatic implications in case of system failures in digital technologies. The last disadvantage in this category is that the values of the self-measurement kiosk can be different from the true value and therefore it creates extra work for doctors when they have to do the measurement themselves, because of the divergent value.

The second category, *organizational issues,* is considered highly challenging by the respondents. Firstly, some respondents mentioned that they miss some measurements in the self-measurement kiosk, for example height. The other issue is that the measurements are

technically not always perfect and the values are therefore not 100% accurate. For doctors this is an important point, because it affects their patients directly. When the values are there, the question is what to do with the values. Do specialists always need to treat patients based on the values, do they need to take action and what exactly do the values tell us? These are questions that specialists cope with; 'Because we still see that it is unclear what exactly that added value is, for several aspects actually' (respondent 5, grammar adaption by author). Because of these issues, it is the question if it actually pays off when you purchase the kiosk and invest money in implementation and organizational structure, because it is not clear what value the self-measurement kiosk actually has. Lastly, it is important that the values of the self-measurement kiosk are directly linked to the so called 'EPD', which is a registration system in the hospital, where the values are directly transferred to the patient, so that the doctor can immediately see their parameters. When this is not organized well, it can get really chaotic and cause trouble, because patients' parameters could get lost, end up in the wrong places, or be incorrectly linked to other patients, which also interferes with their privacy. As described in the state of research, Patra et al. (2021) and Awad et al. (2021) also found that data security is a really important factor when it comes to new technologies in healthcare and if it is not safeguarded, patients will be more hesitant to use the new technology.

The last category is *patient care.* For healthcare professionals, the care that they provide for their patient is an important factor of their work. Two disadvantages regarding patient care with the use of the self-measurement kiosk were mentioned by the respondents. Firstly, the privacy of patients. Patients seem to not always feel safe when measuring their parameters, because it is done in a public space as opposed to before when it was just the patient and the specialist in one room. The other disadvantage is the risk of overtreatment. When the self-measurement kiosk gives out values, healthcare professionals act upon these values. However, as said before, these values can sometimes be inaccurate, which means that the specialists treats the patient based on incorrect parameter values. This is an important issue, because the patient might not even need that particular treatment, which could lead to less trust in the healthcare professional.

5.7 Willingness to adopt self-measurement kiosk

The last sub question is about the willingness to adopt the self-measurement kiosk and is as follows: *'Which factors influence healthcare professionals' willingness to make use of self-measurement kiosks?'* As already seen in figure 3, there is no perceived impact on *job satisfaction,* which would result in a low *willingness to adopt the self-measurement kiosk.* In the interview, the respondents were asked how they experience the willingness to adopt the

self-measurement kiosk among the healthcare professionals in their hospital and what factors could impact that. Even though the respondents collectively did not think that the self-measurement kiosk had a visible impact on their stress level and job satisfaction, they seem to think that healthcare professionals are rather willing to adopt the self-measurement kiosk. Some respondents however are only willing to use it (or think that healthcare professionals are willing to use it) if the self-measurement kiosk is going to be improved (more accurate) or the concrete benefits are shown to healthcare professionals.; 'Yes, yes, yes, we are willing. Only it has to be changed, but the manufacturer does not want that' (respondent 4); 'Yes, that is an important precondition, I think that has to be checked off first, so the accuracy of the measurement is I think step one' (respondent 5). These two respondents work in a hospital where the self-measurement kiosk is not yet present and mention that things around the self-measurement kiosk first need to be changed and improved before they (and according to them also the other healthcare professionals in that hospital) are willing to use it.

According to the job demands-resources model, the willingness to adopt the self-measurement kiosk would not be too high, since job satisfaction was not the outcome of the theory in the context of this research. However, as said above, all respondents think that the willingness is there, but the self-measurement kiosk still needs to go through some developments. Furthermore, the fact remains that the hospitals where the respondents are based do not have the self-measurement kiosk implemented throughout the whole hospital. It is always one department or even only in a restaurant in the hospital, where the self-measurement kiosk is present. It follows that the self-measurement kiosk is placed in hospitals, but not on a large scale and not necessarily used that much in practice. Therefore, it can be concluded that the willingness to adopt the self-measurement kiosk is there, as also one of the respondents mentioned: 'And that has nothing to do with us not being able to handle innovation or anything, because there are a lot of people in favour of it and we all do innovations. But we do not want to use a measurement that is of poorer quality that is kind of forced down our throats, just because the organization says, look, that is handy' (respondent 4). The only thing that is missing is the proof that the self-measurement kiosk gives at least the same quality (but preferably higher quality) measurements than the equipment that is currently used in hospitals. Before that evidence is available, a lot of healthcare professionals will not use the self-measurement kiosk, with the underlying reason that it is not good for patients to use an unscientific measurement: 'We are very critical of it and if the company does not want to change that, but just wants to sell it as it is now.. I do not want to sell that [to my patients]. That is unscientific and unethical'

(respondent 4). Since the evidence is not delivered by the companies producing these kiosks, the self-measurement kiosk is not considered good enough to assist in performing these measurements, according to respondent 4.

