



Kaunas University of Technology

School of Economics and Business

Model of the Application of Digitalisation in the Performance Measurement in Public Healthcare Organizations

Master's Final Degree Project

Brigita Simniškytė

Project author

assoc. prof. Viktorija Varaniūtė

Supervisor

Kaunas, 2020



Kaunas University of Technology

School of Economics and Business

Model of the Application of Digitalisation in the Performance Measurement in Public Healthcare Organizations

Master's Final Degree Project

Accounting and Auditing (6211LX037)

Brigita Simniškytė

Project author

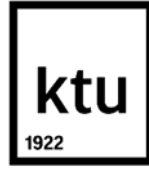
assoc. prof. Viktorija Varaniūtė

Supervisor

prof. Edita Gimžauskienė

Reviewer

Kaunas, 2020



Kaunas University of Technology

School of Economics and Business

Brigita Simniškytė

Model of the Application of Digitalisation in the Performance Measurement in Public Healthcare Organizations

Declaration of Academic Integrity

I confirm that the final project of mine, Brigita Simniškytė, on the topic „Model of the Application of Digitalisation in the Performance Measurement in Public Healthcare Organizations“ is written completely by myself; all the provided data and research results are correct and have been obtained honestly. None of the parts of this thesis have been plagiarised from any printed, Internet-based or otherwise recorded sources. All direct and indirect quotations from external resources are indicated in the list of references. No monetary funds (unless required by Law) have been paid to anyone for any contribution to this project.

I fully and completely understand that any discovery of any manifestations/case/facts of dishonesty inevitably results in me incurring a penalty according to the procedure(s) effective at Kaunas University of Technology.

(name and surname filled in by hand)

(signature)

Simniškytė, Brigita. Model of the Application of Digitalisation in the Performance Measurement in Public Healthcare Organizations. Master's Final Degree Project / supervisor assoc. prof. Viktorija Varaniūtė; School of Economics and Business, Kaunas University of Technology.

Study field and area (study field group): Business and Public Management (Accounting).

Keywords: performance measurement, digitalisation, public sector, healthcare organizations.

Kaunas, 2020. 88 p.

Summary

Public healthcare organization's performance measurement is relevant, complex and time-intensive due to specifics of healthcare organizations. Moreover, performance measurement in public healthcare organizations must be adapted to the changes of environment and changes are referred to digitalisation in this research project. The amount of digital trends, applied in healthcare organizations, is increasing, therefore, quantity of generated digital data is expanding. The benefits of digitalisation on performance of healthcare organizations have been widely studied, however there are limited number of researches on digitalisation application in performance measurement. Digitalisation in public healthcare organizations is inevitable and expected to improve performance measurement in organizations. Considering that performance measurement in public healthcare organizations operating in Lithuania is fairly recent, the need to assess how well performance measurement is adapted to the changes: what is the level of digitalisation application in performance measurement taking into the account organization's digital maturity, occurs. As there is lack of researches in the field of performance measurement and digitalisation in public healthcare organizations, the relevance of this research is reasoned.

Research object. Digitalisation in healthcare organization's performance measurement.

Research aim is to assess and analyze performance measurement of public healthcare organizations and digitalisation specifics, based on theoretical findings, create the conceptual model and practically apply it in order to assess the level of digitalisation in Lithuania healthcare sector organizations' performance measurement with respect to organizations' digital maturity level.

Research objectives:

- to assess and analyze performance measurement of public healthcare organizations and digitalisation specifics and reveal the necessity of further research in existing research gap;
- based on the theoretical findings regarding performance measurement in public healthcare organizations and digitalisation, develop a conceptual model which is intended to assess digitalisation application level in the performance measurement in public healthcare organization and digitalisation maturity level;
- to design research methodology in order to practically implement proposed conceptual model;
- to practically implement model for selected public healthcare organizations in Lithuania, subsequently, to analyse the results and provide recommendations for improvements.

Results. Existing research gap was revealed and on the basis of scientific literature analysis undertaken in the field of performance measurement in public healthcare organizations and digitalisation, the model for assessment of digitalisation application in public healthcare

organization's performance measurement with respect to its' digital maturity was developed. Subsequently, the developed model was practically implemented in four selected public healthcare organizations, operating in Lithuania, by performing multiple-case study. Based on the research results, higher level of application of digitalisation was found in organizations which digital maturity level is higher and these findings contribute to the literature. Moreover, strong digital strategy, more advanced digital trends, performance measures and digitally competent employees were noticed in leading organizations regarding digital maturity and digitalisation application in performance measurement. Nevertheless, due to small sample of this research, the findings could not be generalized. Model of digitalisation application in the performance measurement in public healthcare organizations could be used to assess individual organization's digital maturity level and digitalisation application in performance measurement, provides abilities to compare different healthcare organizations based on gathered results and identify improveable areas. The integration and assessment of digitalisation application in performance measurement could assist for further development of improved performance measurement in Lithuanian public healthcare sector organizations.

Simniškytė, Brigita. Skaitmenizavimo taikymo viešojo sektoriaus sveikatos priežiūros organizacijų veiklos vertinimo modelis. Magistro baigiamasis projektas / vadovė doc. Viktorija Varaniūtė; Kauno technologijos universitetas, Ekonomikos ir verslo fakultetas.

Studijų kryptis ir sritis (studijų krypčių grupė): Verslas ir viešoji vadyba (Apskaita).

Reikšminiai žodžiai: veiklos vertinimas, skaitmenizavimas, viešasis sektorius, sveikatos priežiūros organizacijos.

Kaunas, 2020. 88 p.

Santrauka

Veiklos vertinimas viešojo sektoriaus sveikatos priežiūros organizacijose yra svarbus ir sudėtingas procesas bei reikalauja daug laiko dėl sveikatos priežiūros organizacijų specifikos. Taip pat, veiklos vertinimas turi būti adaptuotas prie aplinkos pokyčių, kurie, šiame tyrimo projekte, siejami su skaitmenizavimu. Su vis labiau sveikatos priežiūros organizacijose taikomu skaitmenizavimu, didėja generuojamų skaitmeninių duomenų kiekis. Skaitmenizavimo teikiama nauda sveikatos priežiūros įstaigų veiklai yra plačiai analizuojama, tačiau tyrimų dėl skaitmenizavimo taikymo veiklos vertinimui esama ribotai. Skaitmenizavimas yra neišvengiamas ir tikimasi, kad jis patobulins veiklos vertinimą viešojo sektoriaus sveikatos priežiūros organizacijose. Atsižvelgiant, kad veiklos vertinimas Lietuvos sveikatos sektoriuje yra ganėtinai naujas reiškinys, atsiranda poreikis ištirti, kaip veiklos vertinimas šiose organizacijose yra prisitaikęs prie aplinkos pokyčių: kokiam lygyje skaitmenizavimas yra taikomas veiklos vertinime, įvertinant organizacijos skaitmeninę brandą. Tyrimų veiklos vertinimo ir skaitmenizavimo srityje viešojo sektoriaus sveikatos priežiūros organizacijose trūkumas pagrindžia šio tyrimo aktualumą.

Tyrimo objektas. Skaitmenizavimas viešojo sektoriaus sveikatos priežiūros organizacijų veiklos vertinime.

Tyrimo tikslas yra įvertinti ir išanalizuoti viešojo sektoriaus sveikatos priežiūros organizacijų veiklos vertinimo ir skaitmenizavimo specifiką, remiantis teorinėmis įžvalgomis, sukurti ir praktiškai patikrinti konceptualų modelį, skirtą įvertinti, skaitmenizavimo lygį Lietuvos viešųjų sveikatos priežiūros įstaigų veiklos vertinime, atsižvelgiant į organizacijų skaitmeninės brandos lygį.

Tyrimo uždaviniai:

- įvertinti ir išanalizuoti viešojo sektoriaus sveikatos priežiūros organizacijų veiklos vertinimo ir skaitmenizavimo specifiką bei nustatyti tolimesnio tyrimo poreikį, remiantis atskleista problema;
- remiantis veiklos vertinimo viešojo sektoriaus sveikatos priežiūros organizacijose ir skaitmenizavimo teorinėmis įžvalgomis, sukurti konceptualų modelį, kuris skirtas nustatyti skaitmenizavimo taikymą viešojo sektoriaus sveikatos priežiūros organizacijų veiklos vertinime ir organizacijų skaitmenizavimo lygį;
- sudaryti tyrimo metodologiją praktiniam sukurto modelio pritaikymui;
- praktiškai pritaikyti sukurtą modelį pasirinktoms viešojo sektoriaus sveikatos priežiūros organizacijoms Lietuvoje, išanalizuoti gautus rezultatus bei pateikti rekomendacijas.

Rezultatai. Atskleidus esančių tyrimų spragą bei remiantis mokslinės literatūros analize, atlikta viešojo sektoriaus sveikatos priežiūros organizacijų veiklos vertinimo bei skaitmenizavimo srityje, sukurtas konceptualus modelis, skirtas nustatyti skaitmenizavimo taikymą viešojo sektoriaus sveikatos priežiūros organizacijų veiklos vertinime, atsižvelgiant į tų organizacijų skaitmeninę brandą. Pasiūlytas modelis buvo praktiškai pritaikytas pasirinktose keturiose Lietuvos viešojo sektoriaus sveikatos priežiūros organizacijose, atliekant keturių atvejų analizę. Remiantis tyrimo rezultatais, aukštesnis skaitmenizavimo taikymo lygis veiklos vertinime yra pastebėtas organizacijose, kurių skaitmeninės brandos lygis yra aukštesnis, todėl rezultatai pagrindžia radinius literatūroje. Taip pat, stipri skaitmeninė strategija, daugiau pažangių skaitmeninių tendencijų, veiklos vertinimo indikatorių bei skaitmeniškai kompetingų darbuotojų buvo pastebėta lyderiaujančiose organizacijose pagal skaitmenizavimo brandą bei skaitmeninės informacijos panaudojimą veiklos vertinimui. Tačiau šie rezultatai negali būti generalizuoti dėl mažos tyrimo imties. Skaitmenizavimo taikymo viešojo sektoriaus sveikatos priežiūros organizacijų veiklos vertinime modelis gali būti naudojamas nustatyti individualios sveikatos priežiūros organizacijos skaitmenizavimo brandos lygį bei skaitmenizavimo taikymą veiklos vertinime, modelis suteikia galimybes palyginti skirtingas sveikatos priežiūros organizacijas, remiantis gautais rezultatais bei nustatyti tobulintinas sritis kiekvienoje organizacijoje. Skaitmenizavimo integravimas ir nustatymas veiklos vertinime gali prisidėti prie patobulinto veiklos vertinimo Lietuvos viešojo sektoriaus sveikatos priežiūros organizacijose kūrimo.

