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# **HEALTHCARE INFORMATION TECHNOLOGY (HIT) ACCEPTANCE IN LITHUANIAN HEALTHCARE ORGANIZATION: HEALTHCARE PROFESSIONAL'S PERSPECTIVE**

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**Healthcare Information Technology (HIT) acceptance  
in Lithuanian healthcare organization:  
healthcare professional's perspective**

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## LIST OF ABBREVIATIONS

- EHR – Electronic Health Record (information system)
- EMR – Electronic Medical Record (information system)
- EU – European Union
- HIT – Healthcare Information Technology
- HIS – Hospital Information System
- HTA – Health Technology Assessment
- ICT – Information and Communications Technology
- PHR – Patient Health Record
- OECD – Organization for Economic Co-operation and Development
- TRA – Technology Readiness Assessment
- TPB – Theory of Planned Behavior
- TAM – Technology Acceptance Model
- UTAUT – Unified Theory of Acceptance and Use of Technology
- WHO – World Health Organization (<https://www.who.int/>)

Research model abbreviations:

- PE – Performance expectancy
- EE – Effort expectancy
- SI – Social influence
- FC – Facilitating conditions
- HT – Habit
- ML – Management leadership

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## **Abstract**

Rapid advancement of information technology across virtually all the industry sectors is a staple of the XXI century, however one late adopter does stand out – healthcare. Although healthcare is one of the key pillars in everyone’s life, the domain struggles with realization of the full benefits that information technology could provide. Purpose of this thesis is to research the healthcare information technology (HIT) acceptance and use in the Hospital of Lithuanian University of Health Sciences Kaunas Clinics (the largest healthcare institution in Lithuania), and to identify the factors that determine the success of information technology initiatives’ adoption.

To build the research model, a literature review and qualitative in-depth interviews with Lithuanian healthcare experts were conducted. Research model was created using the UTAUT2 framework. A structured online survey was used to collect quantitative data. The questionnaire was completed by 140 healthcare professionals, resulting in a significant and meaningful data set.

Research has resulted into rich, intricate, and actionable insights. Research data has revealed various patterns of HIT acceptance in Kaunas Clinics. For example, across age groups, both youngest and oldest users have demonstrated the best acceptance, and most skepticism was identified in the middle-age groups. Respondents working in time-sensitive or billing related settings (i.e., outpatient, reimbursement) have significantly lower acceptance than those working with inpatient care, reports, or registration. Management leadership was identified as one of the key factors with most potential to influence the successful acceptance of healthcare information technology.

Research outcomes and conclusions can contribute to and support managerial decision-making related to the HIT initiatives. For example, prioritization of practical HIT improvements in domains where HIT users may feel time pressure (i.e., outpatient) or complexity (i.e., billing / reimbursement) over other domains, or setting up continuous HIT users onboarding, training and support function will help to achieve greater overall HIT acceptance and use in the organization.

**Keywords:** Healthcare Information Technology, HIT, Acceptance, Adoption, UTAUT2

## 1 Introduction

Nothing in this life is guaranteed, except death, taxes, and rising healthcare costs. In 2019, OECD nations spent roughly 8.8% of their GDP on healthcare on average. (OECD, 2021). Health spending is projected to outgrow GDP and could reach as much as 10.8% by 2030 (OECD, 2019). Clearly, efficient use of limited resources is critical to ensure efficient healthcare today and in the future.

Globalized activities in all industries are undergoing a transformation as a result of information technology. Throughout the years, most developed countries have successfully integrated information technology into critical sectors of their economies, including the healthcare sector (Alsyouf & Ishak, 2018).

Technological advancement is one of the key drivers for healthcare spending, especially in Healthcare Information Technologies (HIT), that includes all digital technologies which make possible to collect, process, store, and share information in an electronic manner (Gagnon et al., 2010). The cumulative result of the scattered choices regarding the implementation of HIT elements results in significant rise of the cost. Furthermore, inefficient use of the technology may result in increased health expenditure without equivalent gains in healthcare outcomes (Chandra & Skinner, 2012). Organizations face difficulties such as low usability due to the difficulty of learning and using HIT. As a result of these issues, users' performance may drop, and productivity may suffer (Alsyouf & Ishak, 2018).

70% of HIT initiatives fail when term "failure" is defined as "an HIT project in which an unintended negative consequence occurred, such as a project delay, a substantial cost overrun, a failure to meet an intended goal, or complete abandonment of the project" (Kaplan & Harris-Salamone, 2009). Regrettably, the elements that influence the successful adoption of health applications by practitioners are not always obvious. As per Angst et al. (2010), they fluctuate over time in each step of a healthcare technology implementation project, and they can also differ between nations.

In the thesis we will research HIT acceptance and use by healthcare professionals and will determine the factors that are contributing to the HIT acceptance and use. Research will be carried out in the Hospital of the Lithuanian University of Health Sciences Kauno klinikos (Kaunas Clinics), the largest healthcare institution in Lithuania.

The primary goal of the research is to provide evidence for the hospital management on the factors that influence HIT acceptance and minimize the risk of HIT rejection by the healthcare professionals. Secondly, the research could be used by HIT implementors to better understand the behavioral factors of HIT users, so that HIT implementations could be planned and executed more efficiently.

We chose UTAUT2 as a theoretical framework to research HIT acceptance, which includes the factors of performance expectancy, effort expectancy, social influence, facilitating conditions, habit, price and hedonic motivation. Based on the reviewed literature and other research, one of the key factors for effective HIT acceptance that is not included in the UTAUT2 framework is top management leadership and support (Handayani et al., 2017). Management team must not only provide adequate policies regarding HIT and ensure facilitating conditions (such as infrastructure, equipment), but also must minimize the fear of change by introducing users with clear reasons and benefits of technology and clarifying the processes, responsibilities, steps and timeline for implementation period and operational use.

Therefore, in our research we also aim to test the UTAUT2 model in Lithuania's tertiary level hospital and empirically prove the acceptance factors relevance to the local healthcare system.

Hospital managers, lead practitioners, HIT providers and business consultants should learn what encourages employees to utilize new systems and what causes resistance to new systems in order to improve technology project implementation success (Esmailzadeh et al., 2011). To achieve higher user HIT acceptance rates, factors that contribute to poor acceptance must be identified, understood, and addressed prior to major deployments (Ahlan et al., 2015).

During the literature review and the research of the HIT acceptance studies, we have not identified any comprehensive empirical research that has been conducted on healthcare practitioners' acceptance and use of HIT in Lithuania. To bridge this gap, we will collect empirical data in a Lithuanian healthcare organization to answer the Research Question (RQ).

**RQ: What factors determine HIT acceptance and use from the healthcare professional's perspective?**

In the first part of the thesis we review and discuss what exactly is meant by HIT and HIT acceptance, what theoretical frameworks can be used to analyze it and which factors are influencing and motivating people to use or not to use technology in general. We present the research methodology, which consists of both qualitative in-depth interviews and quantitative structured survey to collect the primary research data.

In the second part of the thesis, we review and analyze collected data, identify important findings, discuss the results. Based on the results and discussion, we finish the thesis with the conclusions and managerial recommendations.



## 2 Literature review

### 2.1 *Rising challenges of the healthcare industry today*

Increasing healthcare expenditure and lack of healthcare practitioners (i.e., general practitioners, specialists, nurses, laboratory technicians etc.) is a global trend. In EU, healthcare expenses over the 2014-2018 period have increased by 13% (Eurostat, 2021). Over last decades in United States healthcare spending compared to GDP almost tripled - from 6,9% (in 1970) to 17,7% (in 2019) (Peterson center on healthcare, 2020). Health spending as a percentage of GDP tends to rise significantly during economic downturns and remains relatively steady during the economic expansion period.

As for lack of healthcare practitioners, study from 2016 showed that the United Kingdom (UK) would need 190,000 new doctors by 2027, whereas UK current capacity to train new practitioners is less than 9,000 doctors per year (European Data Journalism Network, 2018). As per Liu et al. (2017) projection, “by 2030, global demand for health workers will rise to 80 million workers, double the current (2013) stock of health workers, while the supply of health workers is expected to reach 65 million over the same period, resulting in a worldwide net shortage of 15 million health workers”. He also concludes that “The global shortages projected for 2030 may not occur if labor productivity could be increased, for example, through better use of technology, improved skills development, and institutional reforms”. Report by the Lithuanian Government Centre for Strategic Analysis states that Lithuanian healthcare sector by 2030 may have shortage of 2800 specialists (or ~6% of the workforce) (Vyriausybės strateginės analizės centras, 2021).

Virtually all spheres of life (i.e., education, communication, entertainment, way of work is being done etc.) have greatly transformed over recent decades due to the use of technology. Healthcare domain is unique in a sense that it is rather late adopter of the worldwide perspective on information technology, and current time is the exact moment of increasing HIT usage within the healthcare arena, to provide care at the facilities, monitoring at home, interactive telemedicine services, health information exchange, and peer support (Vijay, 2018).

Digital transformation in healthcare and Healthcare Information Technology (HIT) adoption is necessary to ensure healthcare availability and efficiency in the future. Today, the quick evolution of information technologies provides multiple more

powerful and efficient tools to replace old ones. The novelty, on the other hand, can only be beneficial when users accept it and use it effectively (Nadri et al., 2018).

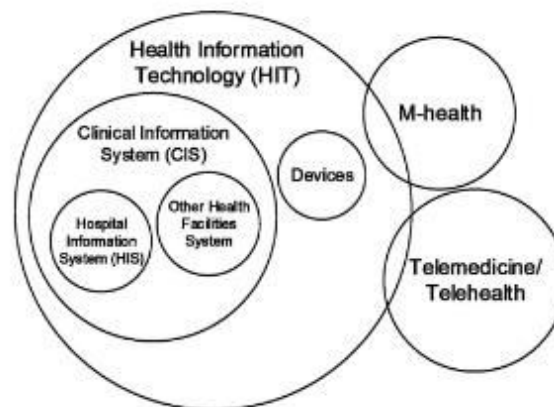
## 2.2 What exactly is Healthcare Information Technology (HIT)

For the purpose of this thesis, it is important to disambiguate different terms that describe healthcare information technology. An overarching term used across all industries is ICT – Information and Communication technologies, that includes all digital technologies which make possible to collect, process, store, and share information in an electronic manner (Gagnon et al., 2010).

Subset of ICT that is specific to healthcare domain is HIT – healthcare information technology. Medicine and healthcare have evolved and will continue to change as new technologies are produced, thanks to the use of “health information technology (HIT) such as electronic health records and clinical decision support systems” (Gaube et al., 2021). As described Ahlan et al. (2015), “HIT is a term that refers to the management and interchange of health information between consumers and clinicians in the healthcare setting, using both computers and mobile devices to make decisions” (Ahlan et al., 2015). Or as per Brenner et al. (2015), HIT can be described as “any automated or computerized system implemented to aid in the management of health information”.

Further breakdown of HIT technologies is presented in the diagram below:

Figure 1. Relationship among healthcare applications and technologies



Source: Angst et al., 2010

- **Hospital information system (HIS)** - is made up of a number of modules, all of which need to be linked to the back office and support modules in order to function properly. These modules include registration, medical records, billing, and an order communication system (OCS) (Nadri et al., 2018). HIS is the main hospital information system used to manage medical data, patient flow, healthcare service provision, hospital staff coordination. In the literature other similar terms can be found used as HIS synonyms – EMR (Electronic Medical Record), EHR (Electronic Health Record).
- **Other health facilities systems** – can be a variety of information systems, such as CDSS (Clinical Decision Support Systems), Laboratory IS, Pathology IS, Radiology IS, ICU IS (Intensive Care Unit), PACS (Picture Archiving and Communication Systems), etc.
- **Devices** – information systems specific to hardware devices (laboratory analyzers, diagnostics), etc.
- **Telemedicine** – delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interest of advancing the health of individuals and their communities (Scalvini et al., 2004).
- **M-Health** – tightly related to PHR (Patient Health Record) – an information system that captures medical data that the patients provide themselves via various wearables and health trackers (as opposed to health data captured in formal clinical setting).

It is worth noting that there is no strong consensus among the healthcare industry on exact definitions, and multiple similar terms and abbreviations are used throughout the literature and publications. Therefore, while discussing HIT related topics it is worthwhile to spend extra care in clarifying exact context.

### ***2.3 Technology acceptance importance in healthcare sector***

Technologies are taking a greater and more important role in nowadays economic growth in both emerging and developed economies. All industries are undergoing the transformation, including the healthcare sector, where technologies were integrated massively (Alsyof & Ishak, 2018).