Next to the fact that the self-measurement kiosk needs to be improved in order for the willingness to adopting by healthcare professionals to increase, the respondents mentioned a couple of other strategies that could help convince healthcare professionals to make use of the self-measurement kiosk. Firstly, it is important to really pay attention to the organizational process of implementing and using the self-measurement kiosk and with that to show the healthcare professionals in what ways it can benefit them with concrete examples. 'I think it is just important to show what it can mean for them personally. Okay, I have a shift as a nurse from 8 to 4. What does that thing do that I experience the benefit of it in that shift, so to speak' (respondent 5). If there are no evident results and benefits from using the self-measurement kiosk, it will be less appealing for healthcare professionals to adopt the kiosk. The other point is to educate healthcare professionals on the kiosk. What it does precisely and how it works, because this will make it easier to get them on board and be involved in the process with their patient.

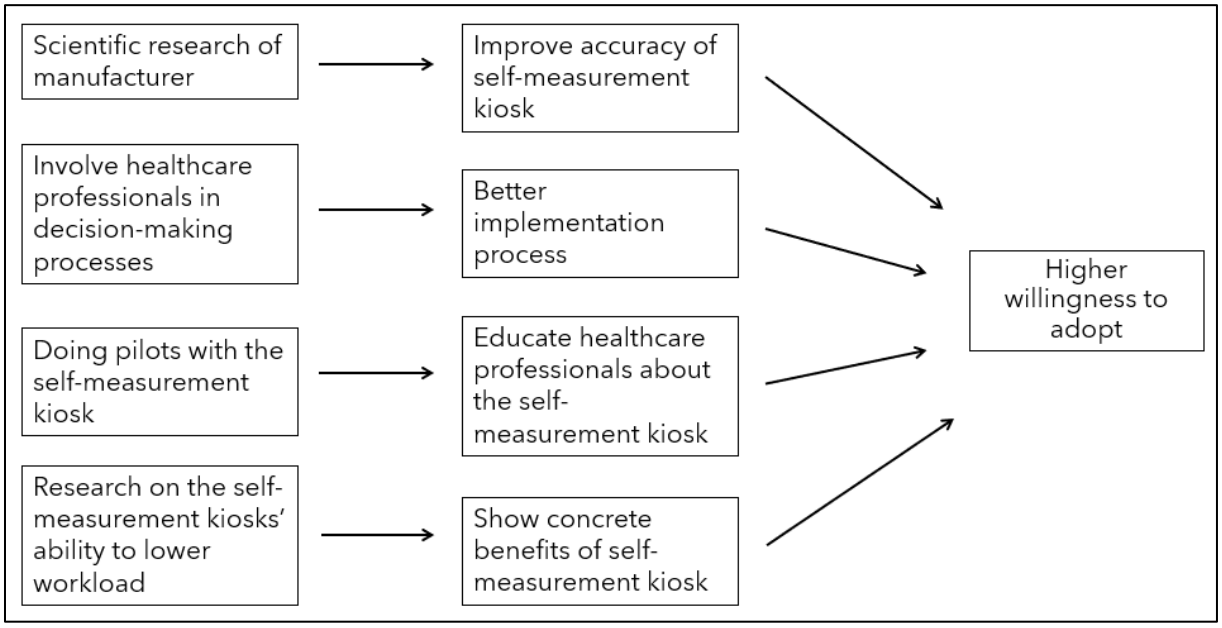

Figure 4 - Factors influencing the willingness to adopt the self-measurement kiosk by healthcare professionals

5.8 Specialists on board in managerial decision-making

One of the respondents specifically addressed a problem in healthcare, which is also applicable to the self-measurement kiosk and the uptake when it comes to the usage of the kiosk by healthcare professionals. As mentioned before, a lot of healthcare professionals have issues

with the self-measurement kiosk because of its inaccuracy and (according to some) its unscientific measurement of patients' parameters. Because specialists are most concerned with their patients' well-being, it is important that they are being involved in new technological developments within the hospital, especially if it affects their treatment strategies. According to Rotar et al. (2016) medical professionals are becoming more and more involved in hospital governance at the departmental and strategic hospital levels. The most important finding is that the involvement of specialists is linked to better quality management system implementation, particularly when physicians participate in strategic management decision making. Thus, a strong medical presence in hospital governance appears to correlate with an enhanced focus on hospital performance. And according to Morilla et al. (2017), which has also been discussed in the state of research, for implementation of new technologies to be successful, doctors must be involved and understanding their relationship with technology is crucial for effective implementation. One of the respondents seems to think that this is exactly what is missing when it comes to the implementation of the self-measurement kiosk: 'It is very good to introduce technological innovation, but you will have to involve doctors at an early stage' (respondent 4). When doctors are not involved in the pre-stages of technological innovation - meaning the decision making stage and potentially the implementation stage - there is a higher chance that the implementation of new technologies (such as the self-measurement kiosk) will not succeed. This could be the reason why the self-measurement kiosk is not yet implemented in a lot of places, and if it is implemented in hospitals, it is usually only present in one department at the whole hospital. In order for the self-measurement kiosk to have a higher success rate in hospitals, doctors should be involved in the managerial decisions. This way, there will not only be a financial and managerial justification for implementing a new technology, but also medical evidence that the innovation will actually improve healthcare.