Table of contents

List of figures	9
List of tables	10
Introduction	11
1. Problem analysis of the application of digitalisation in the performance measurement in public healthcare organizations	13
1.1. Performance measurement in the public sector	13
1.2. Changes in the environment of public sector organizations due to the digitalisation	18
1.3. Problematics of digitalisation application in performance measurement in public healthcare organizations.....	20
2. Theoretical solutions of digitalisation application in performance measurement in public healthcare organizations	22
2.1. The concept of the performance measurement in public healthcare organizations	22
2.2. Digitalisation in public healthcare organizations	39
2.3. Development of conceptual model of digitalisation application in performance measurement in healthcare organizations	46
3. Methodology of practical implementation of proposed model of digitalisation application in the performance measurement in public healthcare organizations	50
4. Results of practical implementation of model of digitalisation application in the performance measurement in public healthcare organizations	56
4.1. Characterization of reseach participants by key performance indicators	56
4.2. Results of assessment of digitalisation application in performance measurement in public healthcare organizations	59
4.2.1. Organization A	59
4.2.2. Organization B.....	63
4.2.3. Organization C.....	67
4.2.4. Organization D	71
4.2.5. Cross-case analysis	74
4.3. Recommendations and directions for further improvements	79
Conclusions	81
List of references	83
Appendices	89
Appendix 1. Methods of performance measurement in foreign hospitals (created by author, based on Jankauskienė, 2016).....	89
Appendix 2. List of performance of Lithuanian healthcare sector measurement indicators (created by author, according to the LRSAM, 2012; 2019)	90
Appendix 3. Questionnaire of proposed model (created by the author).....	91
Appendix 4. Themes and codes of coding analysis (created by the author).....	100
Appendix 5. Results of model implementation: digital maturity criteria and digitalisation application in performance measurement perspectives (created by the author).....	101
Appendix 6. Recommendations for research participants (created by the author).....	102

List of figures

Fig. 1. Structure of public sector in Lithuania (by Balabonienė and Večerskienė, 2015)	13
Fig. 2. Features of performance measurement of organization (created by the author).....	27
Fig. 3. Process steps of organization performance measurement (created by the author, based on Emami and Doolen, 2015; Pirozzi and Ferulano, 2016; Puškorius, 2010)	29
Fig. 4. Application of BSC metrics in healthcare organization(s) (created by the author, based on Emami and Doolen, 2015; Rahimi et al., 2017; Regragui et al., 2018; Taufik et al., 2018)	34
Fig. 5. PATH framework (created by the author, based on Jankauskienė, 2016 and WHO, 2007)..	36
Fig. 6. Digitalisation stages (by Eggers and Bellman, 2015)	42
Fig. 7. Digitalisation in Lithuania (created by the author, based on EC, 2019; Kiškienė et al., 2010; LRV, 2005; VK, 2017)	43
Fig. 8. The conceptual model of digitalisation application in healthcare organizations performance measurement (created by the author).....	46
Fig. 9. Horizontal dimension of conceptual model (created by the author)	48
Fig. 10. Vertical dimension of conceptual model (created by the author)	49
Fig. 11. Process of research activity (created by the author)	55
Fig. 12. General characteristics of research participants (created by the author, based on research participants' financial reports and performance reports).....	56
Fig. 13. Results of model application in Organization A: criteria and perspectives	60
Fig. 14. Sub-criteria of digitalisation maturity in Organization A	61
Fig. 15. Indicators of digitalisation application in performance measurement in Organization A ...	63
Fig. 16. Results of model application in Organization B: criteria and perspectives	64
Fig. 17. Sub-criteria of digitalisation maturity in Organization B	65
Fig. 18. Indicators of digitalisation application in performance measurement in Organization B ...	67
Fig. 19. Results of model application in Organization C: criteria and perspectives	68
Fig. 20. Sub-criteria of digitalisation maturity in Organization C	69
Fig. 21. Indicators of digitalisation application in performance measurement in Organization C ...	70
Fig. 22. Results of model application in Organization D: criteria and perspectives	71
Fig. 23. Sub-criteria of digitalisation maturity in Organization D	72
Fig. 24. Indicators of digitalisation application in performance measurement in Organization D ...	73
Fig. 25. Distribution of research participants according to model implementation results.....	74

List of tables

Table 1. WHO classification of digital health services (by EXPH, 2018)	39
Table 2. Digitalisation trends observed in healthcare services (by OECD, 2016)	40
Table 3. Criteria for digital maturity determination (created by the author)	51
Table 4. Indicators for assessment of digitalisation application in performance measurement in public healthcare organization (created by the author)	53
Table 5. Information about the interviews (created by the author).....	54
Table 6. Legal characteristics of research participants (created by the author, based on Articles of Association and healthcare organization’s licences)	57
Table 7. Organizations’ financial performance indicators (created by the author, based on financial reports).....	58

Introduction

Topic relevance. Performance measurement of public sector (including healthcare organizations) thematics has become more and more relevant nowadays. Public healthcare organizations bring overall welfare to the society, therefore the environment, including the interested parties, are concerned about the performance of these organizations. Performance measurement of healthcare organizations is time-intensive and complex process due to specifics of healthcare organizations. In addition, rapid development of digital technologies brings advanced measures to address: EU policies have highlighted the importance of digitalisation in health such as, eHealth, and have emphasized the advantages of how digital innovations can enhance health care (Expert Panel on Effective ways of Investing in Health [EXPH], 2018). The digitalisation in healthcare sector is inevitable and digital trends are generating huge amount of information, therefore, the performance measurement of healthcare organizations shall be brought up to date. As literature revealed advantages of digitalisation application in performance measurement in healthcare organizations (Adler-Milstein et al., 2017; Rogge, Agasiti, and De Witte, 2017), it is necessary to assess how well performance measurement in healthcare organizations is updated to the changes. Nevertheless, different organizations applied digitalisation trends in individual scope, therefore, it is necessary to assess the digitalisation application level in public healthcare organizations performance measurement taking into the account that organizations' digitalisation level. As performance measurement of Lithuanian healthcare organizations is fairly new itself, the integration and assessment of performance measurement within digitalisation could assist further development of enhanced performance measurement in Lithuanian healthcare sector.

Research problematics. Performance measurement of public sector is widely analysed by the literature in national (Balabonienė and Večerskienė, 2015; Jankauskienė, 2016) and international scale (Bawole and Ibrahim, 2016; Di Meglio, Stare, Maroto and Rubalcaba, 2015; Gomes, Mendes and Carvalho, 2017; Lobont and Bociu, 2017; Moullin, 2007, 2017; Nuti, Noto, Vola and Vainieri, 2018; Oh and Bush, 2015; Riratanaphong and Voordt, 2015; Venkatesh and Ramachandran, 2014). Healthcare organizations, as a representative part of public sector, pose complexity in terms of performance measurement. As universal performance measurement method is not feasible, different and widely applied performance measurement frameworks are tailored according to specifics of such kind of organizations by introducing peculiar performance indicators (Cinaroglu and Baser, 2018; Emami and Doolen, 2015; Jankauskienė, 2016; Malekzadeh, Mahmoodi and Abedi, 2019; Nuti et al., 2018; Pirozzi and Ferulano, 2016; Purbey, Mukherjee and Bhar, 2007; Schoten, Blok, Spreeuwenberk, Groenewegen and Wagner, 2016; Venkatesh and Ramachandran, 2014). One of the challenges performance measurement of healthcare organizations face is changes of environment dynamics led by digital transformation. As digital trends application and their generating data is rapidly increasing in healthcare sector, performance measurement of healthcare organizations shall be also updated to the changes. The assessment of these two concepts in literature is fragmentary. Authors analyse and assess digitalisation, its transformation and digitalisation trends in public sector (Demircioglu and Audretsh, 2017; Frach, Fehrmann and Pfannes, 2017; Mollerup, Hitchiner and Ubaldi, 2016), and particular in health care organizations (Atasoy, Greenwood and McCullough, 2019; Bradley et al., 2018; Kokkinakos, Markaki, Koussouris and Psarras, 2016; Reddy and Sharma, 2016; Scott, Curley, Williams, Linehan and Shaha, 2016), literature mainly involves the level of digitalisation or its effect on organization's processes and activities. Nevertheless, there are limited number of researches (Adler-Milstein et al., 2017) on digitalisation application in performance

measurement, therefore, there is a need to assess it in Lithuanian public healthcare organizations. As performance measurement in Lithuanian public healthcare organizations is relatively new and digitalisation is novel itself, this brings out the originality of this research.

Research problem. What is the level of application of digitalisation in public healthcare organization's performance measurement taking into account digital maturity of organization?

Research aim is to assess and analyze performance measurement of public healthcare organizations and digitalisation specifics, based on theoretical findings, create the conceptual model and practically apply it in order to assess the level of digitalisation in Lithuania healthcare sector organizations performance measurement with respect to organizations' digital maturity level.

Research objectives:

- to assess and analyze performance measurement of healthcare sector organizations and digitalisation specifics and reveal the necessity of further research in existing research gap;
- based on the theoretical findings regarding performance measurement in public healthcare organizations and digitalisation, develop a conceptual model which is intended to assess digitalisation application level in the performance measurement in public healthcare organization and digitalisation maturity level;
- to design research methodology in order to practically implement proposed conceptual model;
- to practically implement model for selected public healthcare organizations in Lithuania, subsequently, to analyse the results and provide recommendations for improvements.

Research object. Digitalisation in healthcare organization's performance measurement.

Research methods. Analysis of scientific literature is used for research problem identification, and theoretical solutions of research problem. For practical implementation of proposed conceptual model, multiple-case study method was used.

Limitations. The research is limited with the number of the cases, therefore, additional case studies in depth should be performed to get a more comprehensive view of practical application of conceptual model. In order to investigate trends of digitalisation maturity level and its relation to application in performance measurement, the quantitative research which utilize statistically representative sample should be executed.

1. Problem analysis of the application of digitalisation in the performance measurement in public healthcare organizations

This chapter contains main findings of research undertaken in scientific literature in the field of performance measurement of public healthcare organizations and digitalisation. Main objectives of this chapter are to assess performance measurement specifics in public sector, assess and analyze performance measurement of selected part of public sector – healthcare organizations, assess and analyse digitalisation in public healthcare organizations and their performance measurement. Subsequently, reveal the necessity of further research in existing research gap found out by this chapter.

1.1. Performance measurement in the public sector

Specifics of the public sector. Public sector is a set of organizations, which are funded by the State and municipal budgets, and supply the public with goods and services (Balabonienė and Večerskienė, 2015). Public sector services are comprised of public administration, social security, public education, healthcare, social work and other public services (Di Meglio et al., 2015). Structure of Lithuania public sector is illustrated in Figure 1. Balabonienė and Večerskienė (2015) reveal that the main activity of public sector organizations is to provide these services to the residents according to the terms and conditions set in legal requirements, while using resources effectively and efficiently and therefore satisfy the society (public) needs. Public services to the society are provided via State institutions, municipalities, budgetary institutions and others. These institutions could be further divided into healthcare institutions, education institutions, social care/services institutions, municipal and budgetary institutions and other public institutions (as illustrated in Figure 1).

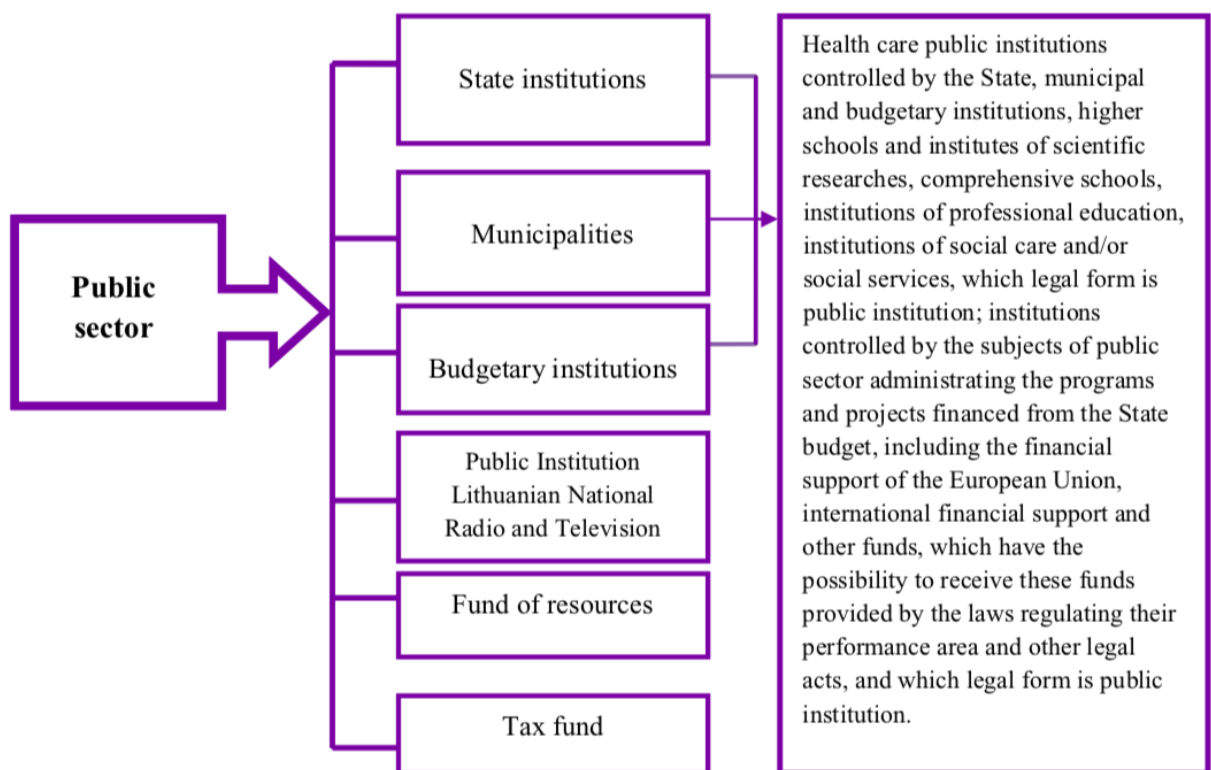


Fig. 1. Structure of public sector in Lithuania (by Balabonienė and Večerskienė, 2015)