Technological innovation is a significant driver of health expenditures. Cost increases as a consequence of the disparate decisions made regarding the implementation of different HIT features. Furthermore, inefficient use of the technology may result in increased health expenditure without equivalent gains in health (Chandra & Skinner, 2012). Organizations are confronted with challenges such as limited usability as a result of the difficulty in learning and implementing HIT. As a consequence of these concerns, users' performance may deteriorate, and their productivity may be negatively affected (Alsyof & Ishak, 2018).

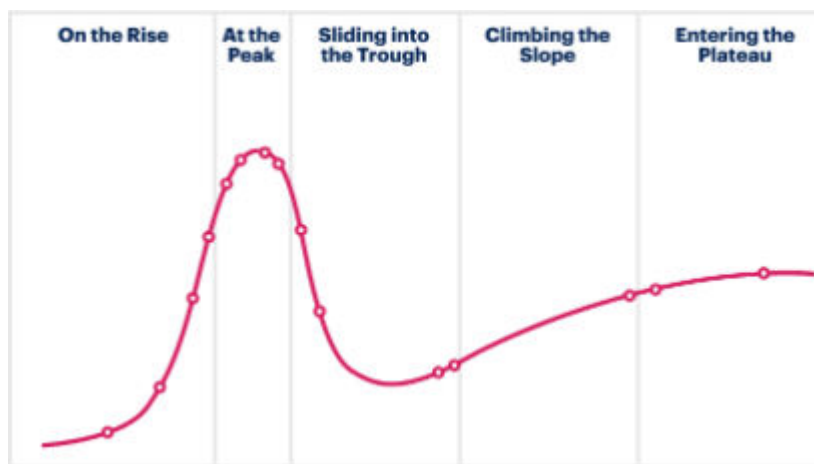
Over the last decade, HIT adoption has undergone a global breakthrough. In US, usage of electronic health records rose from 10% (in 2008) to 70% (in 2014) (Wachter, 2017). Expert opinion and systematic studies suggest that widespread deployment of HIT is required to enable the delivery of improved patient outcomes (Ingebrigtsen et al., 2014).

In the case written by Handayani et al., (2017) authors have noted that HIT is a must-have for clearly all healthcare institutions, whether it is big or not, government or private, local or worldwide in scope. Consequently, it is critical that a health information technology be designed and implemented in such a manner that it is well-accepted by all individuals who will be impacted by it. In healthcare systems in general and hospitals in particular, one of the most essential types of administrative and medical decisions that can be made is the choice of whether or not to use a certain piece of technology (Greenberg et al., 2005).

As Kaplan & Harris-Salamone marked (2009) that almost 70% of HIT initiatives fail and the term “failure” was defined as “an HIT project in which an unintended negative consequence occurred, such as a project delay, a substantial cost overrun, a failure to meet an intended goal, or complete abandonment of the project”. Regrettably, the factors that influence the usability and adoption of health applications by practitioners are not always obvious and usually changing depending on the project itself, hospital, people or even nations (Angst et al., 2010).

In technology acceptance research, Gartner hype cycle model is often used to explain the dependence of the technology acceptance (or realized productivity gain) maturity versus the technology rollout timeline. Regarding to the Gartner hype cycle applicability to this research, as the latest major HIT rollout in Kaunas Clinics was performed in the period of 2015-2016, we assume that the “Entering the Plateau” phase has been reached by the time of the research, and the results can be interpreted as such – i.e., not affected neither of the over-optimism of the “At the Peak” stage, nor by the “Valley of despair” that follows soon after the “At the Peak”.

Figure 2. Gartner Hype Cycle



Source: Hype Cycle for Healthcare Providers, 2021, n.d.

Healthcare institutions should make investments not only into technology and innovations itself, but as well have to make effort to improve HIT acceptance which would lead to improved HIT adoption and use outcomes. Management teams should be interested and learn what encourages employees to utilize new systems and what causes resistance to new systems in order to improve technology project implementation success (Esmailzadeh et al., 2011). Strong managerial support is one of the success aspects and criteria that influence acceptance (Handayani et al., 2017).

However, HIT adoption processes in Lithuanian healthcare organizations have been sporadic, slow, and unpopular among the public. The report National Audit Office of Lithuania (2017) states “Having completed the tasks for establishment by 2015, the use of the e-health system started out as passive and controversial opinions from the users and creators of the system showed up in the public space, regarding the achievement, quality, and safety of goals set for the creation of the system.”

## 2.4 *Healthcare in Lithuania*

As it is stated in the Ministry of Health website – “Lithuania has a hybrid system that is supported by the national health insurance system, which is based on mandatory enrolment in a health insurance program, and the state budget” (Ministry of Health of The Republic of Lithuania, 2022). Majority of Lithuanian healthcare organizations are public non-profit organizations. The federal government (Ministry of Health) or local municipalities are responsible for property rights and administrative tasks. The Ministry of Health of the Republic of Lithuania is the primary governmental entity in charge of overseeing the whole healthcare system. The National Health Insurance Fund (NHIF) is responsible for funding healthcare services on behalf of the Ministry of Health.

Primary and secondary healthcare is administered by 60 municipalities. Tertiary care is mostly focused on hospitals, and accountability is delegated to the government. A patient typically enters the health system via their primary care physician or directly through a specialized doctor (if urgent treatment is required) free of charge; for non-emergency care and without a referral from a primary care physician, a user fee is charged (Ministry of Health of The Republic of Lithuania, 2022).

There has been a lack of systematic use of health technology assessment (HTA) in Lithuania. Since 2013, number of initiatives funded by the EU Social Fund have been carried out in Lithuania to establish a national strategy for health technology assessment. Computers and the Internet are used by the great majority of healthcare professionals and almost all of them use specialized software. There is a growing number of individuals using Internet to study health-related concerns (Ministry of Health of The Republic of Lithuania, 2022).

In 2007, Lithuania has established an e-health strategy. As described in Lithuania’s Health System Review report by Murauskiene at al. (2013) “e-health system's core aspect is a database of electronic medical records that interfaces with national and Ministry of Health databases, the NHIF database, the State Information System, and healthcare providers.”

Lithuanian National Health Record (NHR), launched in 2015, is used more and more effectively, and as per Lithuania’s Health Ministry 2020-year report, 99,7% of drug prescriptions, 92% of the referrals were issued through the NHR. 92% of the patients in Lithuania were using NHR in the last quarter of 2020, as per Lithuania’s health Ministry (Ministry of Health of The Republic of Lithuania, 2020). The biggest

impact to the rise of the NHR was the new investments into HIT, as well as Covid-19 crisis, when patients were not allowed to visit practitioners in “brick and mortar” and were communicating and getting care via phone, NHR or other e-health systems.

In 2018, Lithuania was ranked 28th in Europe by the Euro Health Consumer Index, which ranks European healthcare systems based on the wait times, outcomes, and other indicators (Björnberg & Yung Phang, 2019). To improve the situation, implementation of contemporary HIT is important. Even more essential is to ensure that HIT is accepted and used by the practitioners, as well as to identify which acceptance factors are the most significant in Lithuania's healthcare system.

## ***2.5 Technology acceptance models***

According to the Oxford Dictionary, "acceptance" is defined as the act of consenting to receive or perform something that has been given to you. Users' acceptance was defined by Esmailzadeh et al. (2011) “as their willingness to use IT to support tasks”, with a particular focus on medical staff acceptability. Additionally, acceptance by users may be specified as “demonstrable willingness within a user group to employ IT for the tasks it is designed to support” (Dillon A, 2001).

Understanding why individuals behave the way they do and what can encourage them to change is the best method to effect positive changes in technology adoption behavior. As a result, technology acceptance theories and models assist in explaining consumer behavior and guiding the creation of more effective ways to influence and change it. In the past years healthcare research has invested tremendous efforts to understand HIT system use behavior. As a result, there are different theories that define user behavior and approach towards technology, as well as how that technology can be adopted and disseminated (Ahlan et al., 2015).

In the literature we found several models that explains technology acceptance like Theory of Planned Behavior (TPB, found in 1985), most often used Technology acceptance Model (TAM, found in 1989) and United Technology Acceptance and Use of Technology (UTAUT, found in 2003) which connect 8 different theories in to one. We chose to go further into the latest version of UTAUT2 since it incorporates not just technical acceptance considerations, but also behavioral theories.

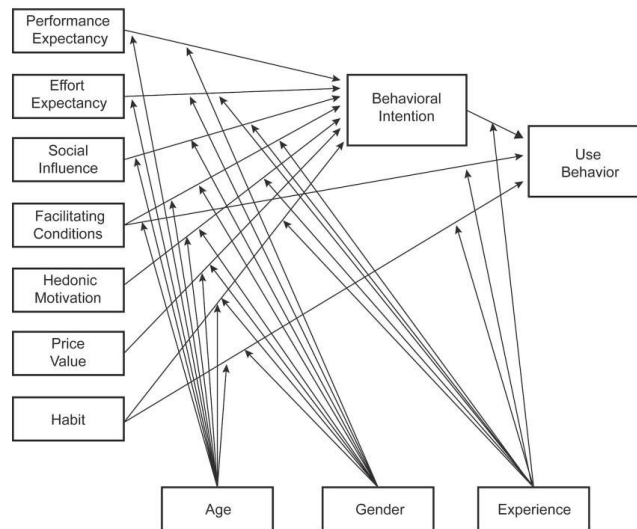
Venkatesh, Morris, Davis (2003) developed the “Unified Theory of Acceptance and Use of Technology (UTAUT) by combining eight main theories, including the



personal computer use model, reasoned action theory, motivational model technology acceptance model, planned behavior theory and combination of planned behavior/technology acceptance model, innovation diffusion of theory, and Bandura's (1977) social learning and cognitive theory” (Antwi et al., 2014).

Later on, the extended version was presented as UTAUT2, which is a collection of elements that influence both the intention to utilize information technology and the actual usage of this technology (Alsyouf & Ishak, 2018). This model has narrowed down the most significant contributors and conditions that affect the prediction of how people will act when they use technology and how people use technology in the workplace (Venkatesh et al., 2012). These factors also contribute to the ease with which users may get to know how to utilize a framework or application. Additionally, the function of prominent individuals in their places of employment has an effect on how people behave when it comes to their usage of information technology (Venkatesh et al., 2003).

Figure 3. UTAUT2 theoretical model



Source: Venkatesh et al., (2012)

According to UTAUT2, the following key elements influence a user's willingness to utilize a particular IT and eventual acceptance of that technology as a way of life. These factors include (Antwi et al., 2014, Venkatesh et al., 2012):

- *The technology's performance expectancy* - the extent to which using technology will assist customers while completing certain tasks (Nair et al., 2015). As per Venkatesh et al. (2003) when people feel that applying a given technology



would assist them in more successfully and efficiently accomplishing activities in the workplace, they are said to have a high quality of performance expectation. The expectation of future performance might have an impact on the desire to continue using a product.

- *Projected effort that will be required to use such technology* - the ease with which customers may use technology and the amount of work required to do so. Or as per Venkatesh et al. (2003), determining the ease with which a system may be learned to use.
- *Socio-cultural impacts that linger in an individual's surroundings* - the term "social influence" refers to the "degree to which an individual believes that influential others think they should adopt a new system." (Venkatesh et al. (2003).
- *The existence of facilitating conditions that help or hinder technology adoption* - views held by customers about the tools and assistance that are at their disposal in order for them to participate in a certain activity (Nair et al., 2015). Or as defined by Venkatesh et al. (2003), "a facilitating condition is the extent to which individual trusts that existing requisite structures in the organization are established with the aim of supporting the use of the system."
- *Hedonic motivation* – is the term for the satisfaction or pleasure that is related with the application of technology. This kind of motivation is referred to as hedonism. Moreover, it has been demonstrated to have a considerable impact on the acceptance and application of technological innovations (Brown & Venkatesh, 2005). Considering hedonic motivation as a determinant of pleasure and happiness in the health sector would be insignificant.
- *Price value* – is explained by Nair et al., (2015) as consumers' cognitive trade-off between the applications' apparent advantages and the expenses of utilizing them. This factor is critical distinction between consumer usage and organizational use, the context in which UTAUT2 was established, is that consumers often face the financial expense of such use, but workers do not (Venkatesh et al., 2012). Which is not applicable in the case of the healthcare industry and practitioner's intention to use HIT.
- *Habit* - is a term that expresses the degree to which individuals conduct acts automatically as a consequence of their learning or feels that their behavior is

automatic. It may also refer to the perception that humans have that their behavior is automatic (Venkatesh et al., 2012).

The purpose why we choose the extended UTAUT2 was to pay particular attention to the environment in which consumers interact with technology, while building on previous developments of UTAUT. The extended model is the newest defined in the literature review, as well it connects eight different theories into one and is updated by identifying crucial new components and interactions, such as hedonic motivation, price value, and habit, to be included into the UTAUT model, allowing it to be tailored from an organizational to the context of the consumer (Venkatesh et al., 2012). More than that, it is one of few models that focuses to the consumer instead of organizational level.