6 Discussion

From the result section it becomes clear that according to the healthcare professionals who worked with a self-measurement kiosk, there might be a perceived effect on the workload of the healthcare professional, but not on the stress level and job satisfaction of the healthcare professional. According to the interview results, the self-measurement kiosk might be able to lower workload and maybe in the future help in the shortage of healthcare professionals. And even though most respondents did not think there was an effect on the stress level and job

satisfaction, some respondents also mentioned it reduced their stress level and increased their job satisfaction. The willingness to adopt the self-measurement kiosk, according to the participants, seems to depend on the accuracy of the self-measurement kiosk, the implementation process and information provision for healthcare professionals and the benefits of the self-measurement kiosk. When connecting this to the job demands-resources model, we could state that the resource (self-measurement kiosk) needs to be improved in order to have the outcome of job satisfaction, which will lead to a higher willingness to adopt the self-measurement kiosk. It is important to note that not all healthcare professionals have directly worked with the self-measurement kiosk, which means that some of the results are also based on healthcare professionals viewing the self-measurement kiosk and its impacts from a managerial perspective. Therefore, the results could differ from if they have actually had worked with the self-measurement kiosk in practice.

From the results it becomes clear that the self-measurement kiosk can have different impacts on different type of healthcare professionals. When looking at the job demands-resources model, it can be stated that deciding which are demands and which are resources is subjective and might depend on your own perception. It also becomes clear that the outcome of the model can differ a lot depending on what type of healthcare professional is talked about. When distinguishing between specialists, nurses and doctor's assistants, the self-measurement kiosk seems to have the biggest effect on doctor's assistants, based on this study. This is overall a positive effect regarding workload, stress level and job satisfaction. Therefore, doctor's assistants are also rather willing to adopt the self-measurement kiosk. This probably is the result of the fact that doctor's assistants mostly had to do the tasks that the self-measurement kiosk now takes over. Therefore, they see a change in their daily tasks and might see the potential to perform other tasks in which they can develop themselves more as a healthcare professional. Going back to the literature, Atkinson et al. (2018) mentioned that finding meaning in one's work could lead to a lower stress level and a higher job satisfaction, which is probably the reason why doctor's assistants see the advantages of the self-measurement kiosk rather than the disadvantages. Even though only one of the respondents is a doctor's assistant, the respondents who perform a (partly) managerial role at the moment also mentioned that doctor's assistants are very happy with the self-measurement kiosk. It became clear that the nurses who were interviewed were mostly hesitant about what the effect of the self-measurement kiosk on their workload, stress level and job satisfaction actually is. They seem to think that it can make a difference and help in reducing workload and stress level and increasing job satisfaction, but

they do not see the benefits of the kiosk yet. This is due to the fact that the kiosk is not yet 100% reliable, as the measurements are not as accurate as the measurements that the healthcare professionals exercised before (or still do) manually, and the implementation strategy at the moment is not advanced nor scaled enough in order to have a visible difference. Additionally, not every interviewed healthcare professional has actually worked with the self-measurement kiosk, which could also play a role in their perception of the benefits it has. Lastly, the specialists, who were all internists in this study, have a more divergent viewpoint on the matter. One of the respondents does not (yet) believe in the benefits of the self-measurement kiosk and the other two respondents think that it can help in the future, but it does not affect their workload, stress level and job satisfaction that much, because they usually already hand out the task of measuring patients' vitals, which also connects to what is stated by Atkinson et al. (2018). For the specialists, the self-measurement kiosk does not necessarily provide them with more meaningful work, because their tasks mostly stay the same. A notable difference between the one respondent who has a rather critical attitude towards the self-measurement kiosk as opposed to the two respondents who have a more supportive attitude is that these two respondents perform a managerial role in the hospital at the moment. It could be that their viewpoint is therefore shifted and they think more about efficiency and cost-effectiveness of the hospital, while the respondent with a more critical look regarding the self-measurement kiosk is a fulltime internist and therefore worries heavily about the measurements that are the basis of patients' treatments. This could be because physicians that also have a managerial role have more of an overview on the whole department for example and therefore are able to see the bigger picture better than physicians that are not in management (Knorring et al., 2016; Iedema et al., 2003). Physicians that only work as physicians and do not undertake a management role as well only have to focus on their own tasks and might not see the self-measurement kiosk as a helping tool in their specific profession. However, physicians in management have to focus on all physicians in the department, also physicians who potentially could benefit from the self-measurement kiosk. When linking this back to the job demands-resources, it could be that the demands and resources are a matter of perception and might differ per specialist. Literature about specialists versus generalists can also be linked to these results, where specialists are very knowledgeable about specific areas of healthcare and have deep extended knowledge on that and generalists are professionals that have a wide variety of knowledge, in a more general way and are not as specialised in one specific department or health area (Harrold et al., 1999). The fact that the internist is more critical about the self-measurement kiosk than the physicians who are also involved in other areas of healthcare (for