Lithuania public sector covers various types of organizations. There are two main subgroups of public sector organizations – State institutions and municipalities, according to the ownership of the organizations. State institutions are comprised from around 751 subjects (Vidaus reikalų ministerija [VRM], 2019), for example, Government of the Republic of Lithuania, The Seimas of the Republic of Lithuania, Courts, around 18 public healthcare institutions, theatres, museums and others. Set of organizations owned by municipalities are comprised from around 3000 budget organizations, for example, schools, kinder gardens, local museums, libraries, moreover, around 300 public healthcare institutions and etc. According to Public Sector Report, launched by Ministry of the Interior of the Republic of Lithuania, there were 4357 public sector organizations operating during the year 2016: 894 State institutions and 3463 institutions covered by municipalities and, compared to the previous year, total number of public sector organizations decreased by 137 organization (VRM, 2017). In 2017, there were total 4244 public sector organizations: 862 State institutions (20%) and 3382 municipalities institutions (80%), which decreased by 113 organizations, if compared to previous year (VRM, 2018). In 2018, there were total 4120 public sector organizations operating during the 2018 year, from which 751 were State (18%) and 3369 (82%) were municipalities. And, compared to the previous year (2017), the total number of public sector organizations decreased by 171 organization: total number of State organizations decreased by 111 and total number of municipal organizations decreased by 60. According to the 2018 Public Sector Report (VRM, 2019), the number in decrease of public organizations differ almost twice between State and municipalities, which shows more effective implementation of public sector optimization initiatives in State level. As it could be noticed, municipalities cover more public sector organizations than State institutions and the variety of municipalities institutions is wider. Moreover, the number of public sector organizations is decreasing every year. All of the public sector organizations comprise Lithuania public sector which is regulated by State law, resourced by State and municipalities and bring the overall wealth to the residents of the Lithuania.

Public sector brings good and services to society and vice versus – society is naturally concerned about the efficiency of public sector, in order to make sure public sector bring complete welfare to society. Efficiency of the organization could be described as the ratio between allocation of expenses, resources and qualitative results: higher organizational efficiency refers to higher degree of achievement of objectives while minimizing resources utilization. Efficiency of organization includes various organization activities: decision-making and implementation, improvement of employee activities, quality of services, allocation of resources and others (Štaras and Šiopė, 2010). Therefore, it could be noticed, that the results of activity of public organizations and community interests to these public sector organizations are strongly related. Specifics of public sector is emphasized by the authors: Balabonienė and Večerskienė (2015), Di Meglio et al. (2015) because it differs from private sector, the society is strongly related to it and the performance of public sector plays dominant role in advanced economics. To determine whether the public sector organizations perform well, as stated in legislation, moreover, to improve the organization's management and to increase the satisfaction of society with provided services and their accessibility, performance measurement is needed (Balabonienė and Večerskienė, 2015).

Performance measurement in public organizations. Performance measurement is continuous process that applies measurement methods and assess the value of performance of the organization. During the continuous organization performance measurement process, relevant data is collected, indicators are settled and described, statements, which analyze the performance results, are prepared.

Riratanaphong and Voordt (2015) states that performance measurement of an organization is multi-dimensional and includes several performance perspectives and indicators over cost efficiency. Performance measurement is a tool for management of company, creation of objectives and monitoring their achievement and overall process. Others consider performance measurement as a tool for strategy formation. It is important tool to understand how organization works, to find the ways, and to improve that work. Taking into the account performance measurement in public organizations only, the multidimensionality (Gomes et al., 2017; Lobont and Bociu, 2017; Nuti et al., 2018; Riratanaphong and Voordt, 2015) and complexity (Balabonienė and Večerskienė, 2015; Oh and Bush, 2015; Gomes et al., 2017; Nuti et al., 2018) of public sector performance measurement is defined in literature. It is naturally understandable, because public sector organizations highly differ from private entities, including, but not limited to management, finances and accountability. The field of performance measurement in public organizations is widely analyzed by the literature, filled with performance measurement frameworks, models and guidelines that define what to measure and how to implement the measurement.

As there are plenty of performance measurement systems (methods), Balabonienė and Večerskienė (2015) analyzed the application of three methods in public sector performance measurement: Malcolm Baldrige National Quality Award (MBNQA), Model of European Foundation for Quality Management (EFQM), Balanced Scorecard (BSC), the article reveals that they could be integrated together in order to improve the effectiveness in measurement. In addition, Moullin (2017) offers improvement of Balanced Scorecard framework, customized particular for public and not-for-profit organizations and called as Public Sector Scorecard (PSS). Lobont and Bociu (2017) provide methods for public sector performance measurement in terms of productivity (outputs/inputs), efficiency and efficacy (goals achievement extent): Data Envelopment Analysis (DEA) used to measure the effectiveness of the organization or its department; Data Envelopment Analysis Imprecise (IDEA), which is improved DEA method, that does not require exact values of inputs/outputs and works with variables, as an alternative Free Disposal Hull (FDH) method was introduced for determining the efficiency of public sector. Methods could be used in order to compare public sector performance results among the countries. Otherwise, Jennings (2010) provides the idea of measuring the results of investments and activities, instead of analyzing the inputs and outputs of policies and programs. It could be described as drawing the attention to results or consequences (outcomes) organizations activities: “the water is cleaner, students are better educated, and health is improved” (Jennings, 2010, p. 224) instead of paying the attention to activities or outputs. That measures could help to identify the unnecessary activities of public sector organizations which may produce output which do not have reasonable sense (outcomes). Di Meglio et al. (2015) also focus on the outcomes dedicated to end users rather than on outputs: Services Performance Indicator (SPI) and Services-Economic-Effectiveness Indicators (SEEI) calculation could be applied, however, possible improvement of performance measurement of public sector is highlighted: application of new indicators for deeper measurement of outcomes, collaboration with private sector or third parties as innovation networks, because it is widely accepted that private sector is rapidly growing in innovation aspects, which also could increase effectiveness of public sector organizations. As it could be noticed, performance measurement of public sector organizations in general is widely analyzed and the relevance of it is even increasing. Authors, such as, Balabonienė and Večerskienė (2015), Moullin (2017), Di Meglio et al. (2015) highlight specifics of public sector performance measurement and propose improvements, because various performance of public sector organizations measurement approaches, methods are continuously criticized as insufficient and inappropriate. According to Gomes et al.

(2017), different stakeholders could be interested in different aspects of organization performance, as results, different methods could be needed. It is also highlighted by the literature (Lobont and Bociu, 2017) that information gathered from performance measurement in organization is useful only if it reflects the studied aspect accurately. Therefore, various attempts are being made over years to modify existing methods, integrate with each other, create multidimensional performance measurement models, and develop alternative ones in order to improve performance measurement of the public sector organizations. ***Performance measurement in public sector organizations remains challenging, complex, multidimensional and problematic.***

Performance measurement in healthcare organizations. As shown in Figure 1, public sector consists of various types of organizations and they differ significantly within each other, therefore, it is feasible to narrow the scope of organizations and to look at the performance measurement in particular sub-sector of public organizations. Healthcare is one of the fastest growing sectors in advanced countries (Purbey et al., 2007), moreover, this sector is facing environment dynamics and challenges. The challenges faced by healthcare organizations are highlighted by the literature (Emami and Doolen, 2015; Malekzadeh et al., 2019; Nuti et al., 2018; Purbey et al., 2007): provision of high quality healthcare services while reducing the costs, high loads of patients, long waiting times, insufficient employees competence, the need for organizations' processes adaptation to environment changes. Moreover, present literature highlights the increasing costs of healthcare and the essential need of these services as an issue (Malekzadeh et al., 2019). The complexity of public healthcare organizations stimulated these organizations to be involved in performance measurement (Malekzadeh et al., 2019). Therefore, public sector healthcare organizations (or public healthcare institutions) which provide personal health care were chosen to analyze in this research.

Performance measurement of healthcare institutions is analyzed by foreign literature (Cinaroglu and Baser, 2018; Emami and Doolen, 2015; Malekzadeh et al., 2019; Nuti et al., 2018; Pirozzi and Ferulano, 2016; Schoten et al., 2016). Well known and widely used (in private entities and/or public organizations) performance measurement models could be adapted to healthcare organizations. For example, Schoten et al. (2016) show that EFQM model could be used in Netherlands hospitals for quality management in order to improve the quality of hospitals' performance. The study was conducted between 1995 and 2011 and it showed that applying the EFQM in dependent relationship between the enabler and result criteria of the EFQM Model. It showed that EFQM application is related to performance of hospital's performance improvement, as measurement results are used as feedback for processes improvement. Notwithstanding, Pirozzi and Ferulano (2016) provide controversial view of EFQM model application in healthcare organizations performance measurement, as it is not specific enough and does not address all areas of a healthcare organization. Therefore, it could be noticed, that application of universal, well-known performance measurement models to healthcare institutions are judged controversially and the gap of application of these models appears, as they do not reflect the specifics of healthcare organizations. Performance measurement frameworks specific for healthcare institutions were discussed by Emami and Doolen (2015); Jankauskienė (2016); Gurevičius (2015); Nuti et al. (2018); Pirozzi and Ferulano (2016). According to Moullin (2004), National Health Service (NHS) performance measurement framework consists of six categories for measuring the performance of healthcare organizations, such as, "health improvement, fair access, effective delivery of appropriate healthcare, efficiency, patient/career experience, and health outcomes of care" (as cited in Emami and Doolen, 2015, p. 427), Pirozzi and Ferulano (2016) research proposed integrated model for hospitals performance measurement in order

to measure financial performance, non-financial performance and intellectual capital, because healthcare organizations are always knowledge-intensive organizations and IC measurement plays a fundamental role in their value creation dynamics. In addition, Emami and Doolen (2015) proposed to develop a set of future looking indicators, using one of the four perspectives of BSC – learning and growth, which aims at sustaining innovation and is mostly related to intangible assets of organization. Learning and growth perspective of BSC framework is related to organizations capabilities operate in the future, sustain changes and innovations, therefore, metrics within this perspective are associated with future. The results showed that human capital metrics have the most significant impact on the performance compared to innovation, infrastructure and technology, and organizational capital of the participating hospitals. Therefore, research highlights human capital as the most preferred healthcare organization resource that needs to be taking into the account. The findings could be reasoned as human capital (organization employees) is key driver of innovation and adaptation to changes. It could be observed, that researches done by Emami and Doolen (2015) and Pirozzi and Ferulano (2016) contribute to each other by highlighting the importance of intangible assets to performance measurement in healthcare organizations. Thus, it could be stated that by measuring the healthcare organization performance in terms of financial perspective only is not feasible: additionally, outcomes indicators, future-oriented metrics shall be included. Nuti et al. (2018) investigated evolution of the Italian Regional Performance Evaluation System (IRPES) in healthcare. It was created in 2004, in order to integrate financial information concerning the regional healthcare system with evidence on quality, equity, efficiency, appropriateness, effectiveness and responsiveness. The aim was to make such information available to stakeholders in the healthcare system, since many regional health organizations adopted this model, ability to compare organizations, based on gathered information appeared. In 2016, the model was improved by integrating evaluation of individual institutions with the evaluation of patient care paths (performance achieved by one or more providers of health services in patient care path). The method provides relevant information for decision makers about each of healthcare institution and about overall health system of region or whole country in terms of different patient care paths, provided by that health system. However, this framework is new and there is no a lot gathered feedback yet. Taking into the account Lithuanian practice, it is clear, that there is a lack of researches of Lithuanian healthcare sector performance measurement. Gurevičius (2015) presented application of Pabo Lasso method in performance measurement in district hospitals of Lithuania by using three indicators. These three indicators were related to beds of hospital – length of stay, bed occupancy rate (shows the number of hospital beds that was used during the year), bed turnover rate (shows efficiency of bed usage and number of patients treated per year). Based on the calculated indicators results, each hospital was assigned to one of four quadrant of Pabo Lasso diagram. The results showed low performance of Lithuanian district hospitals and surplus of active treatment beds in hospitals, therefore, restructurization was proposed. Jankauskienė (2016) applied hospitals performance measurement model, which covered 26 indicators (officially approved in 2012 of the Minister of Health of the Republic of Lithuania) and was created using Performance assessment framework for hospitals (PATH) model proposed by WHO and Health Consumer Powerhouse Index as basis. However, the created model was not implemented practically, therefore additional researches are needed. Performance measurement in Lithuanian public healthcare organizations is fairly new and the literature covers this subject fragmentary.