According to the model, the influence of enabling factors on behavioral intention is modulated by age, gender, experience or educational level. Which in our healthcare case allows to understand the relations between the factors and users age – where assumption could be done that older customers often have a harder time digesting new or complicated information, which affects their ability to learn new technology (Venkatesh et al., 2012). Additionally, gender, where several case studies shown distinct relationships between influencing variables affecting women and men.

Consequently, UTAUT2 is more applicable to a broader variety of consumer technology usage situations as a result of this development. As well, model is valuable for management team who wants to know how users would react to new technology and what factors will make it easier for them to adopt the new technology (Alsyouf & Ishak, 2018). Since its first publication, UTAUT2 has been utilized as a foundational model for the investigation of a “wide variety of technologies in both organizational and non-organizational settings” (Venkatesh et al., 2012).

## **2.6 *Other factors influencing HIT acceptance***

The process of HIT acceptance, on the other hand, is complicated and impacted by a wide range of interconnected elements, which we discovered in the reviewed literature and it can't be measured only by technology acceptance. We recognized that many of the studies have more or less concentrated on organizational level. Individual approaches have gotten less attention despite the fact that adoption choices in hospitals

are made by (groups of) people and are influenced by a variety of subordinate subjects (Peng et al., 2016).

It is of the utmost importance for developers to stick to a strategy that will ultimately result in the acceptance and exploitation of information technology systems. Considering the enormous financial and human resources that go into the creation and deployment of a system, this is very necessary and may be accomplished by thoroughly knowing all of the components and how they influence the intention of users to accept and utilize the system (Owusu Kwateng et al., 2019). As per Holden & Karsh (2010), “knowing the factors that shaped one’s intentions would allow organizations to manipulate those factors in order to promote acceptance, and thus increase IT use.”

As Handayani et al. (2017) stated “unfortunately, the factors influencing healthcare users' adoption behavior regarding health applications are not completely clear.” Despite growing interest in identifying factors that influence whether or not prospective users accept and utilize a system, they vary over time in each stage of the healthcare application implementation project, as well as between countries. It is remarkably dependent on the individual responses of clinician end users, such as their acceptance or rejection of information technology, as well as how (or even if) clinicians use information technology. This is because it is extremely difficult to collect data on clinicians' actual usage of information technology. The effectiveness of HIT is greatly dependent on these individual responses (Angst et al., 2010).

According to Handayani et al., (2017), it is critical that HIT be designed and implemented in a manner that is well received by all individuals who will be impacted. Users inside the organization should share connected medical information with external users via the HIT, and vice versa, in order to promote the highest level of health-care delivery. Users of HIT or any other similar technologies should be encouraged to participate in the development and implementation stages, which will increase user acceptability of HIT and associated technologies in general (Gagnon et al., 2010).

It is possible to increase the likelihood of IT adoption by providing favorable conditions, such as reducing practitioners' uneasiness with technology, examining and comprehending practitioners' perceptions of positive effects and the advantages of incorporating IT into their practice (Farokhzadian et al., 2020).

Sambasivan et al. (2012) hypothesized and demonstrated elements that may play a crucial influence in technology adoption and utilization using the UTAUT model. The researchers looked at the impact of a physician's perceived threat to professional

autonomy, his or her amount of engagement in the decision to install HIT, and his or her view that the new HIT would enhance work performance in the study. Also confirmed by the Oo et al., (2021) that prior to implementation, the readiness assessment was the most critical phase and a precondition obligatory for the accomplishment of HIT in terms of the rate of its acceptance by the population.

Garavand et al. (2016) in their case study has reviewed 156 articles concerned with the considerations that impact the acceptance of HIT and chosen 35 of them to use for research. They have done a summary of most affecting factors in order of importance – “perceived ease of use, perceived usefulness, social influence, facilitating conditions, attitude to use, and users’ behaviors”.

Looking from another perspective, physicians' motive has often been stated as being critical to adoption, despite the fact that actual data to support this claim is limited (Peng et al., 2016). Medical professionals are concerned with choices on whether or not to accept technology that will be employed in the treatment of patients. According to Peng et al. (2016), this is a significant difference when contrasted to adoption choices made in a consumer setting, where the acquired technology is employed for one's own benefit. As a result, an extra component reflecting doctors' incentive to increase patients' benefits via the use of medical technology is required (Teplensky et al., 1995).

Also, as per Kahneman (2013) “People prefer doing things the way they’ve always done it because the potential negative aspects of change loom larger than the potential gains”. As a result, practitioners in general might be afraid to change their working methods and prefer paperwork because they are unsure that they will not make a mistake in the new HIT system, which the brain interprets as a loss and uncertainty. In other words, they might fear that lack the needed competences to use the HIT. Therefore, how the change is introduced and presented to the users plays a significant role. According to research by Gagnon et al. (2012), the impression of proper “organizational infrastructure, training, and support” is one of the most critical elements that influences healthcare workers' adoption of telemonitoring. In general change is perceived as “more work” and management team should prepare for it by providing needed education, trainings and information. As correctly stated by Abbott et al. (2015) “during the change stage, change must occur, and target change group(s) must be convinced that the new way of doing things is better than the old.”

Therefore, management team should ensure the safe environment and minimize the fair of change for better technology acceptance by having and introducing

practitioners and nurses with clear reasons and benefits of change and clarifying the processes, responsibilities, steps and timeline for implantation period and later usage. It is also confirmed by Wu et al., (2007) and Handayani et al., (2017) who found that “management support had a direct impact on reported usefulness and perceived ease of use and is one of the key success factors”. In addition, the findings suggest that the backing of management and implementation team is a significant component that has a direct impact on the subjective norm and willingness to change, as they are responsible for the processes and the implementation strategy (Gagnon et al., 2014).

Various studies have attempted to comprehend the aspects that impact the behavior of people when confronted with a new technological innovation. There is a wide variety of theory that has been developed in try to anticipate and explain the behavioral intentions of users in connection to the adoption and usage of new technical developments. These ideas have been formed in many different ways. Even though the literature outlines, to some extent, the obstacles and facilitators to the adoption of ICT in healthcare settings, only a small number of studies have conducted an in-depth analysis to identify influential factors, some of them are provided in the table below.

Table 1. Cases reviewed for HIT acceptance

No	Title	Authors, years	Acceptance model used	Main findings
1	The PMA Scale: A Measure of Physicians' Motivation to Adopt Medical Devices	(Peng et al., 2016)	TAM	The motivation of doctors to embrace medical gadgets is measured using this scale.
2	Healthcare System-Use Behavior: A Systematic Review of ITs Determinants	(Wu, 2016)	Systematic review of cases	6 determinants that influence the use of HIT.
3	Intention to adopt clinical decision support systems in a developing country	(Sambasivan et al., 2012)	UTAUT	The intention to use is lower when there is a <i>perceived threat</i> , higher when there is <i>participation</i> , and even higher when there is a <i>belief</i> .
4	Using a Modified Technology Acceptance Model to Evaluate Healthcare Professionals' Adoption of a New Telemonitoring System	(Gagnon et al., 2012)	TAM	According to a study, the notion of proper organizational infrastructure, training, and support is the most critical element influencing healthcare workers' adoption of HIT.
5	Factors affecting the adoption of healthcare information technology	(Phichitchaisopa & Naenna, 2013)	UTAUT	Of all the primary factors, <i>performance expectation</i> had the most impact on behavioral intention.
6	Adoption of health information systems: Health professionals' perspective	(Owusu Kwateng et al., 2019)	UTAUT2	Additional moderating factor added – <i>education level</i> .

7	Factors Affecting Acceptance of Hospital Information Systems Based on Extended Technology Acceptance Model	(Nadri et al., 2018)	TAM2	<i>Users' behavior</i> variables are critical to the system's performance and should be taken into account.
8	Testing the technology acceptance model for evaluating healthcare professionals' intention to use an adverse event reporting system	(Wu et al., 2007)	TAM	As a factor, <i>management support</i> influenced perceived utility, perceived ease of use, and subjective norm.
9	Analysis of the factors influencing healthcare professionals' adoption of mobile electronic medical record (EMR) using the unified theory of acceptance and use of technology (UTAUT) in a tertiary hospital	(Kim et al., 2015)	UTAUT	End-users have favorable intents to employ and positive attitudes toward a system if it <i>improves their job performance</i> .
10	Implementation of an Electronic Medication Management System in a large tertiary hospital: a case of qualitative inquiry	(Vaghasiya et al., 2021)	UTAUT	The clinical <i>leadership</i> of the implementation team had a significant impact on HIT acceptance.
11	Assessment of the social influence and facilitating conditions that support nurses' adoption of hospital electronic information management systems (HEIMS) in Ghana using the unified theory of acceptance and use of technology (UTAUT) model	(Zhou et al., 2019)	UTAUT	The main influences on behavioral intention were found to be social influence and enabling environments.

Source: Created by authors

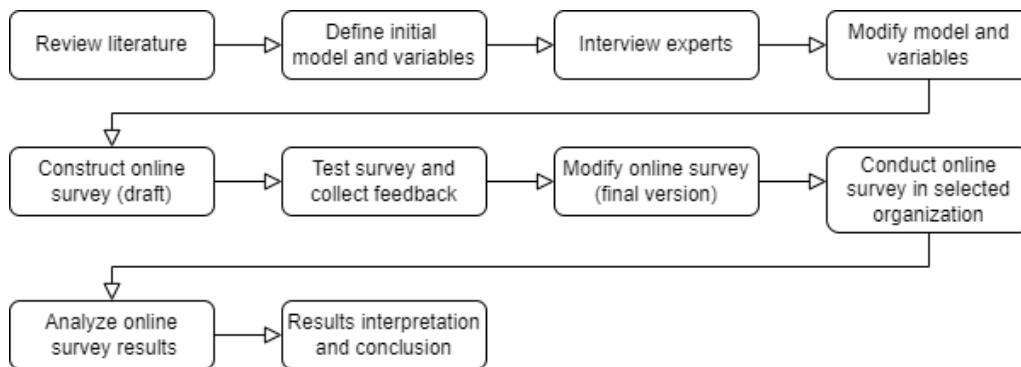
Based on the reviewed research and cases, the acceptability of HIT varies widely amongst enterprises and nations. It can be influenced by different aspects such as cultural, organizational, and demographic. More than that, a lot depend on the healthcare institution itself – the size, location or region, ownership etc. The management aspects play role as well, depending on what is the institutions budget, organizational readiness, technologies itself, IT knowledge and skills? And not to mention the human behavior, personal intentions and readiness to change, as the change itself might create the stress, therefore the resistance to transit from paper-based system to electronic one might be one of the obstacles (Peng et al., 2016, Wu, 2016, Chang et al., 2012, Oo et al., 2021).

### 3 Methodology

#### 3.1 Research method

The research included both qualitative and quantitative approaches to collect the data. In-depth semi-structured interviews with healthcare experts and a quantitative survey distributed to a broader sample of respondents were used to explore and corroborate the factors discovered in the literature research. For the research only the primary data were used, which as per Kotler and Armstrong (2015) is data gathered through surveys, focus groups, or personal interviews. Research methodology algorithm is provided in the Figure 3 below:

Figure 4. Research algorithm



Source: Created by authors

In the first step, we have researched the literature, conducted previous research, and case studies, from which we have identified and defined the most influential factors for HIT acceptance. Further on, we have chosen the experts with deep knowledge about Lithuanian healthcare system to discuss the technology acceptance perspective from their point of view, as well as to reconfirm the factors found in literature that might be specific for Kaunas Clinics. In this instance, the qualitative personal interviews have assisted in delving deeper into the subject of the study. Differently from what can be achieved with the structured survey, by using the qualitative interviews we wanted to get in-depth insights and flexibility of the topics to discuss with the interviewees. Expert interview is one of the best ways to get the details that might be important and not obtained during the survey (Ponto, 2015). More than that, during the interviews we could get immediate results which could lead to other directions and topics during the

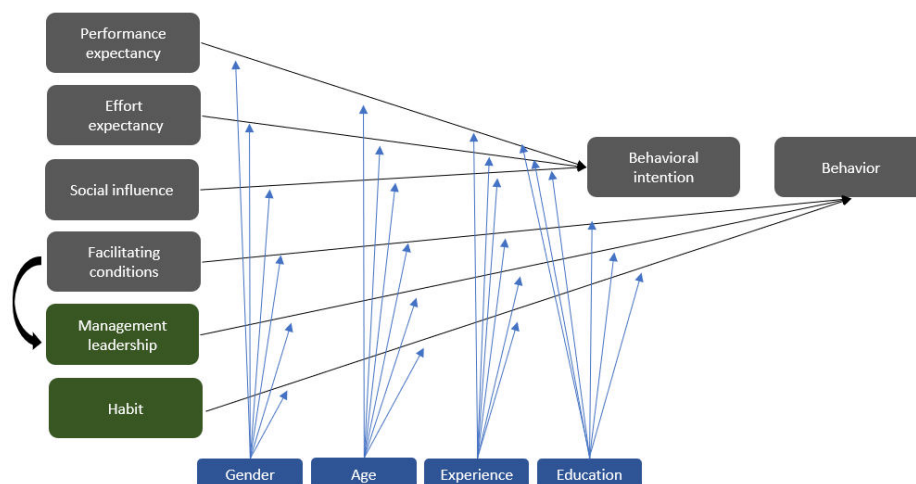


research or at least provide the insights to be included into the survey. As the research topic is relatively narrow and focused, we have agreed to conduct few (i.e., 3 to 5) in-depth interviews or to stop when the information becomes consistent or saturated (Fusch & Ness, 2015). We also took into consideration the importance of sample randomness and did our best to have different experiences and specialization among the interviewees.