example because they also perform a managerial role) can be due to the fact that the internist is very knowledgeable about their specific area of expertise, while the physician with the partly managerial role looks at the bigger picture (Harrold et al., 1999).

Furthermore, it is of high importance to think about what is done with the time that healthcare professionals spare when the self-measurement kiosk is used and takes over some of their tasks. In the results section, it was already confirmed that healthcare professionals cannot use this time to relax or take a break, but this time is spent on other tasks. The question is if they have time now for things they did not have time for before or if they simply take more time for the same tasks they did before but did quicker. It is a very good development if time is created that is spent on tasks that they did not have time for before using the self-measurement kiosk. This would make the healthcare system that more efficient and effective, without having to leave certain tasks unperformed because of lack of time. It is therefore important to find out how this time is spent, and if not spent optimally, how that can be assured.

The literature talks about both the stress reducing and the stress increasing side of digital technologies in healthcare for healthcare professionals. According to Wu et al. (2021) and Chandawarkar et al. (2021) the optimal use of health information technologies and inefficient work processes that come along, can lead to stress and burnout. On the other hand, digital tools have the potential to compel administrative tasks or serve as their front end, diverting healthcare professionals' attention from their desired activity. Administrative work is generally regarded as less significant labor and discovering purpose in one's work serves as a means of reducing stress and burnout (Atkinson et al., 2018). It is interesting to see how the impact can go both in a positive and in a negative way. When looking at this specific study and considering the self-measurement kiosk as the new digital technology in question, it becomes clear that stress is either reduced or it stays the same with the use of the self-measurement kiosk. This could be because the self-measurement kiosk is an easy tool to work with and the results come directly in healthcare professionals' EPD, so it does not ask a lot of adjustment from the healthcare professional (and therefore also not more time). The point that Atkinson et al. (2018) are making in their study aligns with the viewpoint of respondent 2, which is that doctor's assistants usually do not enjoy measuring patients' vitals and are glad to be rid of those tasks. The self-measurement kiosk gives room to healthcare professionals to grow in their profession and have more time for tasks that are more significant to them, which influences their job satisfaction positively (Atkinson et al., 2018).

Another important point from the results is the advantage of patients gaining more autonomy and being more aware about their health. The knowledge that the patients obtain when being involved in their treatment process results in healthcare professionals not having to explain as much to the patient and being able to hold more inclusive conversations, which also makes the treatment easier to justify and explain towards the patient. These findings are similar to the findings of Kraai et al. (2011), which are described in the state of research, where it is stated that patients are more inclined to accept their treatment plans when they are well-informed and more involved in their own treatment.

Regarding overtime work, literature tells us that it could be that having more technologies means that healthcare professionals also spend more time on assessing data and work with health information technologies, which can lead up to spending 1 to 2 hours of overtime work on this (Sinsky et al., 2016; Arndt et al., 2017). Especially in the beginning of implementing a new technology, like the self-measurement kiosk, it will take time to get used to it and this might result in overtime work. However, respondents did not mention that up until now they have noticed that the use of the self-measurement kiosk resulted in more overtime work. They did mention that it is a process of getting used to and good implementation strategies, which takes time at the beginning, but they have not experienced an overload of overtime work due to the presence of the self-measurement kiosk. Though, they also all agree that the self-measurement kiosk is not significant enough to reduce overtime work. When linking this back to the job demands-resources model, the self-measurement kiosk is not an additional demand but considered a resource with a rather weak effect.

A central result in the literature so far is that digital tools in healthcare are associated with a lot of negative consequences for both patient and healthcare professional. In the interviews, however, it was remarkable that the respondents associated digital tools in healthcare faster with positive outcomes (reduced workload, reduced stress level and increased job satisfaction) than negative outcomes. Some of the outcomes also show that there is no perceived impact of the self-measurement kiosk on healthcare professionals.