Healthcare institutions bring their specifics to overall public sector complexity. Performance measurement of healthcare sector organizations seems even more problematic than public sector organizations in general. There are initiatives for public sector performance measurement in

international and national level, however, healthcare institutions performance measurement is assessed narrowly, especially in Lithuania – performance measures in Lithuanian healthcare sector are introduced fairly recently, this sector is lacking a practically implemented performance measurement models. Overall, performance measurement in healthcare organizations is definitely needed, however described as complex due to dynamics of healthcare sector (Cinaroglu and Baser, 2018; Nuti et al., 2018; Pirozzi and Ferulano, 2016) there are many challenges in implementing a comprehensive performance measurement system in the healthcare organizations because it needs to reflect the realistic situation of organization and progress towards the objectives achievement while satisfying stakeholders' needs (Emami and Doolen, 2015). Healthcare sector could be stated as one of the most rapidly changing out of all public sector. Taking into the account the changes within the sector as well as the particular organization (e.g., public healthcare organization), it is important how well it manages these changes (Pirozzi and Ferulano, 2016; Venkatesh and Ramachandran, 2014). Venkatesh and Ramachandran (2014) reveal the gap of organizations management of changes of performance measurement system, because article explains that applying the same performance measurement tool for too long has been described as one of the pitfalls of performance measurement. Moreover, Pirozzi and Ferulano (2016) remarked that performance measurement shall be updated to the changes of competitive environment and that updation expressed as one of the steps of performance measurement. Therefore, in order to be effective, to ensure competitive advantage of the organization and to reflect true and fair view of the organization, performance measurement needs persistent adaptation to the changes in organizational environment.

1.2. Changes in the environment of public sector organizations due to the digitalisation

One of the main reasons of changes in the world is digital revolution, which comprises digital technologies. Digital technology is utilized in different forms at least in a small scope of organizations activities, it applies to countries at all levels of development and nearly to every sector of the country, therefore, public sector is also affected. Considering the application of digital technologies as an innovation, minor innovation in the public sector may cause huge outcomes (Demircioglu and Audretsh, 2017). The application of digital technologies in public organizations is expected to bring the advantages, such as, shift from paper-based to digital forms, improvement of information exchange among organizations, opportunities of digital data application for further needs (Rogge et al., 2017), moreover, enhancement of relationships across stakeholders, provision of more person-oriented services rather than government-oriented (Mollerup et al., 2016). Therefore, public sector needs to follow the digitalisation trends to continue provide services, and to be an attractive employer for employees in the future (Frach et al., 2017). As digital literacy is increasing, according to Organisation for Economic Co-operation and Development comparative study (Mollerup et al., 2016), users' expectations are increasing with regards to more innovative and responsive services while public organizations deal with pressures to to operate efficiently and to maintain growth (Demircioglu and Audretsh, 2017; Mollerup et al., 2016). Therefore, it could be noticed that digitalisation in public sector is multifaced – the environment of public sector is changing unavoidably and public sector organizations need to adapt to these changes while being stricted by legislation pressures. These challenges occur in all public sectors, including healthcare, as one of the fastest growing sub-sector.

Taking into account the application of digital technologies in healthcare organizations, the subject is analyzed by the literature (Atasoy et al., 2019; Reddy and Sharma, 2016; Scott et al., 2016 and others) and the future hospitals are associated with digitalisation. World Health Organization (WHO) Global

Observatory for eHealth (GOe), performed recent survey which showed highest response rate by WHO Member States (125), which reflected growing interest digitalisation in healthcare (World Health Organization [WHO], 2016). Reddy and Sharma (2016) explained that digitalisation can help improve healthcare system globally and highlight the advantages of digital revolution in healthcare organizations: cost-effectiveness (for example, home-based medical treatment, remote healthcare services decrease the cost of healthcare services), customized drugs or medical devices, remote healthcare services, increased customer satisfaction, ability to prevent healthcare issues. In addition, by adopting the changing trend in technology, healthcare organizations could grow and enhance quality of health care while reducing costs. According to Scott et al. (2016) study, the views of clinicians about the benefits and disadvantages of using digitised patient records (or electronic health records) were collected. Clinicians from two English hospitals highlighted that digital patient records are still in development stage, not all the departments of hospitals use it, because traditional paper records are still easy to use and search to, takes less time than digitalised. However, digital records provide easy patient-data accessibility, ability for remote medicine and reduce the risk of loosening patient data in paper format, thus it could be seen that digitalisation in healthcare sector changes the processes within organizations. Opinions of clinicians (physicians and surgeons) draw results that the disadvantages were less than the benefits; in addition, qualitative data showed that the introduction of digitized records had unexpectedly led to improvements in the structure and content of clinic letters. Atasoy et al. (2019) evaluated electronic health records (hereinafter, EHR) in local and national level: EHR may improve clinical communication and information management, thus the quality of healthcare, improve process automation, as a result, reduce costs and increase productivity. Nevertheless, several difficulties related EHR exist, such as, disruption of organizational processes, technical issues, maintenance related problems or user resistance to change. It could be noticed, that, nevertheless it brings advantages and drawbacks, digitalisation in healthcare organizations is multipurpose, future-oriented and un-avoidable. It is understandable that digitalisation changes performance of healthcare organization and provides the potential to supply high quality, innovative and responsive to patients needs healthcare services.

The need and importance of digitalisation in public sector organizations and particular in hospitals are clearly defined; therefore, it is essential to assess this phenomenon. There are different methods proposed in the literature to measure the digitalisation in different levels – country or organization. Kokkinakos et al. (2016) apply two indexes to assess public sector (as government) digitalisation – Digital Adoption Index (DAI) and Digital Evolution Index (DEI), to compare the digitalisation between the private and public sector and compare the digitalisation progress over the 6 year in a particular country. Based on the results, public sector does not only keep up with the private one in terms of digitisation, but in three (out of the five: Germany, Greece, the Russian Federation, Spain and United Kingdom) cases public sector is even ahead. Nevertheless, article assess the digitalisation level in broad level – whole country, instead of organizational level. As there are significant differences between the organizations in public sector, it is needed to assess digitalisation in particular sub-sector of public organizations or even at organizational level. Habran, Saulpic and Zarlowski (2018) provide insights in the healthcare innovations (mostly, related to digital technologies) projects, issued by a French fund in 2017 and revealed the gap that most of the projects do not evaluate the impact or effectiveness to healthcare organization's performance: how new developments would challenge existing work processes within the organization. Nevertheless, there have been found studies that address the issue of digitalisation and healthcare organization performance. Bradley et al. (2018) assess how application of digital technologies, particular, radio frequency identification

(RFID) for asset tracking and electronic data interchange (EDI) for claims processing affect the performance of the hospital. Research focused on three aspects of hospital performance—supply chain cost efficiency, personnel expenses, which reflect hospital operational excellence, and hospital readmission rates, which reflect the quality of provided clinical services. Based on the results, application of RFID and EDI helps hospitals better coordinate supply chain activities as well as manage inventory more effectively. In addition, hospitals performance according to three measured aspects (8.88% decrease in their supply costs, 6.29% decrease in personnel expenses, and 1.59% decrease in readmission rates) is improved in long-term perspective. Wang, Wang and McLeod (2018) assessed the digitalisation expenditures impact on financial performance (measuring it by return on assets) and productivity of US hospitals. Results showed positive affects on hospitals return on assets. The increase of operating investment in digital technologies increased organization net profit by 0,74% on average, while the increase of capital investment in digitalisation caused 1,41% increase of net profit. Taking into the account productivity, the increase of capital and operating investments in IT, caused increase of net revenue. Despite the mentioned improvements of performance, enhanced by digitalisation, it could improve performance in terms of performance measurement in healthcare organization. Adler-Milstein et al. (2017) diminished digital data (particularly, EHR) application in performance measurement on healthcare organization as one of the factors that contribute to performance improvement. In addition, Rogge et al. (2017) remarked that digitalisation in the form of big data could provide information for performance measurement in public organization. That could help facilitate public organizations efficiency and effectiveness by providing large amounts of financial and non-financial data or make comparisons among different departments or organizations. Adler-Milstein et al. (2017) research assessed the application of EHR data in performance measurement and patient engagement in US hospitals in terms of 10 functions of performance measurement and patient engagement. Research findings varied across various hospitals characteristics and shown that about 25% of hospitals use EHR data in all 10 functions of performance measurements. Nevertheless, this research has some limitations relevant to this research thesis – only one digitalisation trend (EHR) was assessed in performance measurement of healthcare organization, while there are more digitalisation trends applied in healthcare sector. In addition, selected performance measurement functions could differ among healthcare organizations. Therefore, the need for further researches of digitalisation in performance measurement is foreseen.

Afore mentioned publications clearly define digitalisation importance and multidimensionality. Digitalisation in public sector is highlighted by the literature, not an exception is healthcare sector – digitalisation brings promising improvements in organizational outcomes together with new responsibilities to satisfy society needs which are caused by rapidly growing worldwide digitalisation. There are methods for digitalisation assessment within single organization or between several organizations and countries covered by literature, in addition digital data application in public sector performance measurement brings unquestionable advantages, nevertheless the combination of these two concepts is not analyzed by the literature widely, especially within organizational level in particular sub-sector; therefore, this field naturally brings the need for further researches.

1.3. Problematics of digitalisation application in performance measurement in public healthcare organizations

With an increasing engagement in total quality management in healthcare, there is a need to measure performance, control costs, and improve the quality of healthcare (Cinaroglu and Baser, 2018; Nuti

et al., 2018). In other words – performance measurement is needed for quality management of the healthcare organizations. In order to enhance performance and attain strategic success. Measuring the performance in the health system is important, because this tells us about the general quality of the healthcare system and that leads to improved care (Cinaroglu and Baser, 2018). The task of selecting the appropriate performance measure for healthcare organizations is a controversial issue because no standard methodological approach exists in the literature (Cinaroglu and Baser, 2018). Taking into account Lithuanian public sector, since 2000, Lithuania started implementing public sector performance measurement system in addition to strategic planning implementation. Afterwards, performance measurement was improved to higher level of importance in order to reflect general tendencies of public sector decisions, projects or plans. Performance measurement of healthcare organizations in Lithuania is novel, mostly grounded on theoretical frameworks instead of practical implementations and no officially confirmed performance measurement framework exist, thus the performance measurement of public healthcare organizations is complex itself. In addition, by rapidly changing environment, performance measurement shall adapt to these changes.