We have prepared guidelines for the semi structured interviews (Appendix 8.2) and have used it during the discussions with the experts. Although we have moderated the interviews to ensure that all the questions were answered, we have used the option of reordering and elaborating on the questions or even asking additional questions as needed, which enabled us to discover further influential factors and insights. The execution of the interview required a deep understanding of the study problem, which we have gained via analysis of the academic literature and case studies. Interviews were held via the online platforms – Zoom and Teams in Lithuanian language (native language for the interviewees). Interview transcriptions have been converted from audio files and may be provided upon request.

The insights gained from the interviews were consistent and repetitive, and as a result, we have decided to discontinue the expert interviews after the fourth session. Based on the analysis of the literature, case studies, and expert interviews, we have proposed modified version of the UTAUT2 framework to be used to conduct the quantitative research of the HIT acceptance and use in Kaunas Clinics.

Figure 5. Modified UTAUT2 model used for the HIT acceptance and use research in Kaunas Clinics, Lithuania





Source: Created by authors based on interviews with experts

The insights collected during the interviews were used to validate and confirm the data collected during the literature review, as well as to account for potential cultural and professional variations. The insights were also helpful to prepare the questionnaire for the structured survey, as we have considered and implemented the suggestions in terms of survey questions' sequence and wording.

### 3.2 Survey design and sample

Second part of the research methodology was conducting a structured survey to ascertain the variables that impact practitioner motivation to accept and use HIT. The survey was selected as a means of contacting a large number of respondents in a short period of time. Due to the systematic and ordered nature of the surveys, the researcher collects a data set that is simpler to evaluate (Ponto, 2015). On the other hand, the information that has been obtained via survey is more credible and less susceptible to debate. As oppose to that, certain topics that were found later in the study process may not have been included in the surveys, and because of the large number of respondents, it is not feasible to follow up for additional explanations. However, both types of studies – quantitative and qualitative - have the potential to be subjective and deceptive, because they might be influenced by bias, personal attitude or even mood.

The questionnaire was developed using the framework of the UTAUT2 model, features identified during the literature research, and adaptations to the Lithuanian healthcare system based on in-depth interviews with experts. The questionnaire structure and reasoning are summarized in Table 2, and the whole questionnaire in local language is included in Appendix 8.3.

Table 2. Survey items and construction based on UTAUT2 model, experts' interview and other cases

1.	<b>PERFORMANCE EXPECTANCY (PE):</b>	<ul style="list-style-type: none"> <li>• PE1. HIT functionality corresponds to my needs.</li> <li>• PE2. I can save time for others when using HIT in my daily work.</li> <li>• PE3. Information entered by others (into HIT) is useful for me / saves time for me.</li> <li>• PE4. Use of HIT increases my work performance (I perform tasks better, more efficiently)</li> <li>• PE5. Using HIT improved quality of patients'</li> </ul>	<b>UTAUT</b>
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		<p>healthcare services.</p> <ul style="list-style-type: none"> <li>• PE6. Using HIT reduced my workload (compared to paper process).</li> </ul>	
2.	<b><i>EFFORT EXPECTANCY (EE):</i></b>	<ul style="list-style-type: none"> <li>• EE1. I know how to handle situations when I encounter errors using HIT.</li> <li>• EE2. Learning to use HIT was easy for me.</li> <li>• EE3. My interaction with HIT (UI) is clear and understandable.</li> <li>• EE4. Use of HIS strengthens my professional skills.</li> </ul>	
3.	<b><i>SOCIAL INFLUENCE (SI):</i></b>	<ul style="list-style-type: none"> <li>• SI1. My colleagues think that use of HIT is necessary at our work.</li> <li>• SI2. Patients are actively interested in their health history in National Health Record (eSveikata.lt).</li> <li>• SI3. People that work around me use HIT frequently.</li> </ul>	
4.	<b><i>FACILITATING CONDITIONS (FC):</i></b>	<ul style="list-style-type: none"> <li>• FC1. I have the knowledge necessary to use HIT.</li> <li>• FC2. I have the resources necessary to use HIT (i.e., workplace, computer, digital signature).</li> <li>• FC3. I received sufficient training before starting to use HIT.</li> <li>• FC4. When I have trouble using HIT and cannot solve it by myself, I know where to ask for help.</li> </ul>	
5.	<b><i>HABIT (HT):</i></b>	<ul style="list-style-type: none"> <li>• HT1. HIT is something that I use without thinking.</li> <li>• HT2. I use HIT frequently.</li> <li>• HT3. Using HIT is stressful for me.</li> </ul>	<b>UTAUT2</b>
6.	<b><i>MANAGEMENT LEADERSHIP (ML):</i></b>	<ul style="list-style-type: none"> <li>• ML1. My managers have explained me the benefits of using HIS.</li> <li>• ML2. My managers motivate me to use HIT.</li> <li>• ML3. My managers support me using HIT.</li> </ul>	<b>EXPERTS &amp; OTHER CASES</b>

Source: Venkatesh et al., 2012; Vaghasiya et al., 2021; Holden & Karsh, 2010; authors

The survey starts with an introduction and explanation of why the survey is being conducted and what the survey's objective is. Each participant was informed that their responses would be kept anonymous and private. We expect that the impact of the anonymous responder approach will be an increase in the response rate to the survey, as well as result into more honest answers to the posed questions.

The survey included all the elements listed in the Table 2 above, and each question was associated with one of the aspects from the research model – performance expectancy, effort expectancy, social influence, facilitating conditions, habit or management leadership. Survey was conducted using a close-ended questions, which are easier and quicker to answer, therefore respondents would more likely to respond.

Selected survey question type also helped us to obtain measurable primary quantitative data which later could be structured, analyzed and compared.

The survey was designed with the purpose of determining the parameters that have the greatest influence on HIT acceptance and gaining an understanding of how these factors correspond with moderating variables such as age, gender, education level, and years of work experience. The sequence of the questionnaire was done in order to have the repeating and re-confirming questions. Except for questions with moderating variables, all questionnaire items were scored on a rating scale from 1 to 5, which corresponds to the "strongly disagree" and "strongly agree" statements. Two open-ended question was created to ascertain respondents' top-of-mind selections of factors that mostly affect HIT adoption and job title, which respondents had to write in by themselves.

We have done test review of the questionnaire together with the Kaunas Clinics representatives, in order to address residual potential pitfalls or shortcomings of the questionnaire before the survey was distributed to wide circle of the respondents. The recommendations and tips helped to structure the questionnaire language, as well, it was suggested to remove the confirmational / repeating questions, which significantly shortened the questionnaire. The final survey questionnaire comprised of 32 questions (in comparison to the first draft of 40 questions) and could be responded to via the Qualtrics online platform. Questionnaire had to be translated to the Lithuanian language to make it accessible to the respondents. The link with the survey was distributed by Kaunas Clinics managers via respondents' work emails. Personalized links were used, in the sense that they were linked to the respondent's email address. This was done in order to ensure that the survey would be completed only once by each unique responder. Respondents were only able to complete the survey online. Time given for the answers were 2 weeks.

Participants of the study are healthcare professionals who use the health information technologies at Lithuania's Kaunas Clinics. Approximately 2000 respondents were planned to be targeted with the survey. It is worth mentioning that among the HIT user's vast majority belong to one of the two different homogenous population groups – practitioners and nurses, of different age, gender, education, and years of experience of working in Kaunas Clinics. Both groups are using HIT, but they might be using different programs or completing different tasks, therefore might have a different understanding of the acceptance and need for technology. Most of them are

used to work and can compare the paper-based systems used several years ago. Both groups are crucial in increasing the population's access to and quality of the healthcare.

The data collected from respondents will serve as a significant resource and major source of knowledge on what specifically motivates and influences practitioners to accept and use HIT in Kaunas Clinics. Comparing and contrasting them with those reported in the literature review and other case studies would be beneficial. Although the data was acquired from the practitioners of one specific hospital, the outcomes may be of interest and use to other Lithuanian healthcare institutions as well, as no similar research has been done yet.

### **3.3 Data analysis**

Data for the in-depth interviews was gathered and saved as audio files, which were later transcribed to written form. As the number of in-depth interviews conducted was low, no specific data analysis method was used. The most frequently mentioned factors that influence motivation to use the HIT using the UTAUT2 framework were identified and classified. The findings were used to confirm the factors discovered during the literature review and were applied to a survey conducted in Kaunas Clinic's hospital.

Data for the second – quantitative – part of the research was collected via online survey, conducted during the period from 2022 April 20<sup>th</sup> to 2022 May 4<sup>th</sup>. Management of Kaunas Clinics put effort and assistance to obtain a valid and trustworthy sample of replies. Distributed survey was opened by 194 respondents, out of which 140 responses were answered in full and hence were included into results analysis.

During the study, all survey data was recorded online on the surveying tool website (Qualtrics). After the designated survey period ended, survey results were exported to Microsoft Excel and to Microsoft Power BI for further analysis. Cross-tabulation data analysis method was used to find the relations and connection between the factors and moderating variables such as age, gender, experience, and education. The Power BI tool enabled us to evaluate and investigate survey data, as well as generate data visualizations, charts, and tables.

To present the influencing factors and moderating variables in a convenient way, response choices were converted to the numeric values. “Completely disagree” choice was converted to numeric value of -10, “Disagree” choice to -5, “Don’t know” to 0, “Agree” to 5 and “Completely agree” to 10, and average value was calculated. This way, any average below zero indicates that respondents tended to disagree (the larger the negative value, the stronger the disagreement), and vice versa – positive values indicate tendency of agreement (the larger positive value, the stronger the agreement).

### ***3.4 Methodology challenges and limitations***

Coronavirus illness (COVID-19) has claimed hundreds of thousands of lives in 2019, closed economies, country borders, unleashed global disruption. National healthcare systems and healthcare professionals have been pushed to the limits. While the study is being done, the Covid-19 virus is spreading at an alarming pace in Lithuania again. Therefore, we identify the risk that healthcare practitioners may not have time or energy or motivation to respond to the survey, what would result in limited amount of quantitative data. To mitigate the risk, we have tried to obtain the interest of the organization for the study, in order to facilitate and motivate practitioners’ participation. In the end, healthcare professionals’ participation in the quantitative research was satisfactory, with total of 194 respondents were gained, out of which 140 surveys were answered fully and were used for further analyses.

There is a possibility that the practitioners share information based on his or her perception of what is right and wrong or attempts to portray the topic in the best light possible. As proven in a case study of Peng et.al (2016) *personal bias* may have strong influence. For instance, from a social or moral standpoint, it is often considered undesirable for practitioners to confess that personal benefit motivated HIT adoption (e.g., for career development purposes), and so related elements are anticipated to indicate lower values. On the other side, bias toward the benefit of patients may be in the other direction, since assisting patients is seen as the practitioner's main objective. Therefore, we assume, that some of the dimensions could be affected by individual bias, because the HIT adoption is made by practitioners, whose personal goals are expected to play a role in acceptance decision. As Handayani et al., (2017) noted, “individual attitude is the most influential factor on individual acceptance of HIT”.

The quantitative data was obtained at a single healthcare facility in Lithuania; hence, the results should be limited to Kaunas Clinic and cautious implications should be drawn for the entire country.

As the survey was distributed on 2022 April 20<sup>th</sup>, the overall mood of interviewees may be depressed due to the outbreak of war in Ukraine on 2022 February 24<sup>th</sup>.

## **4 Results and Discussion**

The goal of the research was to determine what encourages (or discourages) practitioners in Kaunas Clinics to accept and use HIT and to understand motivational factors and individual behavior in the healthcare context.