Even though literature suggests that especially nurses are having difficulties with adjusting to the digital era in healthcare, all six respondents did not mention having any problem with this. The study by Bøgeskov and Grimshaw-Aagaard (2018) tells us that nurses spend up to half of their time in front of a computer documenting patient information. This new type of workflow fails to support their own workflows and interferes with their normal routines and processes. Concluding from the interviews, in which two nurses were included, this issue was not brought

forward and it does not seem like healthcare professionals have an issue with routines being more digitalized by the self-measurement kiosk, but rather worry about the quality of the measurements. Especially doctors working in vascular medicine are bound to have a more critical look at the measurements that the self-measurement kiosk provides. This is because blood pressure is a parameter which is of high importance in the diagnosis and treatment of their patients. When blood pressure is the core focus point in the medicine area of the specialist, it is more understandable that the self-measurement kiosk is not as easily trusted as in areas in medicine where blood pressure is not as important. For example, almost all respondents mentioned that the self-measurement kiosk can be a success in preoperative consultation or the anaesthesia department. Doctors that work in these departments just need the patients to have a blood pressure that is conform the standards of performing an operation. If it is between the range of these standards, they will not question the outcome of the measurements as quick as an internist vascular medicine would. However, one could argue that if the self-measurement kiosk indeed sometimes gives the wrong results, it is very dangerous to perform operation on those patients anyway, just because the result seemed to be acceptable. In vascular medicine, the whole patient treatment might be based on the results of the blood pressure measurement, which means that if the results are wrong, patients might get a treatment that they do not need or they lack treatment that they do need. Therefore, it is not a surprise that the respondent(s) who work in vascular medicine have a more critical stand towards the self-measurement kiosk, especially when they are not convinced of its accuracy yet.

There are multiple manufacturers that offer self-measurement kiosk, and not all hospitals have the same kiosk, however they all roughly measure the same parameters. One of these self-measurement kiosks is the Alviscan. When looking at medical justification (and hence the accuracy of the measurements of the Alviscan) it can be found that the Alviscan is a medical system which is in accordance with Article 22 of the Medical Device Regulation (MDR). Article 22 of the MDR, of which the first paragraph is the following: ‘Natural or legal persons shall draw up a statement if they combine devices bearing a CE marking with the following other devices or products, in a manner that is compatible with the intended purpose of the devices or other products and within the limits of use specified by their manufacturers, in order to place them on the market as a system or procedure pack’ (Medical Device Regulation, 2016). Four more paragraphs follow, with regulations about verification of mutual compatibility of devices, providing relevant information to users and appropriate methods of internal monitoring, verification and validation (Medical Device Regulation, 2016). The Alviscan is in

accordance with this article, which means that the blood pressure monitor, pulse oximeter and scale integrated into the Alviscan are medical devices. The Alviscan does not have a CE mark itself, but the medical equipment in the system all has its own CE mark, which is also in accordance with article 22 of the MDR (Alviscan, 2023). The other kiosk that is mentioned in the interviews, is the kiosk from HQ Healthcare. When looking at their website and information about their self-measurement kiosk, it says that the self-measurement kiosk complies with the Nederlands Instituut voor Accreditatie in de Zorg, NIAZ (Dutch Institute for Accreditation in Healthcare) and JCI (Joint Commission International) accreditation. Even though the self-measurement kiosks comply with Dutch and EU directives, there are still some healthcare professionals included in the study that do not trust the measurements that the self-measurement kiosk performs. This could be due to the perception of healthcare professionals that patients do the measurements themselves, and they might not know how to do the measurements correctly, which could also result in errors in the data. For example, laying still, being seated or other actions that can influence the results. Besides that, they might think that it is still a digital device that can always have machine error and patients will not know if the data is correct or wrong.

From the interviews it also becomes clear that some of the respondents are innovation-sceptic. Meaning that they are not too sure about new technologies in healthcare and what this will do to the healthcare system on the long term. For example, one of the respondents is concerned that too much new technologies will make healthcare professionals lazy. Additionally, another respondent worries about new technologies taking over our tasks which might lead to ignorance and deskilling on the long term, which can be very common when new technologies are implemented (Hoff, 2011). However, according to Hoff (2011), in addition to ongoing pressures in the surrounding work environment, physicians' personal behaviour also plays a role in this kind of deskilling. It is beneficial for managers and health care organizations to work together to try and reduce this. This could result in healthcare professionals not knowing how to perform certain tasks, for example measuring blood pressure when the self-measurement kiosk has taken over this task. Since technologies are very dynamic, but can also be unreliable in today's age, it is important to still have healthcare professionals that know how to perform these tasks when it is necessary. To depend on technologies completely would lead to healthcare professionals not putting in the effort to school themselves about certain things that technology could take over. However, it is very important to still acknowledge the worth of human capacity in comparison to technological innovations. This also brings up the paradox of aiming to preventing human error (for example when measuring parameters or documenting results) but

the risk of having machine error instead. Is the self-measurement kiosk actually adequate enough to measure patients' parameters or should we question its abilities? The respondents already question the accuracy of the self-measurement kiosk and think that it is not accurate enough – at least not in all cases. Technology can be the solution to preventing human errors, but only on the condition that machine error is not present. Therefore, the self-measurement kiosk should first be tested and improved, where specialists can see for themselves that the measurements are accurate and errors are not occurring, or at least less than when healthcare professionals perform the measurements themselves.