Digitalisation drive the changes among public sector organizations and performance measurement of any organization including healthcare organizations shall be adapted to digitalisation. Increasing amount of digitalisation is used in healthcare organizations and according to Organisation for Economic Co-operation and Development (OECD, 2016), it is relevant process that already had a huge impact on healthcare systems and is expected to further impact healthcare delivery in the future. The importance of digital solutions in healthcare is emphasized by EU policies (EXPH, 2018; WHO, 2016). There are studies in literature that assess the digitalisation in the national or organizational level (Frach et al., 2017; Kokkinakos et al., 2016). In addition, there are studies that are looking for associations between digitalisation and performance of healthcare organization (Bradley et al., 2018; Wang et al., 2018). For instance, scientific articles measure the level of digitalisation or operational effects of digital technologies application in hospitals (Bradley et al., 2018; Habran et al., 2018). As it could be noticed, scientific literature mainly covers the level of digitalisation within organization or among countries, its effect on certain operations or overall organization performance with respect to selected aspects. As digitalisation is inevitable, increasing amount of digital information is being created. The promising results of digital information application in performance measurement have been found in the literature (Adler-Milstein et al., 2017; Rogge et al., 2017), nevertheless there is limited number of researches performed in this particular field. As performance measurement in Lithuania public healthcare organizations is fairly new, while the demand of digital trends is increasing, the necessity of investigation of digitalisation application in performance measurement occurs because digitalisation in performance measurement could facilitate promising enhancements. Therefore, this research aims to determine digitalisation in performance measurement by developing and practically implementing model for assessment of digitalisation application in Lithuanian public healthcare organizations performance measurement.

2. Theoretical solutions of digitalisation application in performance measurement in public healthcare organizations

This chapter contains main theoretical findings on performance measurement in public healthcare organizations and associated features, models, challenges. In addition, digitalisation, its application, trends, challenges, stages and assessment are analysed. Based on theoretical findings on performance measurement in healthcare organizations and digitalisation, conceptual model for assessment of digitalisation application in public healthcare organizations performance measurement is developed.

2.1. The concept of the performance measurement in public healthcare organizations

Overview, need and importance. Performance measurement of organization was known already in XIX century. Higher attention started to be paid when taxpayers required to privatize public services, legislation instruments needed to control too high expenditure level and transfer of responsibilities to lower management levels (Puškorius, 2010). Therefore, the need to increase public sector transparency, accountability and feedback to society naturally appeared. Nuti et al. (2018) mentioned three main phases of performance measurement by reciting Wilcox and Bourne (2002) and Bititci et al. (2012). The first phase – *budget control* (1890-1980), it was developed from cost and management accounting systems and was applied to vertical hierarchy of organization, which characterized organizations at that time. Second phase started in 1980 and involved *multidimensional measures* besides the financial ones. At that time, first integrated performance measurement systems were introduced to private and public sectors. In the third phase, which started in 1990, the need to link *performance measurement* to strategy was introduced, thus at that time performance measures were started to be applied for strategic management. It could be stated that the third phase lasts up to present, the link of performance measurement and strategy is still relevant in present organizations, various performance measurement methods exist, which are being continuously improved. Taking into the account selected particular public sub-sector, trends of performance measurement evolution in healthcare organizations similar to mentioned by Nuti et al. (2018) could be observed. Performance measurement followed New Public Management (NPM) reform in 1980, which encouraged the application of private sector approaches to public sector, including healthcare organizations (Bawole and Ibrahim, 2016). First generation, budget control, mainly used financial measures (e.g., revenue, costs, profits), volumes of services and organizational responsibility. According to Cinaroglu and Baser (2018), financial measures were used by healthcare organizations to achieve their strategic financial objectives. This phase of performance measurement helped to overcome bureaucratic model, nevertheless, created internal competition within institutions, which had its advantages and drawbacks. On the other hand, over the years, the importance of outcomes in terms of performance measurement has arised (Di Meglio et al., 2015; Jennings, 2010, Nuti et al., 2018), for example, quality improvement, patient satisfaction and other measures (Cinaroglu and Baser, 2018). Thus, integrated, evidence-based, multidimensional, designed by all stakeholders (including health professionals) performance measurement systems were introduced (Nuti et al., 2018) and represented the second phase of performance measurement in healthcare organizations. This phase is society-centered rather than organization-centered: more related to consumers of services provided by public healthcare organizations, by taking into the account what is the outcome of organization's activity, as outcomes of public sector organizations have a direct impact (negative or positive) on quality of residents' life and are highly important to overall Public Health Sector of a country. In addition, the involvement of outcomes of healthcare organizations' activities into performance measurement relates the measurement to organization's mission, vision and strategic objectives.

It is noticeable, that performance measurement is being continuously improved over the years – since it was developed in XIX century to present. At the very beginning of performance measurement of organizations, financial measures with high level of control were used for measurement of public sector performance, mainly because of information availability, compulsory accountability of public sector regarding budgetary expenditures and etc. Nevertheless, financial measures cannot provide the multidimensional, informative and balanced image about critical success factors of any organization, mainly, because the financial measurements reflect the past (Balabonienė and Večerskienė, 2015; Rezagui, Sefiani and Azzouzi, 2018), in addition, financial measures have limited spectrum of information they provide. On the other hand, according to Pirozzi and Ferulano (2016), performance measurement system should be comprised of a combination of financial and non-financial metrics, which could be used to assess strategic level objectives achievement and performance of organization is measured based on its financial and non-financial results. Therefore, it was started to look for the improvements of performance measurement and develop effective and modern performance measures by incorporating non-financial performance indicators. Nowadays *performance measurement systems align with the strategy of organization and involve financial and non-financial measures, qualitative and quantitative indicators in order to multidimensionally reflect organization's financial and non-financial activities.*

Considering the performance measurement concept, it is defined by different Lithuanian and international authors (Balabonienė and Večerskienė, 2015; Bawole and Ibrahim, 2016; Černiauskienė, 2011; Lobont and Bociu, 2017; Rimkutė, Kirstukaitė and Šiugždinienė, 2015; Riratanaphong and Voordt, 2015; Segalovičienė 2011). Bawole and Ibrahim (2016) characterize performance measurement as a synonym of “performance audit” which means independent and full-scale assessment of organization performance, regarding its objectives and stakeholders’ expectations. Lobont and Bociu (2017) also define performance measurement as a process of assessment of an organization and additionally emphasize the application of various methodologies and indicators in assessment of organization by using data of the inputs, outputs and results of processes in organization. Very similar definition is provided by Černiauskienė (2011), performance measurement is described as continuous process, used to determine the value of performance of organization by applying measurement methods. Two aspects are emphasized in this definition: continuity and the need of appropriate measurement method. It is clearly understandable, that performance measurement is a process which needs appropriate method (or approach) to practically perform performance measurement, moreover, that process is not a single-use, but repetitive. Segalovičienė (2011) considers output of this process – information and defines performance measurement as an activity of gaining information intended for practical application to determine the value of object being evaluated. Performance measurement could be also considered as a system which assess performance of “development interventions against stated goals” (OECD, 2004, p. 26). Although system could be considered as wider term than process, in this definition it stands for similar meaning. Another synonym of performance measurement could be performance monitoring, which also describes the process of collecting and analyzing information related to project, program or activity progress against defined objectives (OECD, 2004). Other authors specify performance measurement as a tool for specific purposes: improvement (Balabonienė and Večerskienė, 2015), judgments or decisions making (Rimkutė, 2015; Riratanaphong and Voordt, 2015) and management (Balabonienė and Večerskienė, 2015). Notwithstanding, although definitions of performance measurement slightly differ within each other, the principles are similar among all the mentioned definitions. To summarize, performance measurement could be defined as: ***regular process or activity***

of an organization or third parties, which involves collection and analysis information about the organization, program or process under assessment, in order to evaluate the performance of that organization, program or process and further uses that information for particular purposes (e.g., improvements, decision-making, management and etc.).

By assessing performance of organizations measurement, it naturally becomes important why it is needed and what value it brings to the organization (the need and importance of this phenomenon). According to Balabonienė and Večerskienė (2015), any organization cannot work effectively and objectively without measuring its performance. Performance measurement of the organization helps to quantitatively assess the achieved goals. In more detail, performance measurement in public sector gives informative view of organization state – where is it now in terms of determined objectives achievement. Nevertheless, it provides an ability not only to measure the achievement of goals, overall organization progress, efficiency and effectiveness but also to improve the quality of provided services and accountability, which, is important for every organization and its stakeholders (Gomes et al., 2017). Accountability of organization is compulsory and is regulated by each country's legislation. Link between the organizational accountability and performance measurement is described in the literature (Bawole and Ibrahim, 2016; Di Meglio et al., 2015; Gomes et al., 2017; Hailey and Sorgenfrei, 2005; Rimkutė et al., 2015). According to Hailey and Sorgenfrei (2005), accountability includes realization of the requirements, defined by legislation, public expectations and organizational goals, as well as responsiveness to the concerns of a wider constituency. Nevertheless, application of performance measurement for accountability purposes only has its drawbacks: too many criteria for performance measurement exist, speculation of the values of performance measurement criteria, organizations are indeed to complete the requirements but not to improve the performance (Rimkutė et al., 2015). Performance measurement for organizational accountability only would not give its potential value to the organization and its stakeholders. Therefore, performance measurement supplements the organization's accountability, but is not a replacement of it. Performance measurement supplies a wide variety of application directions.

The result of performance measurement is information, which is considered as one of the main resources for management and decision-making (Bawole and Ibrahim, 2016; Emami and Doolen, 2015; Gomes et al., 2017; Gurevičius, 2015; Moullin, 2017; Purbey et al., 2007; Rimkutė et al., 2015; Riratanaphong and Voordt, 2015; Segalovičienė, 2011), according to the performance measurement concept of United Nations, it plays a huge part in the improvement of public management (Segalovičienė, 2011). Cinaroglu and Baser (2018) accentuate that performance measurement is needed for quality management. Well management is leading to quality improvements, thus organizational competences are improved. Performance measurement systems (hereinafter, PMS), as support for decision makers, are also highlighted by Riratanaphong and Voordt (2015). It is noticeable, that performance measurement and management are strongly related, Kaplan and Norton (1996) stated, „If you can't measure it, you can't manage it” (Rimkutė et al., 2015, p. 11). Performance measurement provides the basis for organization to assess how well it is progressing towards its determined objectives, helps to identify areas of strengths and weaknesses, and decides on future initiatives, with the goal of improving organizational performance, thus providing the inputs for the management. Performance measurement is not an end in itself, but a tool for more effective management. Thus, it is an input for adjustments in management in order to make relevant improvements. Even one of the most popular frameworks for measuring organization's performance – Balanced Scorecard (BSC), is integrated within management of organization and is used for both

of the objectives – measurement and management (Emami and Doolen, 2015; Moullin, 2017). Results of performance measurement indicate what happened, not why it happened, or what to do about it. In order to make an organization effective, the performance measurement outcomes must be able to make the shift from measurement to management (Purbey et al., 2007), performance measurement shall not be finished once performed, it is continuous process, which information is used for internal and external applications and decision making. Nevertheless, Lithuanian public sector performance management lacks information, gathered from performance measurement applications in relevant fields of the management (Rimkutė et al., 2015), mainly because performance measurement in public sector is novel itself and most managerial decisions are not based on performance of the organization. Taking into the account decision making, performance measures are applicable only if they are relevant to decisions makers' needs (Balabonienė and Večerskienė, 2015; Jennings 2010; Klovienė and Speziale, 2014; Segalovičienė, 2011), therefore, the information must be relevant and reflect the actual state of phenomena, which is important for particular decision to be made. Organization management is supported by performance measurement with application of information for decision making. Thus, measurement and management comprise a closed loop: outputs of measurement are inputs for management and outputs of management are inputs of measurement – this reflects strong relation between these two concepts and highlights the importance of performance measurement for organization. Further considering performance measurement application in management, it is important to highlight, that management and strategy are inseparable things and performance measurement has a strong relation to strategy, for example, it serves as monitoring tool of the strategy (Cinaroglu and Baser, 2018; Klovienė and Speziale, 2014; Moullin, 2017; Pirozzi and Ferulano 2016; Riratanaphong and Voordt, 2015). For example, Riratanaphong and Voordt (2015) remarked five strategically important questions which could help for managers to answer by PMS application and they are connected with organization's previous state in terms of measurable objectives, organization current state and future plans and control. Other scientists think that performance measurement is a tool for the formation of the strategy, and it is directed into strategy implementation, using measurement methods and allocation of resources (Varaniūtė, 2018). Thus, in strategy context, performance measurement is even more expanded and could be applied in different stages of the lifecycle of strategy – formation, implementation and monitoring. Each organization applies it for the purpose that fits best according to its activities and current condition of its strategy. Moreover, the alignment of performance measurement to the strategy is emphasized by modified definition of PMS – strategic performance measurement systems (Klovienė and Speziale, 2014). This definition reflects the role of performance measurement to the strategy and highlights this particular field of its application. According to the literature, it could be clearly observed, that performance measurement is important for every organization, especially in public sector.