To examine the adoption and usage of HIT in Kaunas Clinics, the UTAUT2 model was chosen as the theoretical basis. This model has strong theoretical foundation because it connects eight distinct ideas on user's acceptance of the technology, and it combines numerous models of human behavior theory. In addition, this model has a strong empirical base since it has been tested and validated. As per Venkatesh et al. (2003) the UTAUT2 in general may be used to identify factors that have the potential to influence the intention and the use of IT.

Detailed description of both components of the research – in-depth interviews and a structured survey – is presented in the following paragraphs.

### ***4.1 Qualitative – In-depth interviews***

The purpose of the in-depth interviews was to discuss and assess the UTAUT2 model's eligibility for Lithuania's healthcare system, as well as to determine whether all relevant criteria have been considered or if more elements should be included to the survey of practitioners. Therefore, four experts with broad knowledge and experience of Lithuania's healthcare system were chosen. At the time of the interview, each expert had different working experience and represented a valuable perspective in terms of HIT acceptance:

- Co-owner and the manager of the primary care clinics (~30 employees) in Marijampole, medium sized city of Lithuania.

- IT manager, co-owner and director of private IT company that has created health information system, which is deployed in more than 100 of Lithuanian healthcare organizations.
- Healthcare strategy consultant with experience of health information technology deployment in multiple countries (both at hospital level and national solutions level).
- Healthcare practitioner with experience of working at several different Lithuanian hospitals, and hands-on experience of multiple different healthcare information technology solutions used in Lithuania.

The interview results were evaluated to identify and quantify the factors indicated during the interviews that impact HIT acceptability, according to experts. Factors were indicated and marked accordingly based on the UTAUT2 framework after few considerations:

- It was determined that the *Price value* as the factor from the UTAUT2 model is not applicable for healthcare specialists and could be used more for understanding other industries (mobile, gaming and etc.), where consumers often face the financial expense of such use.
- *Hedonic motivation* – was described as the enjoyment or pleasure associated with technology usage (Brown & Venkatesh, 2005) which, after the discussion with experts, was understood not to be the influential factor for healthcare industry, therefore is excluded.
- On the other hand, it was agreed that keeping the *Habit* as a factor would be beneficial. The term "habit" refers to the extent to which individuals do things without conscious thought as a direct result of their prior learning (Venkatesh et al., 2012). Habits can be formed at different levels based on how much interaction and familiarity a person has with a target technology over time (i.e., experience). In light of the fact that Kaunas Clinics has been using the same HIT for a considerable amount of time led to the conclusion that it possibly has direct impact on the conduct of practitioners.
- Rest of the factors were left as proposed by the UTAUT2 framework.

In general, all the experts pointed out similar challenges that Lithuanian healthcare system in terms of technology usage and acceptance is facing. The factors highlighted by experts are summarized and presented in the Table 3 below.

The majority of experts have begun with and emphasized fundamentals such as the HIT usability and simplicity for the practitioners. Several components of the UTAUT2 model "*facilitating conditions (FC)*", such as a comprehensible interface, trainings, and help when the system is not functioning correctly, were cited, proving the factor's importance for the Lithuanian healthcare system.

Table 3. In-depth interviews summary

<i>Expert</i>	<i>Professional background and experience</i>	<i>Key factors mentioned (mapping with UTAUT2)</i>
Jonas Bieliauskas	The co-owner and manager of 2 private primary care clinics. Working experience 11 years.	<ul style="list-style-type: none"> <li>• Easy to use (EE)</li> <li>• Understandable interface (FC)</li> <li>• Leadership / management focus and engagement towards HIT (ML)</li> <li>• Training and support when bugs and mistakes happen (FC)</li> </ul>
Oleg Niaksu	PhD, Head of Health at AME International, Austria. eHealth consultant. 16 years' experience in digital healthcare transformation.	<ul style="list-style-type: none"> <li>• Change management is crucial (typical mistake is "big bang" approach when introducing new HIT components) (ML)</li> <li>• Support and training of users (FC)</li> <li>• Frequent problem – poorly thought-out processes, i.e., simple "paper" process transfers to HIT, lead to poor performance (EE)</li> <li>• HIT implementation is leadership and management exercise, not a technical one (ML)</li> </ul>
Evaldas Dobravolskis	Director of UAB Varutis. Providers of one of the most popular HIS system in Lithuania (used in ~100 healthcare organizations in Lithuania). Experience in HIT 10+ years.	<ul style="list-style-type: none"> <li>• Alignment between Organization and Practitioners expectations towards HIT (ML) (often it is missing)</li> <li>• Management should take leadership to align HIT vendors, Practitioners and other stakeholders (ML)</li> <li>• Tangible and clear performance improvements must be achieved and demonstrated publicly (PE)</li> <li>• No big quick wins. Process and behavioral changes take long time – months and even years (HT).</li> </ul>
Rūta Mereškevičienė	Medical doctor, working experience 4 years in Santaros clinic and several	<ul style="list-style-type: none"> <li>• IT literacy level, age, job security play crucial role in HIT</li> </ul>



	other organizations.	acceptance among practitioners (EE). <ul style="list-style-type: none"> <li>• In some clinics digital process duplicates paper process (but does not replace it) (PE).</li> <li>• Colleague gossip regarding HIT during coffee breaks has big influence regarding HIT acceptance (SI).</li> <li>• Availability of immediate IT support and consultation is crucial (FC).</li> </ul>
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Source: Created by authors

Other variables highlighted by experts relate to "*effort expectancy (EE)*," where it was suggested that IT literacy in general or even age might play a significant role in the acceptability of HIT, since it needs more effort to use for those who lack the necessary skills. From a "*performance expectation (PE)*" perspective, experts identified obstacles such as when HIT usage does not replace paperwork, but duplicates it, causing practitioners to lose motivation and question the value of such a performance as it increases their workload. While great examples of HIT performance should be highlighted and shared as a motivational best practice. R. Mereskeviciene presented other viewpoint during the interview, noting that "*social influence (SI)*" plays a role in hospitals in Lithuania as well, since coffee breaks and engagement with colleagues impact the perspective and intention to adopt HIT. The significance of "*habit (HT)*" as a determining factor was shown by the experts who stated that all behavioral changes need time and that HIT acceptance must become a routine after prolonged usage.

As a result of the in-depth interviews additional factor was determined and added to the UTAUT2 model, which was also confirmed by a literature review. All experts mentioned that "leadership team for HIT implementation" or "management support when launching the new technology" is crucial variable that influences how fast and if at all practitioners will accept the technology. Rather than only launching the new program technically, it is necessary to lead and manage the change with the participation of all stakeholders. It was also confirmed by Vaghasiya et al., (2021) case study where they concluded that "clinicians' acceptance of the HIT was highly influenced by the unique implementation strategy and leadership from the implementation team". Also, Handayani et al., (2017) and Wu et al., (2007) stated and proved in their studies that "key factor of successful HIT implementation program is strong management support".

The discussions with the experts have clarified and proven what was already indicated in the literature review, as well as led to the inclusion of additional important factor – Management leadership – into the model for quantitative research (Figure 4).

## 4.2 Quantitative – Structured online survey

For the structured online survey, we have collected 194 responses in total. 140 surveys (72% of the total) were answered fully. Only fully answered surveys were used for further data analysis.

The distribution of respondents across different moderating variables is presented in the table 4, allowing the typical survey respondent to be identified as a woman, aged 46 to 60, working in Kaunas Clinics for more than 10 years, and possessing at least a Master's degree in education.

Table 4. Respondents by gender, age, working experience and education

Gender	Count	%	Age	Count	%	Working experience	Count	%	Education	Count	%
Male	28	20%	Less than 30	9	6%	Less than 3 years	4	3%	Secondary education	0	0%
Female	110	79%	31-45	47	34%	3-6 years	18	13%	Higher education	6	4%
Do not want to disclose	2	1%	46-60	72	51%	7-10 years	19	14%	Bachelor degree	12	9%
			More than 61	12	9%	More than 10 years	99	71%	Master degree	72	51%
									Doctor degree	48	34%
									Other	2	1%

Source: created by authors using survey results.

Majority of the respondents (79%) were women, followed by 20% of men and 1% of those who did not want to disclose their gender. Majority of the respondents were between the ages of 46 and 60 years old (51%), followed by those between the ages of 31 and 45 (34%), those older than 61 (9%) and those younger than 30 (6%).

71% of the respondents have been working in Kaunas clinics for more than ten years and only 3% have been with the hospital for less than three years. A minimum of a bachelor's degree is held by most respondents (94%).

In the following chapters, detailed survey result analysis and discussion is presented in accordance with the research framework (Figure 4).

### 4.2.1 Survey results

140 fully answered surveys were included in the results analysis. Overall distribution of the response choices to the different questions is presented in the Table 5

below. Columns 1 to 5 mean response choices ranging from “Completely disagree” (1) to “Completely agree” (5).

Table 5. Summary of the survey questions and answers

Questions	1	2	3	4	5	Total
<b>Performance expectancy</b>	<b>92</b>	<b>221</b>	<b>146</b>	<b>268</b>	<b>111</b>	<b>838</b>
HIT functionality corresponds to my needs.	22	62	7	43	6	140
I can save time for others when using HIT in my daily work.	16	28	29	45	22	140
Information entered by others (into HIT) is useful for me / saves time for me.	3	11	13	74	38	139
Use of HIT increases my work performance (I perform tasks better, more efficiently)	11	33	25	49	21	139
Using HIT improved quality of patients' healthcare services.	10	35	58	26	11	140
Using HIT reduced my workload (compared to paper process).	30	52	14	31	13	140
<b>Effort expectancy</b>	<b>48</b>	<b>147</b>	<b>95</b>	<b>217</b>	<b>51</b>	<b>558</b>
I know how to handle situations when I encounter errors using HIT.	18	44	29	43	5	139
Learning to use HIT was easy for me.	6	17	7	77	32	139
My interaction with HIT (UI) is clear and understandable.	9	42	30	54	5	140
Use of HIS strengthens my professional skills.	15	44	29	43	9	140
<b>Social influence</b>	<b>5</b>	<b>39</b>	<b>99</b>	<b>122</b>	<b>153</b>	<b>418</b>
My colleagues think that use of HIT is necessary at our work.	1	11	37	67	23	139
Patients are actively interested in their health history in NHR (eSveikata.lt) system.	3	26	62	44	5	140
People that work around me use HIT frequently.	1	2		11	125	139
<b>Facilitating conditions</b>	<b>29</b>	<b>104</b>	<b>47</b>	<b>285</b>	<b>95</b>	<b>560</b>
I have the knowledge necessary to use HIT.		10	17	89	24	140
I have the resources necessary to use HIT (i.e., workplace, computer, digital signature).	2	16	1	76	45	140
I received sufficient training before starting to use HIT.	23	54	11	45	7	140
When I have trouble using HIT and cannot solve it by myself, I know where to ask for help.	4	24	18	75	19	140
<b>Habit</b>	<b>34</b>	<b>94</b>	<b>29</b>	<b>129</b>	<b>134</b>	<b>420</b>
HIT is something that I use without thinking.	4	23	15	77	21	140
I use HIT frequently.	1	9		24	106	140
Using HIT is stressful for me.	29	62	14	28	7	140
<b>Management leadership</b>	<b>67</b>	<b>134</b>	<b>90</b>	<b>110</b>	<b>18</b>	<b>419</b>
My managers have explained me the benefits of using HIS.	24	46	24	40	6	140
My managers motivate me to use HIT.	18	30	41	42	8	139
My managers support me using HIT.	25	58	25	28	4	140
<b>Total</b>	<b>275</b>	<b>739</b>	<b>506</b>	<b>1131</b>	<b>562</b>	<b>3213</b>

Source: created by authors using survey results.

**Performance expectancy** (PE) in general was perceived more positively (45% of the respondents) than negatively (37% of the respondents). Absolute majority of the respondents (81%) agree that the information entered by others into HIT is valuable to them and saves time. However, when it comes to entering information by themselves, only 47% of respondents believe that the information they enter would save time for others. 58% of respondents think that using HIT does not reduce workload, even when compared to the paper-based process. While reviewing other research cases, there are many that emphasize the advantages of using the HIT, and only a few that have identified negative side-effects, such as in the case by Abbott et al. (2015) who discovered that for the healthcare professionals using the HIT expectation for the productivity (tasks completed) might increase, which leads to the overall increase of the workload. To summarize, performance expectation is polarized and has significant impact in the Kaunas Clinic's for the HIT acceptance and use. Practitioners do comprehend the advantages of the HIT and the information sharing, which enhances their intent to use the HIT, however large part of the respondents are discontent how the HIT supports (or even hinder) their performance.