When looking at the willingness to adopt the self-measurement kiosk, it is evident that the respondents think that the willingness is there, however some things will have to change in order to actually see the self-measurement kiosks implemented throughout hospitals in the Netherlands. The most important issue is that the self-measurement kiosk needs to be more accurate and scientific medical evidence is needed in order to justify the measurements. It is important for digital healthcare tools providing companies to keep in mind the guidelines of hospitals and the healthcare industry before putting new digital tools on the market. More research needs to be done, which means that more time, effort and money need to be spent on examining the self-measurement kiosk. When bringing in the perceptions of doctors and medical researchers on these matters, the chance of healthcare professionals adopting the technology will be a lot higher. Rotar et al. (2016) also mention this in their work. The most important finding is that specialist participation is associated with improved quality management system implementation, especially when doctors take part in strategic management decision-making. Therefore, it would seem that a greater emphasis on hospital performance is correlated with a significant medical presence in hospital governance. Furthermore, Morilla et al. (2017), state that doctors must be involved in the implementation of new technologies and that a thorough understanding of their connection with technology is essential for successful implementation. It follows that in order for the self-measurement kiosk implementation to be a success and to have a positive impact on healthcare professionals' workload, stress level and job satisfaction, doctors need to be involved in the testing of the self-measurement kiosk, the decision-making regarding the implementation and potentially also in the implementation stage itself.

The results have shown that doctors should be involved in the decision-making processes of a hospital, for example when a new technology is implemented like the self-measurement kiosk. Literature also tells us that when doctors are not involved in the pre-stages of technological

innovation, there is a higher chance that the implementation of new technologies (such as the self-measurement kiosk) will not succeed (Morilla et al., 2017). Four out of six respondents of this study fulfil a (partly) managerial role in the hospital where they work, from which we can derive that doctors are already involved in managerial decision making. However, it could be that because of their managerial performances, the specialists find financial and organizational aspects of higher importance than the medical evidence that the self-measurement kiosk is actually doing what it is supposed to do. Therefore, it is hard to tell whether bringing on board doctors in managerial and organizational issues is bringing the quality of care up or down.

The perceived impact of the self-measurement kiosk on healthcare professionals seems to be limited according to the results of the interviews. The question, however, is if we really overestimate the impact of such a self-measurement kiosk or whether it just takes more time and more hospitals to implement the technology in order to see the impact evidently. When thinking about what the self-measurement kiosk can take over from healthcare professionals, it sounds very promising, however up until now it does not seem to be extremely helpful – as well as it does not seem to have obvious negative impacts. One of the respondents mentioned that they think that the self-measurement kiosk could be a success if it were to be implemented on a massive scale. However, it takes time, money, effort and more trials for hospital managers and specialists to adopt these kiosks. Until then, the actual impact these kiosks have on healthcare professionals is limited, because the self-measurement kiosk is simply not used that much. Additionally, because of the low implementation rate, the perception of the healthcare professionals is also biased, because the self-measurement kiosk could have different impacts on healthcare professionals' workload, stress level and job satisfaction if it were to be implemented on a larger scale and used by more healthcare professionals.

6.1 Theoretical implications

The job demands-resources model that is used in this study is can help in finding out whether the outcome, based on the resources and the demands, is job satisfaction or burnout/stress.. Hence, if the self-measurement kiosk leads to a lower workload and stress level, it should, according to the job demands-resources model, result in a higher job satisfaction and a higher willingness to adopt the self-measurement kiosk. However, from the interviews it became clear that it cannot always be used in that way. Some of the results from the interviews did therefore not match the results that the job demands-resources model predicts. A limitation of this model in this particular study is that it does not give you the opportunity to analyse the variables separately, but let them depend on each other, even though separately they can give you other

results. Especially in this study, there were multiple dimensions of 'job demands' and each of them had different outcomes based on the interviews. It is hard to combine these dimensions together and let the other variables depend on that. The job demands-resources model can only have one result, even though for this study the outcome was not that evident. Multiple factors played a role, for which the job demands-resources model gives not a lot of room. Additionally, the demands (workload, overtime work, time pressure) also do not always give generalizing results. Meaning that the self-measurement kiosk could reduce workload but might not have an effect on overtime work. Lastly, the option that there is no impact is also not an outcome in the job demands-resources model. It either results in job satisfaction/engagement or burnout/stress, even though in this study it became clear that the self-measurement kiosk has no perceived impact on the job satisfaction of healthcare professionals. The job demands-resources model is therefore sometimes not as easy to use or the results are not completely reliable. The suggestion is to either make the model more inclusive with more than two outcomes or to use the model separately for each demand – as long as there is only one resource.