Authors provide even more reasons to consider the importance of performance of organization measurement by highlighting the benefits it generates despite resources performance measurement requires. Overall, according to Segalovičienė (2011), the information, gathered from performance measurement could be applied not only for making decisions inside the organization, but also for organizational transparency, accountability, social responsibility assurance, information and education taking into the account all stakeholders. In addition, one of the main success element of performance measurement is human factor, because the success of measurement depends on the assessor's competence, objectivity, knowledge about the organization. Taking into the account information applicability in broader way, it could be used to compare organization within organizational units (departments), other organizations or for comparison between the different

countries (Lobont and Bociu, 2017; Riratanaphong and Voordt, 2015). Thus, the ways of application (or features) of organization performance measurement could be objectively divided into internal and external. Internal features are the roles of performance measurement inside the organization, connected with the management, employees, processes and other internal organization's elements. External features involve the usage of performance measurement information in broad way, outside the organization. According to authors of different scientific publications opinions about performance of organizations measurement, the main features of performance measurement are as follow:

1. *Improvement of organization transparency* (Gomes et al., 2017; Segalovičienė, 2011). Transparency is a top priority especially for public organizations, because it could show organization performance to its stakeholders, prevent illegal actions and increase overall society trust in public sector organizations if organization is sharing its information to the society. Transparency is encouraged in local (by residents) and national (governments) level. Information of organizational performance is important for the statistical purposes to assess the overall performance of region or country's healthcare sector. Transparency is strongly related to accountability of organization.
2. *Enhancement of accountability* (Bawole and Ibrahim, 2016; Di Meglio et al., 2015; Gomes et al., 2017; Hailey and Sorgenfrei, 2005; Rimkutė et al., 2015). Although accountability of public sector organizations is highly regulated, the gaps in legislation could still be found. Performance measurement of organization could reveal what impact on budget investments have particular managerial tools or other interventions. In addition, performance measurement results could be integrated with other related reports, for example, sustainability reports, which demand is increasing rapidly (Hailey and Sorgenfrei, 2005; Klovienė and Speziale, 2014). Usually, performance measurement reports are integrated together with organization's financial reports and serve to a wide variety of further applications by providing multidimensional view of organization (financial and non-financial).
3. *Organization's objectives monitoring tool* (Nutti et al., 2018; Purbey et al., 2007). Information, gathered from performance measurement, can be used to determine where is the organization towards its objectives achievement process and to make decisions whether the objectives are reasonable and practically implementable and, if feasible, make adjustments.
4. *Support for decision-making* (Bawole and Ibrahim, 2016; Emami and Doolen, 2015; Gomes et al., 2017; Moullin, 2017; Purbey et al., 2007; Rimkutė et al., 2015; Riratanaphong and Voordt, 2015). Information, received via performance measurement, is applied for the management of organization. Measurement and management are directly related to each other – outputs of performance measurement are inputs for management and vice versus. Based on the feedback of performance measurement, objective and evidence-based decisions could be made.
5. *Strategy formation, implementation and monitoring tool* (Cinaroglu and Baser, 2018; Klovienė and Speziale, 2014; Moullin, 2017; Pirozzi and Ferulano 2016; Riratanaphong and Voordt, 2015). Performance measurement helps to determine the direction of an organization, to evaluate its current situation and to determine where the organization is going, if organization is aligned to its strategy, or what changes need to be made.
6. *Ability to learn from previous experience* (Emami and Doolen, 2015; Hailey and Sorgenfrei, 2005). It is a vital condition for organization adaptation and survival, organizational success and sustainability (Emami and Doolen, 2015; Hailey and Sorgenfrei, 2005). By learning from previous experience, organization is able to make necessary adjustments to its activities and avoid risky operations, prevent lossess and improve its financial and non-financial performance. The

importance of learning from previous experience is naturally understandable in everyday life and is especially needed for organizations.

7. *Ability for comparison/benchmarking* (Lobont and Bociu, 2017; Riratanaphong and Voordt, 2015). Performance measurement supplies means to benchmark organizations or comparison within the different countries using universal performance measurement method or ability to compare the gathered results within sectors (e.g., private or public), institutions, organizations or within different departments of the particular organization. Thus, performance measurement enables to compare the gathered results internally and externally.
8. *Communication enhancement* (Hailey and Sorgenfrei, 2005; Klovienè and Speziale, 2014; Riratanaphong and Voordt, 2015). Performance measurement improves communication inside and outside the organization (Hailey and Sorgenfrei, 2005; Klovienè and Speziale, 2014) and makes communication more precise (e.g., in numbers) (Riratanaphong and Voordt, 2015). By application of performance measurement, information about the organization could be presented in understandable forms, such as numbers and visualization tools.

Roles of performance measurement for internal organizational needs are more related to organization daily life, inside environment, employees, organization operations, procedures and programmes. Thus, organization's objectives monitoring, strategy formation, implementation and monitoring, learning from previous experience, comparison or benchmarking and communication enhancement could be assigned to internal features of performance measurement. Another direction of application of performance measurement information is outside the organization. External features of performance measurement mostly relate to the external environment of organization and external stakeholders. These features contain the following: organizational transparency and accountability improvement, external communication and ability to benchmark the organization within other available organizations. Mentioned features could be illustrated by the Figure 2, which divides features of performance measurement into external and internal (outside and inside of organization respectively) and visually shows the relation between the measurement role and management (decision-making) in the organization.

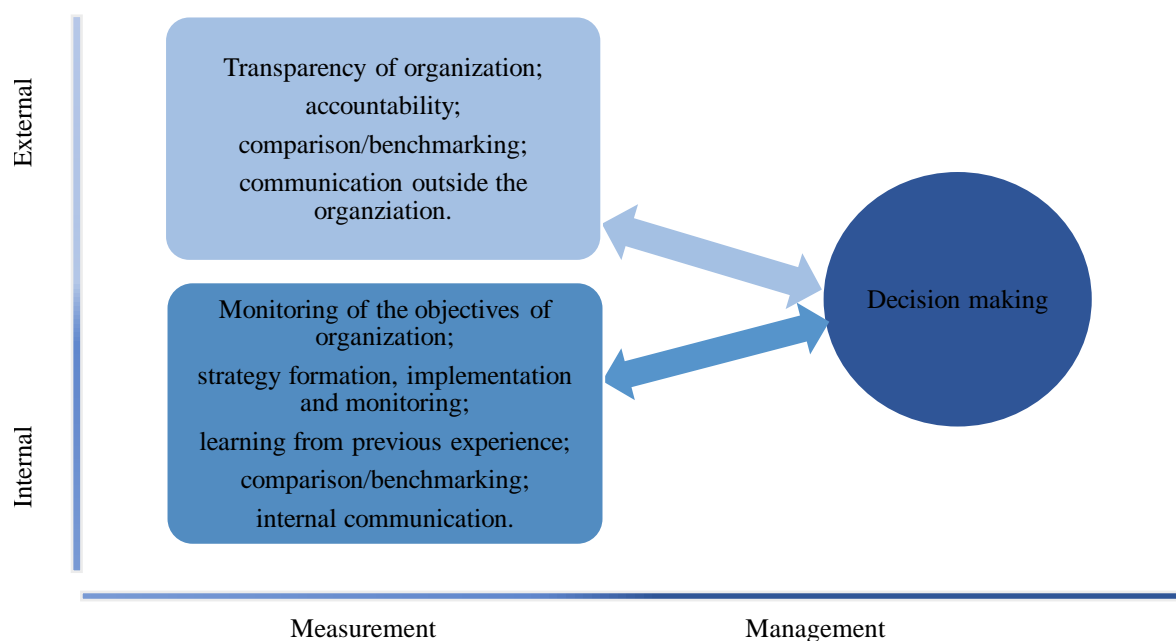


Fig. 2. Features of performance measurement of organization (created by the author).

It could be noticed, that these features of performance measurement of organization are interconnected, as monitoring the achievement of the objectives of organization, strategy monitoring, learning and benchmarking of organization initiates decision-making based on gathered information. Thus, the need and importance of the information, gathered from performance of any organization measurement, is clearly observed at present as well as over the years, since first PMS were introduced. In addition, information, gathered from PMS application is used not only for the successfully operating organization, performance measurement becomes even more important for organization, suffering difficult times – determination of its weaknesses could be useful for appropriate preventions or improvements and for the strategic planning. Overall, the use of PMS that include qualitative, quantitative, external and internal measures could lead to better organizational performance (Gomes et al., 2017) and improved quality of provided goods or services to society. These features prove the importance of performance measurement for management of organization.

Performance measurement systems. After different definitions of performance measurement were considered, it is noticeable, that performance measurement could be implemented by application of particular performance measurement system (PMS). Performance measurement system itself is also defined by different authors in literature (Gomes et al., 2017; Klovienè and Speziale, 2014; Nuti et al., 2018; Oh and Bush, 2015; Pirozzi and Ferulano, 2016). Oh and Bush (2015) define performance measurement system as performance measures that are gathered at regular time intervals to assess performance and encourage organization decision making. Klovienè and Speziale (2014) observed that performance measurement system is balanced but dynamic system that supports decision-making processes by providing relevant information. In terms of performance measures, Gomes et al. (2017) highlight the importance of financial and non-financial measures linked to strategy and provide definition, which is observed from the literature: “collections of financial and/or non-financial performance indicators that managers use to evaluate their own or their units’ performance, or the performance of their subordinates (Tuomela, 2005, p. 297)”. Pirozzi and Ferulano (2016) also describe PMS as tool for tracking the objectives developed in strategic level which consist of financial and non-financial measures. Nuti et al. (2018) defines PMS as series of tools used to define, control and manage outputs and outcomes of organization or particular process and the resources used to achieve these outputs and outcomes and provide decision makers and other stakeholders with relevant information. Marr (2016) states: “without the support of PMs, decision makers and other stakeholders would not have evidence of whether the results achieved are consistent with strategies and whether they are moving in the right direction” (as cited in Nuti et al., 2018, p. 2252). It could be noticed, that definitions of performance measurement system provided by different authors have more similarities within each other, than differences, as well as complement each other. As from the various authors provided definitions, the following characteristics of PMS could be observed: it comprises a set of tools, incorporates various measures, tracks the measures periodically and provides the information which is further used for various kinds of management. Thus, general definition of PMS could be shaped: *performance measurement system (PMS) is a set of financial and non-financial measures (indicators), which are linked to the strategy of an organization and tracked at pre-defined periods in order to support stakeholders with relevant information about the organization.* From this point of view, although performance measurement and PMS definition are similar, PMS definition is wider than already defined performance measurement: performance measurement is understandable as process of gathering, analyzing and applying information about object’s performance, while PMS scope include particular tools and measures in addition to that process.