**Effort expectancy** (EE) factor also shows similar polarization that was discussed in the PE. Responses agreeing that the HIT in general is easy to use (48%) are more prevalent than those disagreeing (35%). However, when asked whether it was simple to learn to use HIT, 78% of answers confirmed that there were issues throughout the learning process. EE factor importance is proven in the literature review and other studies, which state that perceived usefulness and ease of use contribute to a “positive attitude towards using the system” (Vaghasiya et al., 2021).

**Social influence** (SI) factor was perceived more positively. 29% of respondents agree and 37% strongly agree that other colleagues see the necessity of using HIT and use it very frequently (89%). However, when asked about patients, large part of the respondents (44%) did not know whether information added to the HIT benefits the patients and whether patients are taking active interest in it. During the in-depth interviews, however, the value of interacting with coworkers and working environment was also cited as a crucial aspect which can influence the willingness to use the technology in the hospital.

In Kaunas Clinics **Facilitating conditions** (FC) was identified as strongest positively perceived factor for the HIT acceptance and use. 81% of the respondents agree or strongly agree that they have obtained the necessary knowledge to use HIT,

and 86% confirm that they have all of the essential resources and infrastructure to use HIT (workplace, computer, means of digital signature, etc.). However, just 37% of respondents have received sufficient trainings before starting to use HIT, and majority of the respondents (55%) think that their training to use HIT was insufficient. According to Vaghasiya et al. (2021) and Gagnon et al., (2013), IT infrastructure, the availability of sufficient computers, software itself and a bug-free system are among the most influential factors on HIT acceptability and creates the biggest barriers for the fluent usage. Furthermore, trainings are often cited as a crucial aspect that expedites the practitioners' adoption of new technologies (Redwood et al., 2011, Gagnon et al., 2013).

Using the HIT without thinking – *Habit* (HT) – was the fifth researched factor that influences HIT acceptance and use. Absolute majority of the respondents (93%) confirmed that they use HIT regularly or very frequently (i.e., many times on every day). And based on the responses use of HIT does not create stress for 65% of users. The results correspond with the data mentioned in in-depth interviews, as well as other research done, for example Owusu Kwateng et al., (2019) proves that habit is positively affecting adoption, so management team should consider how to influence the practitioners' behavior toward the continuous use of the systems.

The last factor that is not included in the original UTAUT2 framework, however after the case studies review and in-depth interviews with the experts we decided to include in our research model was *Management leadership* (ML). In Kaunas Clinics case, ML was the factor with the largest proportion of negative answers (48%), and also the factor with most strongly expressed “Strongly disagree” attitude (16% among all the respondents), what indicates missed opportunity for managers to take active supporting and leadership role in the HIT acceptance and use. On the other hand, notable 31% of the answers confirmed positive experience with the management leadership towards the acceptance of HIT. Reviewed literature suggests that when healthcare professionals participate in the decision-making process, are included in the implementation stage, and clearly know the benefits of the new HIT, they are more likely to have positive attitude towards it. Similarly, the need of continued support and encouragement from management team remains also after the implementation stage (Abbott et al. (2015), Wu et al., (2007), Handayani et al., (2017)).

Following chapters explore the survey results based on how moderating variables affect the influencing factors defined by the research model. Results are presented based on the “Moderating variable impact across research model dimensions”

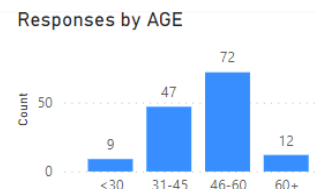
and “Responses distribution within that factor” metrics. In order to present the moderating variable impact to the influencing factors in a convenient way, “Completely disagree” choice was converted to the numeric value of -10, “Disagree” to -5, “Don’t know” to 0, “Agree” to 5 value and “Completely agree” to 10, then average value was calculated. Hence, negative average indicates general disagreement (the lower the average, the stronger disagreement), and positive average indicates general agreement.

#### 4.2.2 Moderating variable – Age

Age, as a moderating variable, had a significant impact on the influential factors. Most positive attitude towards PE, EE, SI and HT was observed in the youngest respondents (age below 30 years), and most positive attitude in FC and ML was observed in the oldest respondents (age over 60 years). “Valley of despair” is observed in the age group of 31 to 45 years, with most negative attitude across five influence factors, only slightly recovering in the age group 46 to 60. Acute lack of management leadership (ML at -2,93) is expressed across the 31 to 45 years age group.

Table 6. Factors influenced by the moderating variable “AGE”

AGE	Performance	Effort	Social	Facilitating	Habit	Leadership	Total
<30	3,15	2,92	6,11	2,64	6,11	-0,19	<b>3,36</b>
31-45	0,25	-0,40	4,24	1,44	4,18	<b>-2,93</b>	<b>0,96</b>
46-60	0,06	0,75	4,35	3,39	4,56	-1,02	<b>1,76</b>
60+	2,22	2,81	5,56	4,69	5,97	0,69	<b>3,48</b>
<b>Total</b>	<b>0,51</b>	<b>0,68</b>	<b>4,53</b>	<b>2,79</b>	<b>4,65</b>	<b>-1,46</b>	<b>1,75</b>



Source: created by authors using survey results.

Results interpretation and post-survey discussions with the experts suggest explanation that as most HIT hands-on activities (i.e., data entry) is performed by the residents and young doctors, users in the <30 age group become adept at using the HIT, achieve good performance, ease of use, and habit much quicker than other age groups, and consequently – demonstrate more positive attitude towards HIT across all factors. HIT users who perform less hands-on actions on HIT (i.e., senior doctors from the middle age groups) struggle with achieving performance benefits, have more difficulties with HIT, have high requirements for HIT and as a result demonstrate worse attitude

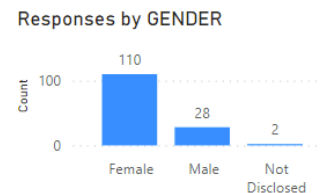
overall. Age group of 60+ years has fewer personal requirements towards HIT overall, and by accepting the HIT “as is”, demonstrate positive attitude. Social factor of workplace preserving plays an important role, hence this age group is less demanding towards HIT overall and appreciate the management (highest score in ML) and any external help (highest score in FC) the most.

#### 4.2.3 Moderating variable – Gender

Gender as the moderating variable did not have significant influence on the factors. Survey results show that there is minor difference in males appreciating the PE slightly more positively than females, however males perceive all other factors slightly more negatively than females, with EE and ML factor differences being little bit more expressed than the rest (ML -2,20 vs -1,26 and EE 0,18 vs 0,89).

Table 7. Factors influenced by moderating variable “GENDER”

GENDER	Performance	Effort	Social	Facilitating	Habit	Leadership	Total
Female	0,50	0,89	4,66	2,90	4,83	-1,26	<b>1,86</b>
Male	0,80	0,18	4,11	2,63	4,11	-2,20	<b>1,48</b>
Not Disclosed	-3,33	-3,75	3,33	-0,63	2,50	-1,67	<b>-1,09</b>
<b>Total</b>	<b>0,51</b>	<b>0,68</b>	<b>4,53</b>	<b>2,79</b>	<b>4,65</b>	<b>-1,46</b>	<b>1,75</b>



Source: created by authors using survey results.

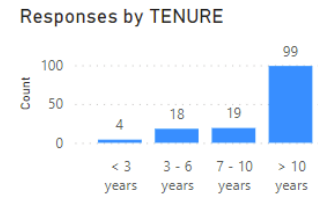
Respondents that chose not to disclose the gender were too few for us to draw any conclusions.

#### 4.2.4 Moderating variable – Experience

Respondents’ work experience (tenure) at the Kaunas clinics as the moderating variable had significant impact on the factors. Distribution of the responses was heavily tilted towards the group with more than 10 years of work experience at Kaunas Clinics.

Table 8. Factors influenced by moderating variable “TENURE” (work experience)

TENURE	Performance	Effort	Social	Facilitating	Habit	Leadership	Total
< 3 years	3,75	0,94	5,00	2,50	2,50	-1,67	<b>2,34</b>
3 - 6 years	1,16	0,35	4,81	0,97	4,17	-1,76	<b>1,47</b>
7 - 10 years	-0,31	0,20	4,12	2,37	4,82	-2,37	<b>1,22</b>
> 10 years	0,41	0,82	4,54	3,22	4,80	-1,22	<b>1,87</b>
<b>Total</b>	<b>0,51</b>	<b>0,68</b>	<b>4,53</b>	<b>2,79</b>	<b>4,65</b>	<b>-1,46</b>	<b>1,75</b>



Source: created by authors using survey results.

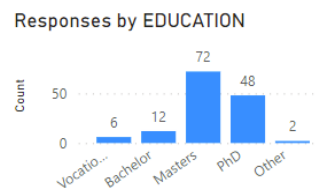
However, the number of responses in other groups allowed us to draw meaningful conclusions, which are rather similar to those of the Age moderating variable – respondents with least tenure (less than 3 years) have strong positive attitude towards PE (3,75), and, interestingly, the lowest HT score (2,50), possibly either indicating that this group perceive other users, majority of whom are with longer tenure, to have less habit in using HIT than they have. “Valley of despair” is observed at the respondents’ group with 7 to 10 years of tenure, which is the only group with negative attitude in PE and clearly worst ML score. On the other hand, FC is lowest in the 3 to 6 years of tenure group. Respondents with tenure above of 10 years again shift towards more positive attitude across all the factors.

#### 4.2.5 Moderating variable – Education

Education as the moderating variable displayed strong and unexpected effect on the influencing factors. In PE and ML, the perception of the factors has gotten increasingly negative with increasingly higher education levels. For EE and SI factors, there was no difference between Masters and PhD levels of education, however Bachelor and Vocational education respondents scored significantly more positive (adhering to the observable trend that the higher education the more negative perception of the influencing factor). FC and HT rebounded slightly at the PhD level, with lowest score being at Masters education level.

Table 9. Factors influenced by moderating variable “EDUCATION”

EDUCATION	Performance	Effort	Social	Facilitating	Habit	Leadership	Total
Vocational	2,14	2,29	5,83	3,13	5,83	2,22	<b>3,32</b>
Bachelor	0,97	2,40	5,83	3,96	5,69	1,11	<b>3,01</b>
Masters	0,75	0,37	4,37	2,01	4,10	-1,65	<b>1,50</b>
PhD	-0,03	0,39	4,31	3,41	5,10	-2,40	<b>1,57</b>
Other	-2,92	3,75	4,17	8,13	4,17	1,67	<b>2,61</b>
<b>Total</b>	<b>0,51</b>	<b>0,68</b>	<b>4,53</b>	<b>2,79</b>	<b>4,65</b>	<b>-1,46</b>	<b>1,75</b>



Source: created by authors using survey results.



Although findings in other studies confirm that there is a direct link between a person's education and the rate at which they embrace new forms of technology, and that higher education increases the likelihood that a person will adopt new technologies more readily (Owusu Kwateng et al., 2019), research results at Kaunas clinics show that healthcare setting might be unique in regarding Education moderating variable. Healthcare domain and HIT complexity dictates different expectations of the HIT users, and HIT not being perfect quickly results in educated users being frustrated with the HIT and demonstrating negative perceptions towards influencing factors.

Respondents in “Other” education group were too few to draw conclusions.

#### 4.2.6 Moderating variable – Tasks

Additional moderating variable “TASKS” was explored, to analyze how the perception of the factors differs based on the tasks that the respondents perform using HIT. Respondents could choose multiple tasks that they perform using HIT.

Table 10. Factors influenced by moderating variable “TASKS”

Tasks	Performance	Effort	Social	Facilitating	Habit	Leadership	Total
Registration	0.39	1.17	4.56	2.58	4.44	-1.00	<b>1,80</b>
Outpatient	-0.36	-0.31	4.32	2.71	4.31	-2.83	<b>1,08</b>
Inpatient	0.51	0.55	4.84	2.45	4.91	-1.75	<b>1,70</b>
Laboratory	0.59	0.59	4.56	2.57	4.90	-2.04	<b>1,67</b>
Radiology	0.77	0.47	4.71	2.75	5.13	-2.04	<b>1,78</b>
Prescription	0.17	-0.28	4.55	2.68	4.66	-2.57	<b>1,33</b>
Referrals	-0.62	-0.70	4.12	2.73	4.48	-2.85	<b>0,94</b>
SPF forms	-1.08	-0.22	4.22	1.25	5.29	-1.47	<b>0,95</b>
NHR forms	-0.55	-0.26	4.21	2.47	4.69	-2.71	<b>1,06</b>
Reports	1.61	2.58	5.00	3.25	5.56	1.11	<b>2,96</b>
Other	0.56	1.79	4.37	2.62	5.08	-1.75	<b>1,92</b>
<b>Total</b>	<b>0,51</b>	<b>0,68</b>	<b>4,53</b>	<b>2,79</b>	<b>4,65</b>	<b>-1,46</b>	<b>1,75</b>

Source: created by authors using survey results.