6.2 Practical implications

The study revealed that the healthcare professionals perceive a reduced workload, but not yet a reduced stress level and an increased job satisfaction with the use of the self-measurement kiosk. However, in the future, when self-measurement kiosks are being implemented on a more massive scale in more departments in hospitals, it might be able to have an effect on both stress level and job satisfaction. The self-measurement kiosk has potential in the sense that it is not yet well-developed but through scientific research and improvement of the technology, with the goal to make the measurements more accurate in order for healthcare professionals to be able to trust the measurements completely and do not have to question them, it can be very promising. In order for the self-measurement kiosk to reduce stress level and increase job satisfaction of healthcare professionals, manufacturers need to research the functioning of the self-measurement kiosk – meaning they will have to find out how the self-measurement kiosk exactly measures the parameters, how this differs from the measurements that are being done manually by healthcare professionals and what that means for the results - and improve the accuracy and involve doctors in this process, in order to have the medical justification to use this digital tool. Even though the Alviscan and HQ healthcare kiosks are in accordance with the Medical Device Regulation and the NIAZ (Dutch Institute for Accreditation in Healthcare) and JCI (Joint Commission International), some healthcare professionals are still sceptical about the accuracy of the self-measurement kiosk. Furthermore, the healthcare professionals need to

be convinced that the self-measurement kiosk has concrete benefits for their work environment (system, patient care) and well-being (workload, stress level, job satisfaction). This can be done through pilots, so that healthcare professionals can experience the benefits directly. A lot of healthcare professionals have not yet worked with the self-measurement kiosk themselves and therefore do not know yet if it would actually be beneficial. Hence, it would be good to introduce more pilots with the self-measurement kiosk to give healthcare professionals the opportunity to work with the tool themselves and find out what the benefits actually are. This way, the overall effect of the self-measurement kiosk within a hospital as a whole can also be studied in order to see if the effect is significant and if the self-measurement kiosk is worth to implement in more hospitals.

6.3 Limitations

This study also does not come without limitations. The participant rate in this study is rather low, with only six respondents. The self-measurement kiosk is still very new in the Netherlands and that became even clearer when looking for respondents. Some results might therefore be biased, because conclusions drawn in this thesis are based on a sample size of N=6, of which 3 healthcare professionals have not worked with the self-measurement kiosk directly. And especially since two of the respondents work in a hospital where the self-measurement kiosk has not been implemented yet. The healthcare professionals had different specific jobs (specialist, nurse, doctor's assistant) which also made the results sometimes harder to analyse and to draw conclusions, because it turns out that doctor's assistants have the most experience with self-measurement kiosks, because they usually had to do the tasks that the self-measurement kiosk now takes over and nurses and specialists not so much. Therefore, there is a distinction between these professions and therefore also in the perceived impact of the different healthcare professionals in this sample. Lastly, some healthcare professionals included in the study are also fulfilling a managerial role, which could be a limitation, because they do not share the viewpoint of a healthcare professional who interferes with patients (and therefore the self-measurement kiosk). However, this also gave some new insights about specific professions in healthcare and the impact of the self-measurement kiosk. Because of this and the low implementation rate of the self-measurement kiosk, the results are not generalizable in a sense that it would count for every other healthcare professional. Regarding the research design, which is cross-sectional for this study, it might have been beneficial to have a longitudinal research approach. This way, the research would not be done at one point in time (interviews with healthcare professionals at a certain moment), but there could be multiple interviews with

the same healthcare professionals before and after the implementation of the self-measurement kiosk. This way, it would become clear how the workload, stress level and job satisfaction changed through the impact of the self-measurement kiosk. Unfortunately, this was not possible since some of the hospitals already had the self-measurement kiosk and hospitals that did not have the kiosk yet would not get it in time for this research. Therefore, it did not fit in the timeframe of this study, which was initially 4 months, but was extended till 6 months. It was also asked to multiple hospitals if more healthcare professionals from that hospital wanted to participate, however there were not more healthcare professionals willing to step in. The last limitation is that there was no second coder to see if some codes were missing and to bring other perspectives into the analysis based on the dataset. This might have influenced the results, because there could have been other codes that were worth analysing and describing. However, the results were presented to a group consisting of students and professors from the Public Administration and Health Sciences department after two interviews were done, and through feedback and further examination of the dataset three codes have been added.