Performance measurement systems shall be created for each individual institution, organization, system or country (Puškorius, 2010). The structure, intended application and functions of PMS strongly depends on what is intended to be measured, what activities are included what are the goals and objectives of PMS. According to Puškorius (2010), who recited Poister (2003), it could be noticed that performance measurement system shall involve organization stakeholders into the development of system and implementation of it in order to assure that system reflects specifics of particular organization, satisfy the needs of stakeholders and ensure conditions for performance measurement system to bring benefits for organization in which PMS is implemented. Every stage of performance measurement system design and development mentioned by Poister (2003) as cited in Puškorius (2010), plays crucial role in whole design and development process. Moreover, PMS design and development process is continuous and never stops within the organization, because, as afore mentioned, environment of organization changes and PMS needs to be adapted to these changes in order to reflect true and fair view of organization and bring benefits of its application. Wrong or wrongly implemented PMS could lead to even worsen performance of organization, because performance measurement utilizes financial, organizational and time resources. After the development and implementation of PMS, performance measurement process does not stop and is regularly proceeded within the organization. Regular performance measurement process mainly consists of five typical steps which are illustrated in Figure 3.

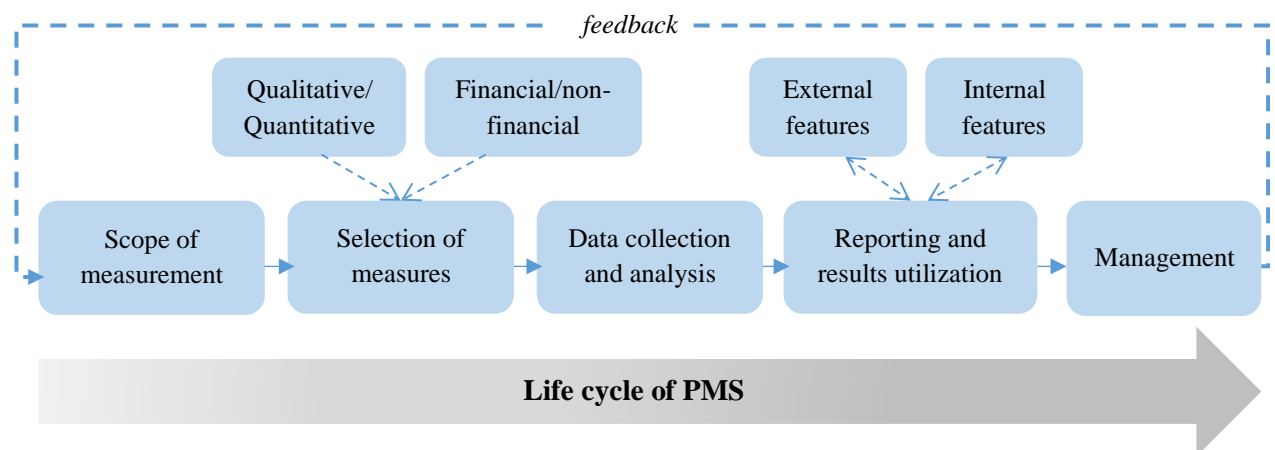


Fig. 3. Process steps of organization performance measurement (created by the author, based on Emami and Doolen, 2015; Pirozzi and Ferulano, 2016; Puškorius, 2010)

The regular process of performance measurement mainly begins with the identification what is going to be measured, following by selecting appropriate measures, which mainly could be further divided into quantitative or qualitative indicators and financial or non-financial indicators. After the identification, data is collected and analysed according to pre-determined scope of performance measurement (its objectives and alignment with the strategy). At the end, performance measurement culminates in the reporting and further results utilization, which encourages the information, gathered from performance measurement, to be applied for the management purposes. Finally, in order to face the changes of environment, PMS shall reflect the current situation of organization and needs to be updated based on gathered feedback.

In general, performance measurements are feasible only if they are connected with particular organization and with activities of that organization, thus the system should be tailored according to

each organization. Notwithstanding, global practice needs to be assessed in order to compare results, to learn from consequences of other performance measurements application, determining causes of failures, choosing appropriate performance measurement indicators, selection procedures and methods for valuation of these indicators, evaluating objectiveness of measures and appropriateness in particular situation, critically correcting gathered recommendations and conclusions, developing performance methods application experience, interviewing employees and managers regarding the grounding of such measures and their theoretical and practical benefit (Puškorius, 2010). Overall, each organization needs to identify the areas of performance that need to be measured, by selecting appropriate measures that align with the strategy and to apply appropriate performance measurement system.

The application of various performance measurement models in public sector and particular in healthcare organizations are analyzed by literature (Balabonienė and Večerskienė, 2015; Cinaroglu and Baser, 2018; Di Meglio et al., 2015; Emami and Doolen, 2015; Jennings, 2010; Lobont and Bociu, 2017; Malekzadeh et al., 2019; Pirozzi and Ferulano, 2016; Schoten et al., 2016; Taufik, Djahmuri and Saraswati, 2018 and others). For example, Jankauskienė (2016) provides the overview of performance measurements in foreign healthcare organizations (in that case, hospitals) operating in particular countries – Scotland, Norway, Sweden, and Germany. Most initiatives for performance measurement in hospitals are fairly recent, such as: Australian Council on Healthcare Standards, Joint Commission Accreditation of Healthcare Organization, Ontario Hospital Association, Quality Indicator Program, Clinical Indicators Support Team Scotland have been developed until 2000, all others have been developed only after 2000, for example, Performance Assessment Tool of Quality improvement in Hospitals (by World Health Organization, hereinafter, WHO). Performance measurement methods applied in foreign hospitals are systematized in Appendix 1. It could be noticed, that all of the methods incorporate particular number of indicators, which are specific to healthcare organizations. The most universal performance measurement method, analyzed by Jankauskienė (2016), is considered as PATH. It reflects all six dimensions of hospital performance and provides support for comparison or benchmarking within the organization in national (within the same country's hospitals) and international (within the countries) level, in addition, provides inputs for management of organization. Performance measurement systems employed in healthcare must be capable of not only meeting expectations of different stakeholders, but also of giving the most realistic image of the status and the progress across certain objectives (Emami and Doolen, 2015). Overall, as there are many various performance measurement methods, most common ones or particularly specific to healthcare organizations could be noticed: Model of European Foundation for Quality Management (EFQM) or common assessment model (CAF) (Balabonienė and Večerskienė, 2015; Franceschini, Galetto and Maisano, 2019; Malekzadeh et al., 2019; Pirozzi and Ferulano, 2016; Regragui et al., 2018; Schoten et al., 2016), Balanced Scorecard (BSC) (Balabonienė and Večerskienė, 2015; Emami and Doolen, 2015; Malekzadeh et al., 2019; Moullin, 2017; Taufik et al., 2018) and above mentioned PATH (Jankauskienė, 2016; WHO, 2007). In order to obtain deeper insight into the diversity of various performance measurement methods (or models), this section covers several of the most common used and relevant performance measurement models, these include: EFQM, BSC, and PATH. While these are the most cited (or relevant), it is recognisable, that there are many other alternate performance measurement frameworks, such as, accredited standards ISO, Performance Prism, The National Health Service (NHS) performance measurement framework and others, which are not going to be further considered in this research.

Model of European Foundation for Quality Management (EFQM) and Common Assessment Model (CAF). EFQM is a model for self-evaluation and it provides the analyzed experience of successfully performed organizations in XX century. Model is based on Total Quality Management (TQM) (Regragui et al., 2018). Nowadays, in Europe only, the European Foundation for Quality Management believes that at least 30,000 organizations are using the EFQM model, thus it is considered as commonly used performance measurement model. The main objective of EFQM – establish a system in Europe, which would help to improve competitive advantage for European organizations, within the effective application of quality of products and services management methods by involving all employees of organization. EFQM is based on nine principles: orientation to results, attention to users, management and goal consistency, facts-based management, people education and involvement, continues training and performance improvement, development of cooperation, responsibility to society. The EFQM model is the reference for other models at a national and regional level in Europe: EFQM model, as a basis, was used to create Common Assessment Model (CAF). CAF is used particular by public sector for self-evaluation: it enables to assess organizations strengths and weaknesses and compare gathered result within other organizations, thus sharing good or bad practice with others. The basis of CAF is 9 criteria: 5 of them (leadership, people management, strategy, resources, and processes) enable to assess and evaluate organizational processes and they are called “enablers” (Regragui et al., 2018, p. 52), which describe what organization does and could help to assure quality management, while remaining 4 criteria (people satisfaction, customer satisfaction, impact in society, performance results) enable to evaluate results of organization performance and they are called “results” (Regragui et al., 2018, p. 52), mainly they describe the achievements of organization. According to Malekzadeh et al. (2019), these 9 criteria are inter-related and could affect each other. The inter-relation is also discussed by Franceschini et al. (2019), positive results, with respect to people, customer, society and performance are caused by enablers. Organization could choose to evaluate one or few departments and it is not necessary to involve all the employees. Although CAF and EFQM models are strongly related, CAF model, compared to EFQM, presents a less systematic tool and requires less inputs for its use (Pirozzi and Ferulano, 2016), therefore it is more practical and easier to implement, especially for public organizations. However, the model does not introduce the options for external assessment or comparing the organization to its competitors, CAF is generic model, therefore, its modification is needed before application to particular organization. In addition, these methods are more focused on effectiveness and results of business management, but not on the quality of goods and services. In terms of benchmarking or comparison with other organizations purposes, different authors provide controversial opinions: Franceschini et al. (2019) state that model engages ability to make comparisons within organizations, while Regragui et al. (2018) provide an opinion, that this model is unpractical for external comparison or benchmarking with other organizations. Taking into the account benefits methods (EFQM and CAF) bring, they are universal and could be applied by the company independently of the type of organization, its size and other characteristics (Franceschini et al., 2019). There is no obligation to involve all departments and employees, therefore organizations have more flexibility when use this method and less resources are needed. In addition, it could be used for self-assessment, thus enables organizations to allocate resources or improve business plans (Balabonienė and Večerskienė, 2015). These are the main reasons this model is widely used for organizations performance assessment. It is one of the few models that recommended to be used for performance measurement of healthcare organizations (Pirozzi and Ferulano, 2016; Schoten et al., 2016). Notwithstanding, it is more focused on outcomes of organizational activities than the processes within the organization (Malekzadeh et al., 2019). In addition, each criterion is not transparent

(Franceschini et al., 2019) and could be interpreted individually, therefore the results of performance measurement could deviate because of personal judgement. Nevertheless, there are performance measurement methods available which pay more attention to quality improvements. From the beginning of healthcare organizations performance measurement, quantitative performance measures were employed first and later qualitative performance measures were introduced (Jankauskienė, 2016). As afore mentioned, financial performance measures throughout the history were popular, however, during the 1990, healthcare professionals started to pay attention to non-financial performance measures of healthcare organizations (Cinaroglu and Baser, 2018) in order to obtain more detail and informative view of a organization and maximize its effectiveness and efficiency, which have increasingly become more and more important for healthcare organizations. That makes performance measurement to be seen from different perspective and apply multidimensional models, one of multidimensional model, that incorporates financial and non-financial measures is balanced scorecard (BSC).