Overall complexity and diversity of the Kaunas clinics processes is well exposed via performed tasks moderating variable, and the results show significant impact of the variable. Most negative perception of the PE, FC was among the respondents working with SPF forms (State Patient Fund forms, that relate to the billing and reimbursement processes). Another group of poor PE perception was among respondents using Referral and NHR forms (National Health Record – health data forms) functionalities. EE factor is worst among the Referral users, indicating perceived complexity, and effort-heavy

functionality. Consistently poor perception across factors was observed among Outpatient functionality users. Registration, Radiology, Laboratory and Inpatient task groups displayed consistently better perception of factors than Outpatient, SPF forms, Referrals.

ML factor is perceived negatively virtually across all the task groups, with the single exception of Reports task group. This observation is explainable by the assumption that the managers do actively use the HIT Reports functionality, show attention and appreciation to the HIT users working with the Reports, and this is reflected in the Reports task group scoring the most positive results across all six factors.

Results analysis and follow-up discussions with experts disclosed multiple viable explanations of the results. SPF forms in general are most complex, and related to financial results of the Clinics, and HIT that Kaunas Clinics use does not yet facilitate the process to the extent that is expected by the users. HIT users working with Outpatient, Referral, Prescription processes are generally under consistent time-pressure (i.e., 12 - 15 minutes per patient visit), so any shortcoming of the HIT performance is acutely expressed in HIT user's negative perception. Therefore, results of mentioned processes are consistently worse than the results observed in less time-dependent processes (inpatient, laboratory, radiology), where HIT is accepted and used noticeable more positively.

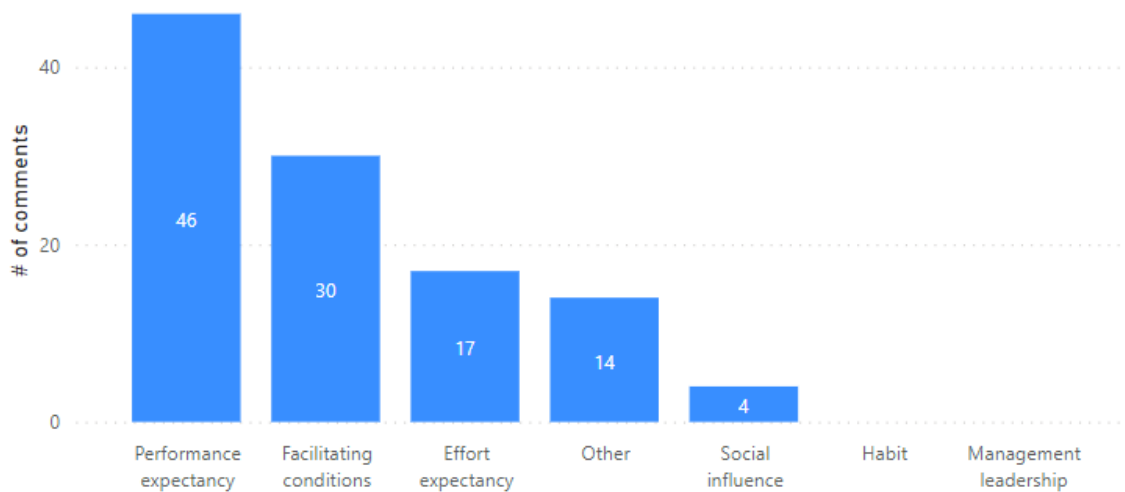
#### *4.2.7 Open-ended question regarding the respondent's motivation to use HIT*

After answering close-ended questions in the survey, respondents were asked to indicate the factor (or a few) which would motivate them personally to better accept and use the HIT. Out of the 140 responses 82 individuals (59%) answered the open-ended question. Surprisingly, just a couple of the replies were one or two words long; the rest were thorough explanations of personal views and experiences, with actual examples and highlighting the issues that prevent them from efficiently using the HIT. Active responses to the open-ended question are clear evidence that the researched topic is sensitive and important subject for the respondents.

To compare the open question findings with the survey results, all the responses were analyzed and categorized based on the research framework. Some responses (especially containing multiple insights) were mapped to more than one factor. Detailed

responses to the open question are submitted together with the quantitative data set and can be provided upon request.

Figure 6. Number of mentions of different factors in answers to the open question.



Source: created by authors using survey results.

Answers to the open question enabled to infer that when no explicit request to pick one of the options was provided, most respondents indicated some aspect of the *performance expectancy* (41%) that would most motivate them to accept and use HIT more. Performance expectancy enables users to seek, get, and use the information more rapidly, saving time and achieving higher efficiency. On the other hand, several respondents mentioned that they are still duplicating the same information recorded into HIT into paper-based documents as well, because the users are concerned that the information might get lost due to HIT not properly working. This further corresponds with *facilitating conditions* outlined by 27% of all open question answers. More than 15% of respondents perceive that reduction of the amount of effort (*effort expectancy*) to use HIT would motivate most. *Habit* was not mentioned at all as the most motivating

influencing factor, which is not a surprise, as more than 93% of the respondents already use the system daily.

Respondents answered in detail on the current challenges that Kaunas Clinics are experiencing regarding HIT acceptance and use from the practitioners' perspective, for example:

- Kaunas Clinic's HIT is not fluently connected with other healthcare systems, for example national healthcare record
- HIT is very slow with a lot of bugs and interruptions
- More reports and different views of the HIT data would be welcomed
- HIT is not specialized based on the different department and user needs
- HIT could have more user-friendly interface, as some of the functions are hard to understand and use, a lot of unnecessary windows, buttons, and functions
- Lack of HIT training
- Duplicating HIT process with paper-based process.

In general, open question supports what was discovered during the in-depth expert interviews or survey within the close-ended questions, as well as in the literature review, as Gagnon et al. (2013) summarizes “the factors reveal that users want a functional, accessible, and supported e-prescribing system that responds to their professional needs”.

## 5 Conclusions and recommendations

### 5.1 *Conclusions and managerial implications*

Summarizing the research results and discussion, we conclude that thesis answers the posed research question “What factors determine HIT acceptance and use from the healthcare professional’s perspective?” in a multi-faceted way.

First, the constructed research model (extended version of the UTAUT2) was successfully applied in Lithuania’s tertiary level hospital setting and research results has empirically proven acceptance factors relevance to the local healthcare system. Evidence for hospital management on the factors that influence HIT acceptance and use and minimize the risk of HIT rejection by the practitioners and nurses was demonstrated. In Kaunas Clinics case, Social Influence, Habit and Facilitating conditions having positive effect on the HIT acceptance and use. Performance expectancy and Effort expectancy have polarized attitude of either slightly positive or slightly negative across the respondents. Management leadership was identified as the factor with most uncovered potential for positive impact towards HIT acceptance and use.

Second, the factors that determine HIT acceptance and use, are perceived significantly differently across the moderating variables of age, tenure, and education. Users of HIT in Kaunas Clinics form multiple different clusters, and from management perspective, uniform approach towards the whole HIT userbase is sub-optimal. Different messages and managerial decisions must be tailored to the different clusters of users.

Third, HIT acceptance and use varies greatly across different domains of Kaunas Clinics. HIT users from inpatient, laboratory, radiology, reports domains perceive HIT systematically more positively than HIT users from outpatient, billing forms, national health record forms domains. These findings can also be used by HIT implementors for understanding of behavioral factors of HIT users, so that HIT implementations could be planned and executed more efficiently.

Research findings and conclusions lead to a series of managerial recommendations:

- Increasing HIT acceptance and use is in large part a change management challenge, in which the role of the manager is critical. Recommendation is to

involve the middle-management as the ambassadors of the change, who proactively communicate the benefits and the reason “why to use HIT?” to the HIT users.

- Necessity to involve the top management into the HIT rollout initiatives cannot be over-emphasised. Recommendation is to leverage top management communication to continuously build and strengthen trust, support, and credibility towards the HIT initiatives. As HIT is at the core of many hospital business processes and is definitely to stay for the foreseeable future, recommendation is to consider and accommodate HIT related aspects into the vision and the strategy of the organization.
- At the core, HIT is supposed to support and improve healthcare service provision. Recommendation is to continuously improve HIT components, setting the priority to the most problematic areas as per “performance expectancy” factor: state patient fund related forms (billing), referral and outpatient functionality. Recommendation is to proactively communicate the gains in HIT functionality in mentioned areas, for the largest gains in overall HIT acceptance in the Kaunas Clinics. Answers to the survey’s “Open question” contain multiple suggestions by the HIT users themselves, from small “quality of life” improvements to the major development directions.
- Recommendation is to address different user groups with different messages, i.e., to find ways to reinforce the positive attitude towards the HIT of both the youngest, low tenure (i.e., residents) and the most senior age groups, and on the other hand to find ways to motivate and break the scepticism towards the HIT of the most educated, middle-aged group of users.
- Recommendation is to leverage the strength of the Social influence factor to build a network of „HIT ambassadors“ who would lead by example and promote the HIT usage among their local circles, positively affecting HIT acceptance and use. Vice-versa recommendation is also applicable – identify the opinion leaders with negative attitude towards the HIT acceptance and use, and resolve the root causes of such behaviour.
- Recommendation is to strengthen continuous HIT onboarding, training and support processes, to resolve HIT users‘ concerns and issues as soon as possible so that HIT users do not develop chronic negative attitude towards HIT.

Recommendation is strongly supported by the HIT users answers to the open question on motivating factors to use HIT, where need and appreciation of facilitating conditions is indicated.

## **5.2 Limitations**

Quantitative research was conducted at the single large tertiary healthcare provider, so research findings and conclusions might not be generalizable across all the healthcare providers in Lithuania (or Baltic states), or across different care settings (i.e., primary care clinics).

Research was conducted during the Covid-19 pandemic and geopolitical instability period, which might have caused respondents to have lack of time, energy, or motivation to respond to the survey. Hospital management support and encouragement of practitioners' participation was key to obtain significant data sample to draw representative conclusions (in total 194 survey responses were received, out of which 140 were answered in full and used for further analysis). Respondents' distribution across the age, gender, tenure and education could not be quantitatively validated across the whole respondents' population due to the lack of the official data. Qualitative assessment is that the respondents' sample is representative.

Personal bias and social norms might have had impact towards some of the answers. For example, for a respondent to admit lack of personal tech savviness might be less favorable option than to demand more robust HIT or better facilitating conditions. Similarly, in general public helping patients is seen as the practitioner's main goal, so answers to the questions about use of HIT for the better patient benefits could be shifted towards the positive end of the spectrum.

Financial factors were out-of-scope of this paper, due to Kaunas Clinics being a public organization, where in general case HIT usage is free-of-charge from personal practitioner's perspective. Therefore, we made the assumption that adding financial factors to the research model would not add value for the purpose of this paper.

## **5.3 Further research ideas**

Research presented in this paper can be developed in several directions. One, is to apply the same quantitative survey research model across multiple healthcare organizations in Baltic states using comparably similar HIT (i.e., other large tertiary hospitals in Lithuania, Estonia, using the HIT of the same providers as used by Kaunas

Clinics). Another research direction can be to apply the same quantitative survey research model across healthcare organizations using significantly different HIT set-ups (i.e., organizations that use HIT by the world-leading providers, i.e., Epic or Cerner, or, on the opposite end of the spectrum – organizations that use lean and small local HIT solutions).

Further research will benefit to include organization's perspective as well – HIT introduction in the hospital setting is constrained by various legal, financial, technical aspects, which most definitely have the impact on the acceptance. Government involvement role, level and support impact towards the HIT acceptance can also be explored as an additional research direction.

As HIT use in healthcare processes is a complex domain, further qualitative research on HIT acceptance and use in specific contexts has a lot of potential to uncover impactful factors and insights, that could be used to elaborate the proposed or create new quantitative research models.