6.4 Future research

This study indicates a need for future research to focus on implementation strategies for the self-measurement kiosk, including a way to gather medical, financial and managerial justification in order to accomplish a successful implementation and a higher willingness to adopt the self-measurement kiosk. Possible research questions could be: ‘What is lacking in the implementation strategies of self-measurement kiosks in hospitals?’ or ‘What implementation strategies for self-measurement kiosks in hospitals are needed to increase the willingness to adopt the self-measurement kiosk by healthcare professionals?’ In order to conduct this research, the current implementation strategies need to be identified and finding out through interviews what is missing and still needs to be added. Moreover, there is a need to explore whether having doctors in managerial positions shift their viewpoints from medical importance to thinking more heavily about efficiency and effectiveness, and therefore brings the quality of care up or down. A possible research question could be: ‘How does having a managerial role as a healthcare professional influence the quality of care of their patients?’ A method for researching this could be surveys or interviews where healthcare professionals are asked if they perform managerial roles next to being a specialist and asking them how important efficiency and effectiveness of the healthcare system is to them. In addition to this, a survey should also be sent out to patients to find out if they notice a difference in the quality of care from doctors that only perform tasks within their specification and doctors that have a managerial role as

well next to that. Furthermore, this study presents an interesting opening for future research regarding time creation with the implementation of new technologies in healthcare. Especially when it comes to finding out what this extra time is used for, if it could improve the healthcare system and increase its efficiency or if this time is still used in the same way but just giving more attention to the same topics. Possible research questions could be: 'How is time that is created by the implementation of new technologies in healthcare spent by healthcare professionals?' or 'How can extra created time through technology implementation in healthcare influence the healthcare systems' efficiency?' When being even more specific, a suggested research question is: 'How can extra created time through technology implementation in healthcare influence the amount of patients healthcare professionals can see in one day?' These research questions can be analysed through interviews with healthcare professionals and professionals with a managerial role in hospitals.

7 Conclusion

This research examined the perceived impact of the self-measurement kiosk on healthcare professionals, regarding their workload, stress level, job satisfaction and willingness to adopt the self-measurement kiosk. The first important note that can be concluded from the study is that the self-measurement kiosk is not yet implemented on a big scale in the Netherlands. Through interviews with healthcare professionals (N=6), this study reveals that it depends on the specific job the healthcare professional is performing (specialist, nurse or doctor's assistant) whether or not the self-measurement kiosk influences their workload, stress level and job satisfaction. The respondents are rather sceptical when it comes to the impact the self-measurement kiosk has on their well-being thus far, but do think that it could be promising in the future, on the condition that the kiosk provides more accurate measurements that are medically justifiable. In addition, the study shows that the self-measurement kiosk has, according to the participants, an effect on their workload and could be able to help alleviate the problem of the shortage of healthcare professionals in the future when the self-measurement kiosk is scaled up massively and being implemented in more hospitals in the Netherlands. Lastly, the research findings highlight the importance of showing the added value of the self-measurement kiosk for healthcare professionals and involve medical specialists in decision-making processes, in order for the willingness to adopt the self-measurement kiosk to be higher.

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Appendix

Interview guide

1. Can you tell me something about the hospital where you work, your position in it and your activities? How long have you been working there? How much experience do you have?

2. Can you tell me a bit more about the self-measurement kiosk, such as what it does/can do and for what purpose and in which department it is (most) used in the hospital? Who uses it? Of the data that it generates?

3. And how far along is the implementation of the self-measurement kiosk in hospital X?

4. What, in your opinion, are the benefits of using the self-measurement kiosk in hospital X?

5. What are, in your opinion, the disadvantages of using the self-measurement kiosk in hospital X? Or barriers/difficulties?

6. Overall, do you have positive or negative experiences with the self-measurement kiosk?

7. How do you think the usage of the self-measurement kiosk by patients affects your workload? Would you say that your workload (or that of healthcare professionals) has changed as a result of the implementation of the self-measurement kiosk?

8. How do you think using the self-measurement kiosk by patients affects your stress level at work? Would you say that your stress level (or that of healthcare professionals) has changed following the implementation of the self-measurement kiosk?

9. How do you think using the self-measurement kiosk by patients affects your job satisfaction? Would you say that your job satisfaction (or that of healthcare professionals) has changed following the implementation of the self-measurement kiosk?

10. How do you think implementing the self-measurement kiosk will affect the shortage of healthcare professionals in the future? In what ways does the self-measurement kiosk help address this problem? Are you already seeing this in practice?

11. Is the self-measurement kiosk able to take over tasks from the healthcare professional, giving them more peace of mind during patient treatment? / Do healthcare professionals get other tasks to perform due to the saved time from using the self-measurement kiosk?

12. How might the self-measurement kiosk affect the time pressure of healthcare professionals? Does it give them additional time with their patient that they can spend on tasks other than taking measurements?

13. Do you often have to work overtime? And can the self-measurement kiosk make sure to overcome/help alleviate this problem?

14. Could the self-measurement kiosk ensure that healthcare professionals can develop and grow more by saving time and not having to take general measurements?

15. Are healthcare professionals generally willing to use the self-measurement kiosk? What factors cause them to be willing or unwilling to use the self-measurement kiosk?

16. How do you see the continued future of the self-measurement kiosk in healthcare? Do you think multiple hospitals will implement this tool? And what is the future specifically for hospital X?