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## 7 Appendices

### 7.1 Supplementary Figures

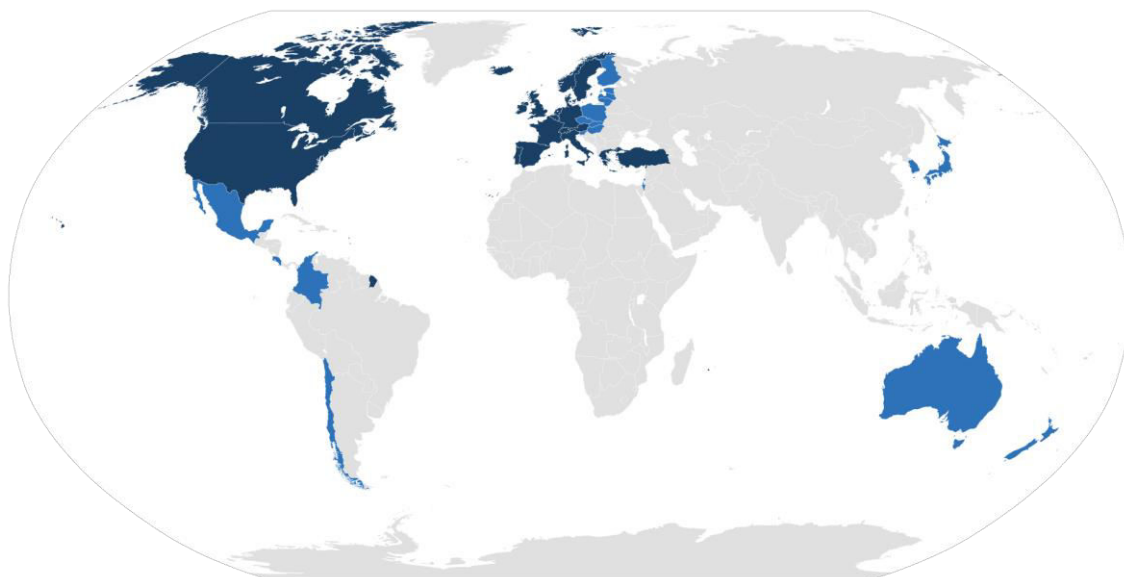


Figure 1. OECD countries ([www.oecd.org](http://www.oecd.org))

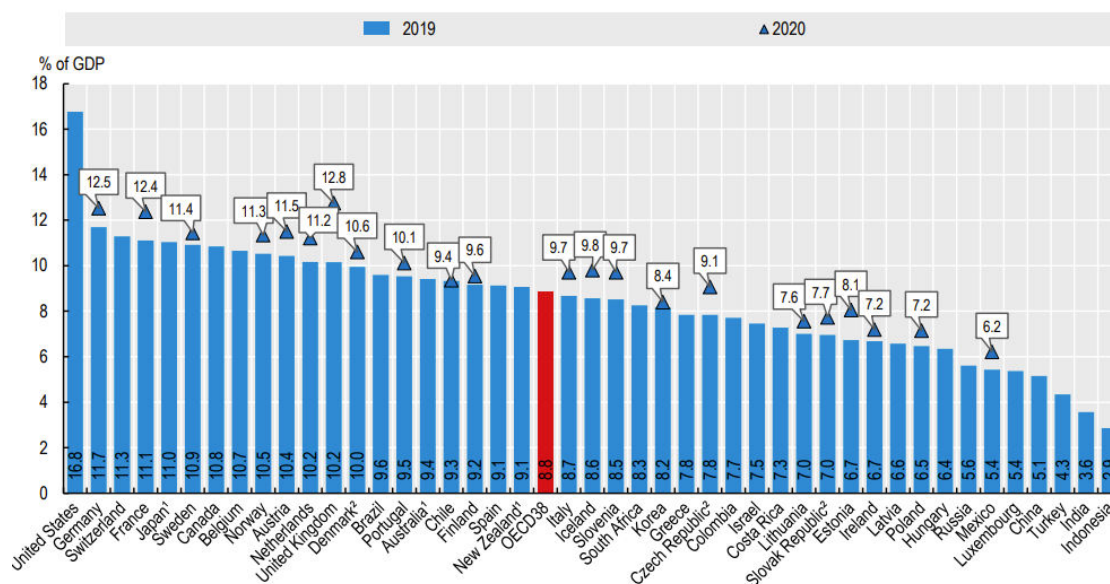


Figure 2. Health expenditure as share of GDP, 2019 and 2020 (OECD, 2021).



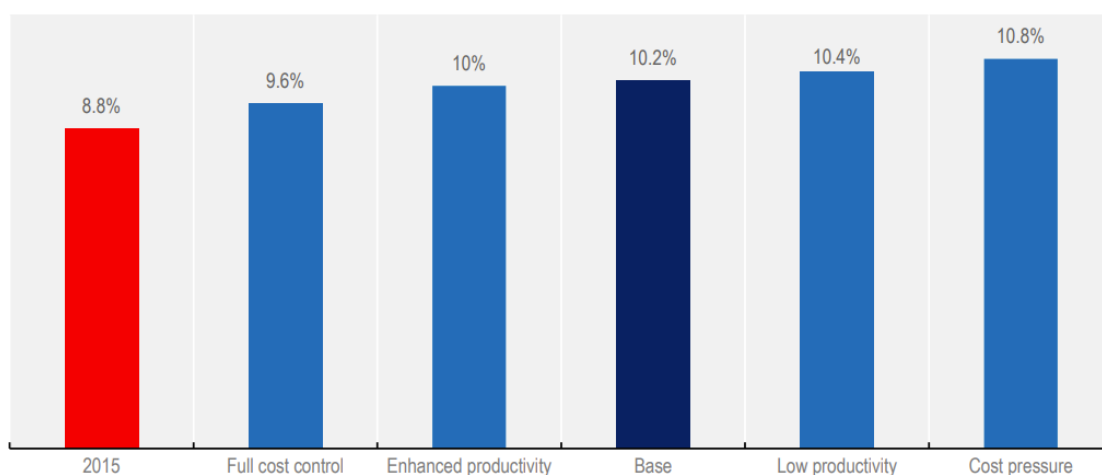


Figure 3. Health spending as a share of GDP, full range of scenarios 2030 forecast, OECD average (OECD, 2019).

## 7.2 Questions for expert interviews.

*We are Executive students at Riga's Stockholm School of Economics, and our research focus is on individuals' acceptance of Information Technology and on the factors that influence their decision to use it or to reject it. Existing academic research shows that although healthcare sector invests heavily in the technologies, there are multiple challenges, such as low practitioner involvement and motivation, failed implementations, resulting in no or limited benefits realized by using the technology. We would like to ask you as an expert with extensive knowledge and expertise of the country's healthcare system to contribute towards our research by answering and discussing the following questions:*

- What is your work experience and position?
- What kind of healthcare information technology (HIT) is used in your organization?
- How would you describe the HIT you know or were using?
- What were (top 3) most important factors that contributed to the success of HIT acceptance among healthcare practitioners?
- What were the factors (if any) that hindered the HIT acceptance among healthcare practitioners?
- Based on your experience, do you find HIT easy to use?

- Given the opportunity, what would you have changed when planning upcoming HIT deployment / upgrade to increase the HIT acceptance among healthcare practitioners?
- Does HIT improve the efficiency of practitioner? Please provide examples.
- Does HIT improve the efficiency of healthcare organizations as a whole? Please provide examples.
- Does HIT have a negative impact on the efficiency of the practitioner? Please provide examples.
- Does HIT have a negative impact on the healthcare organization as a whole? Please provide examples.
- What is practitioner's perception of their HIT acceptance level?
- What is practitioners' perception of HIT improving or decreasing their efficiency?

### 7.3 *Questionnaire for practitioners.*

#### ***Introduction:***

*Kviečiame dalyvauti moksliniame tyrime, kurį vykdo Stokholmo verslo mokyklos magistrantai kartu su Kauno klinikomis. Jūsų atsakymai yra itin vertingi Kauno klinikoms planuoti informacinių technologijų naudojimą. Anketos klausimams užtruksite ~10 minučių. Tyrimas anoniminis.*

*Ačiū už Jūsų skirtą laiką!*

#### ***Klausimai:***

1. Kurią informacinę sistemą naudojate dažniausiai?

*Galimi keli pasirinkimo variantai:*

- HIS (Ligoninės informacinė sistema)
- Laboratorijos IS
- Radiologijos IS
- Patologijos IS
- eSveikata.lt



- VLK IS
- Kita \_\_\_\_\_

2. Kaip dažnai naudojate HIS darbe? (\* - čia ir toliau **HIS** reiškia bet kurią iš klinikose naudojamų informacinių sistemų – HIS, Laboratorijos IS, ESPBI IS ar kt.)

*Pasirinkite vieną iš galimų variantų:*

- Naudoju intensyviai – nuolat, kiekvieną dieną
- Naudoju dažnai – kiekvieną dieną, bet su ilgesnėmis pertaukomis
- Kartais naudoju – keletą kartų per savaitę
- Naudoju retai – kartą per savaitę, ar dar rečiau

3. Pažymėkite užduotis, kurias įprastai atliekate HIS:

*Galimi keli pasirinkimo variantai:*

- Ambulatorinių vizitų dokumentacija
- Stacionaro ligos atvejų dokumentacija
- Laboratorinių tyrimų užsakymas / vykdymas
- Radiologinių tyrimų užsakymas / vykdymas
- E-recepto išrašymas
- Siuntimų išrašymas / atsakymas į siuntimus
- VLK formų pildymas (F025a/LK, F066a/LK ir t.t.)
- ESPBI formų pildymas (E025, E003 ir kt.)
- Ataskaitų analizė
- Pacientų srauto valdymas (vizito laikų tinkleliai, registratūra ir t.t.)
- Kita

4. Manau, kad HIS naudojimas mano darbe yra būtinas.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

5. Kaip dažnai HIS naudoja kolegos, su kuriais jūs dirbate?

*Pasirinkite vieną iš galimų variantų:*

- Naudoja intensyviai – nuolat, kiekvieną dieną
- Naudoja dažnai – kiekvieną dieną, bet su ilgesnėmis pertaukomis
- Kartais naudoja – keletą kartų per savaitę
- Naudoja retai – kartą per savaitę, ar dar rečiau

6. Naudojant HIS sumažėjo mano darbo krūvis, lyginant su popierių pildymu (pvz., eReceptas, ligos istorija ar kt.) prieš 2-3 metus.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

7. HIS naudojimas padidina mano darbo kokybę (užduotis atlieku tiksliau, efektyviau):

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

8. Manau, kad naudodamas HIS sutaupau laiko savo kolegoms.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

9. Kitų gydytojų (HIS naudotojų) įvesta informacija man yra naudinga ir/arba sutaupo laiko:

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

10. Naudojant HIS pagerėjo pacientų sveikatos priežiūros kokybė.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

11. Manau, kad pacientai domisi savo ligos istorijos duomenimis ESPBI (eSveikata.lt) sistemoje.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

12. HIS funkcionalumas atitinka mano poreikius.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau

- Sutinku
- Visiškai sutinku

13. Man buvo nesunku išmokti naudotis HIS programa.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

14. Pradedant naudoti HIS man buvo suteikti pakankami mokymai.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

15. Aš turiu visus reikalingus išteklius, reikalingus naudotis HIS.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

16. Šiuo metu aš turiu žinias, reikalingas naudotis HIS programa.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku

- Visiškai sutinku

17. HIS naudojimas man kelia stresą.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

18. HIS naudotojo sąsaja („interfeisas“) ir valdymas yra lengvai suprantami.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

19. HIS naudojimas stiprina mano profesinius gebėjimus.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

20. Aš žinau, kaip elgtis, kai HIS programa užstringa ar sugenda.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

21. Kai turiu sunkumų naudotis HIS ir negaliu jų išspręsti pats, aš žinau kur kreiptis ir kaip gauti pagalbą.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

22. Šiuo metu HIS naudoju intuityviai – net negalvodamas.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

23. Mano vadovai man paaiškina HIS naudojimo naudą.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

24. Mano vadovai mane motyvuoja naudoti HIS programą.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

25. Mano vadovai man padeda naudotis HIS.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

26. Kolegos, mano, kad HIS naudojimas darbe yra būtinas.

*Įvertinkite skalėje nuo 1 iki 5, kai 1 – visiškai nesutinku ir 5 – visiškai sutinku.*

- Visiškai nesutinku
- Nesutinku
- Nežinau
- Sutinku
- Visiškai sutinku

27. Kas labiausiai jus motyvuoja (ar motyvuotų) naudotis HIS? (galite nurodyti ir keletą faktorių.

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28. Jūsų lytis:

- a. Vyras
- b. Moteris
- c. Nenoriu atskleisti

29. Jūsų amžius:

- a. iki 30 metų
- b. 31-45 metų
- c. 46-60 metų
- d. 61+ metų

30. Jūsų išsilavinimas

- a. Vidurinis išsilavinimas

- b. Aukštesnysis išsilavinimas
- c. Bakalauro laipsnis
- d. Magistro laipsnis
- e. Daktaro laipsnis
- f. Kita \_\_\_\_\_

31. Kiek laiko dirbate Kauno klinikose?

- a. Mažiau nei 3 metus
- b. 3 - 6 metus
- c. 7 - 10 metų
- d. Daugiau nei 10 metų

32. Jūsų specialybė:

\_\_\_\_\_

*Dėkojame už jūsų skirtą laiką ir atsakymus. Jeigu pradžioje napžymėjote, dar galite nurodyti savo elektroninį paštą anketos rezultatams gauti:*

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