Balanced Scorecard (BSC). BSC framework is one of the most popular performance measurement frameworks used by healthcare organizations (Aidemark, 2002; Emami and Doolen, 2015; Regragui et al., 2018; Taufik et al., 2018). Generally, its application in public sector mentioned in the literature (Emami and Doolen, 2015; Oh and Bush, 2015; Moullin, 2017; Regragui et al., 2018; Riratanaphong and Voordt, 2015). R.S. Kaplan and D. Norton created it after an extensive research project in 1990. Although firstly BSC was applied in private sector, in late 1990s, public sector, including healthcare organizations, began considering the application of this framework in order to measure organizations performance (Emami and Doolen, 2015). The transision of BSC application from private sector to public sector was caused by method universality and New Public Management movements. The basis of BSC framework is performance measurement system relation with the strategy, which is already discussed and considered as one of the essential principles for effective performance of organization measurement and management. Using this system, settled goals and their achievement initiatives, as well as the measures, used to evaluate the results are directed to the strategy of organization, therefore, tailored to particular organization. It could be observed, that financial and non-financial measures, alignment with the strategy comprise afore defined performance measurement system concept. Strategy could be further divided into strategic objectives that conform to at least one of four measurement perspectives, developed by the BSC. These strategic objectives are connected to cause-relations, which are used to create the strategy map of an organization. For measurement of achievement of these objectives, indicators are settled, which are used as basis for creating tasks, therefore, indicators reflect objectives which reflect strategy. Four BSC perspectives are: financial perspective, customer perspective, internal business perspective, and learning and growth perspective. Developing and implementing these metrics and indicators provide healthcare managers with a comprehensive view of organizational performance (Emami and Doolen, 2015; Taufik et al., 2018). Based on the organization requirement, the number of these perspectives and the metrics covered by perspectives vary within each organization. According to Emami and Doolen (2015), Kaplan and Norton (1996) suggested that total of only 20-25 metrics within all four perspectives should be tracked, because tracking too many metrics is expensive and may confuse managers in terms of which metrics mostly align with the strategy of organization.

Financial perspective refers to the capacity of the organization to deliver the desired financial performance (Baraldi, 2002). Financial measures are essential to know whether it will be able to efficiently operate in the future or not (even if the hospital is public sector organization) (Regragui et

al., 2018) and whether implementation of organization's strategy will provide improvements in its financial indicators (Taufik et al., 2018). Financial perspective metrics could be, for example, profitability, revenue, sales growth (Riratanaphong and Voordt, 2015), also including other indicators, relevant for particular organization. Thus, financial perspective is also important for public sector organizations as their operation is usually limited with budget constraints. *Customer perspective* refers to customer's comprehension of corporate performances (Baraldi, 2002). Customer metrics could be as follow: customer retention, customer satisfaction, market research (Riratanaphong and Voordt, 2015). Taking into the account healthcare context, customer perspective mainly refers to patients' satisfaction with provided health services, patients complaints regarding provided services. As healthcare organizations, considered within this research are part of public sector, they are dedicated for effective healthcare services provision for patients rather than profit, therefore customer perspective is highly important for such kind of organizations. *Internal business perspective* refers to the capacity to excel in carrying out organizational processes (Baraldi, 2002) or how well the organization is capable to manage its internal processes. Metrics of this perspective: processes to meet or exceed customer expectation (Riratanaphong and Voordt, 2015). This perspective is strongly related to management: internal business metrics are used to evaluate the management, thus in such case, management of internal processes are subject to evaluation and becomes an input for measurement process which again reflects the strong relation between management and measurement. *Learning and growth perspective* helps to determine organization's capabilities operate in future due to competitive environment and maintain changes regarding innovations. Metrics under learning and growth perspective mainly relate to an organization's intangible assets (Emami and Doolen, 2015). Emami and Doolen (2015) highlighted that mostly hospitals do not include all the BSC perspectives, especially learning and growth perspective when measuring the performance. It is clearly understandable that learning and growth metrics – intangible assets, are complicated to obtain. According to Emami and Doolen (2015), learning and growth perspective could be further divided into human capital, organizational capital, innovation, infrastructure and technology, where human capital plays fundamental role in performance measurement. Overall, According to Aidemark (2002), as stated by Norton and Kaplan, these four perspectives are linked to each other in a hierarchical cause-effect chain. Strong learning and growth perspective should positively affect employees, this is thought to support internal business perspective, which in turn would lead to better customer relations, which would reflect the better results in customer perspective metrics. Increased customer satisfaction thought to improve financial results. Thus, it could be seen that positive results in one perspective cause positive effect to other perspective and *vice versa*. Taking into the account healthcare organizations, BSC metrics are analyzed by the literature (Emami and Doolen, 2015; Rahimi, Kavosi, Shojaei and Kharazmi, 2017; Regragui et al., 2018; Taufik et al., 2018), each metric has indicators specific to healthcare sector which could be summarized in the Figure 4.

It could be observed, that BSC could be realized in public sector, particular, in healthcare organizations thanks to the developed metrics, which reflect specifics of healthcare sector organizations. Four perspectives of BSC framework have their specific metrics, thus, healthcare organization could individually decide which perspectives need to be included in measurement and which metrics mostly align with the strategy of that organization and what kind of information could further be used for management purposes.

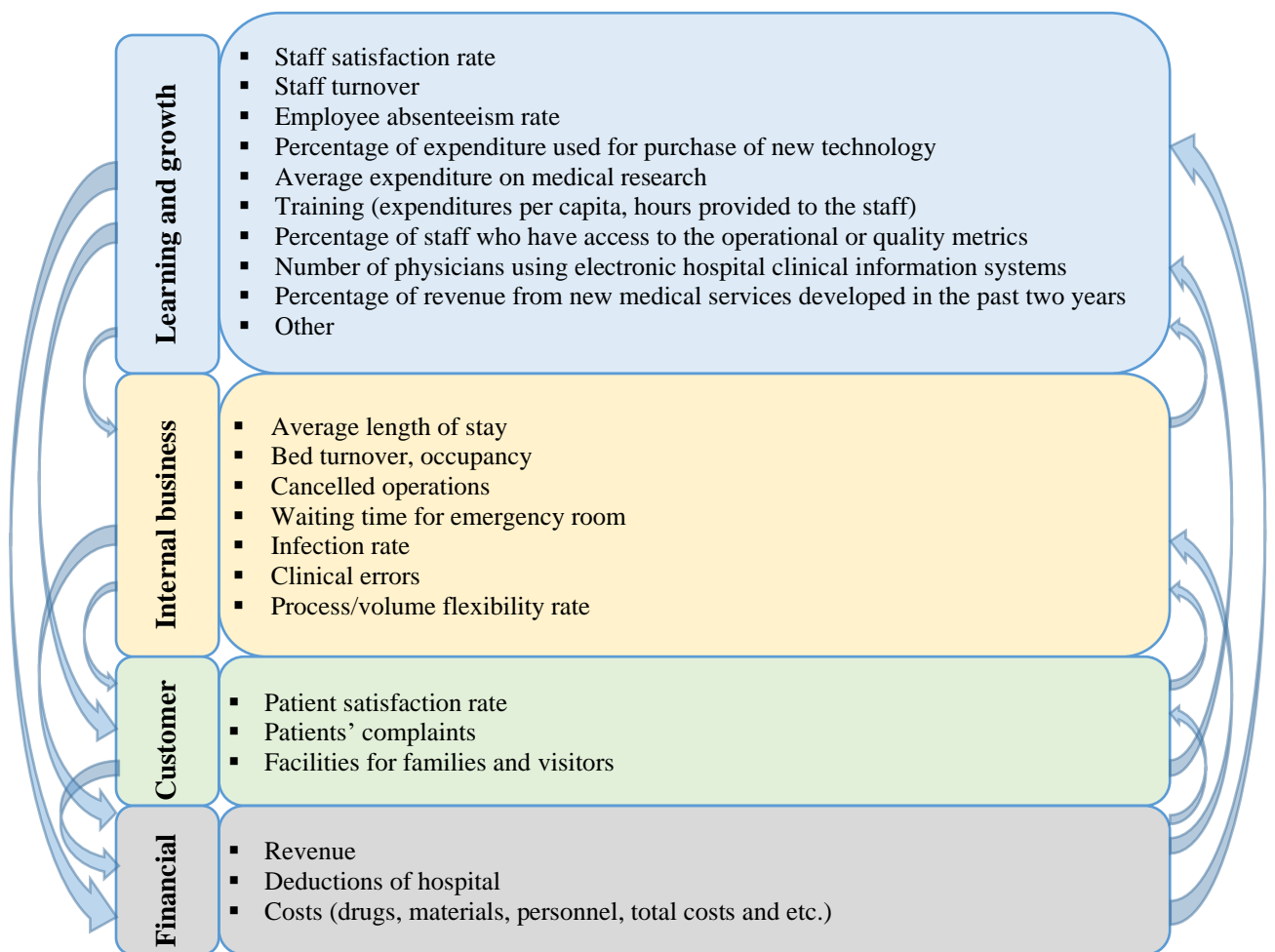


Fig. 4. Application of BSC metrics in healthcare organization(s) (created by the author, based on Emami and Doolen, 2015; Rahimi et al., 2017; Regragui et al., 2018; Taufik et al., 2018)

BSC has its benefits, as well as drawbacks. Taking into the account BSC model advantages, it links company's strategy with the performance measures used to monitor and control strategy implementation (Regragui et al., 2018; Balabonienė and Večerskienė, 2015). Therefore, helps to overcome barriers between strategy formulation and implementation. Model aligns individual departments, units, or employees in the achievement of common goals (Regragui et al., 2018). Thus, improves the motivation of employees in individual and group level. Moreover, method provides a comprehensive view of on organization within different perspectives and measures by providing balance between internal – external, financial and non-financial measures, short-term and long-term goals (Aidemark, 2002; Regragui et al., 2018). Representation of relation between financial and clinical dimensions in healthcare management, in order to guide staff actions, instead of controlling them (Baraldi, 2002). In such a way, improved means of management and better organizational results could be obtained. On the other hand, as every performance measurement model, BSC has its disadvantages. For example, methodology of BSC reflect its private sector origin (Moullin, 2017). BSC usually focuses on financial perspective; however, public sector in general should focus on goods and services provided for society, short waiting times and good outcomes rather than profits and revenues of the organization (Purbey, 2007). Modifying BSC to fit the particular organization is complex (Moullin, 2017): the design and implementation of the BSC in healthcare organization takes time (average 2 years), resources and professionals (Baraldi, 2002). BSC considers several relevant dimensions of performance without explaining how to weight their importance in an integrated

framework (Regragui et al., 2018). This is important for healthcare organizations as performance measurement in healthcare organizations using BSC method, involves indicators which highly differ across each other and are specific to healthcare sector. Overall, BSC application in healthcare sector organizations performance measurement is widely analyzed by the literature. Firstly, introduced to private sector, BSC framework was adapted to public sector organizations, including healthcare organizations by developing specific metrics that reflect to the specifics of healthcare sector. Thus, the application of BSC to healthcare organizations is promising and it is enriched by various examples in literature and associated benefits of its application expected to overcome drawbacks.

Performance assessment framework for hospitals (PATH). This performance assessment framework was created specifically for hospitals. According to Jankauskienė (2016), it is a project that was initiated in 2003 by WHO. The main goal of the performance measurement system is to measure hospitals performance, compare the performance within other countries and improve performance of hospitals in the country by using gathered information (Veillard et al., 2005). Six criteria groups are used to measure hospitals' performance – clinical effectiveness, safety, orientation to patient, efficiency (productivity), orientation to personnel, responsive governance. *Clinical effectiveness* determines if hospital in existing conditions provides clinical services appropriately and sufficiently, in addition, determines goals achievement level of the hospital. *Efficiency (productivity)* is a relation between the resources utilized and services provided. It focuses on the use of health technologies to provide the best possible healthcare services (WHO, 2007). *Orientation to employees* is defined as appropriate hospital's employee's qualification to provide healthcare services, adapt to novel technologies, continuous qualification improvement, and employee's satisfaction with their job. *Orientation to patient* is described as hospital activities, which are focused on patient needs – services are provided according to the state of patient and his/her family, autonomy, needs. Provided information, communication to patient and confidentiality is assured. From this point of view, PATH similarities with BSC model could be observed: both incorporate orientation to patient/customer as a contributing element to organization's performance. *Safety* is the process indicators group that ensures if organization has appropriate structure, in addition, uses such services provision methodic, which effectively reduces potential harm and risks to the patient, employees and environment. *Responsive governance* it is a level which hospital reacts to the need of community hospitality, assures coordination between hospital and community, encourages healthy lifestyle, and provides services to patients equally in accordance to race, gender, age, economic characteristics and other aspects, thus it is more related with external environment of hospital. Six criteria groups that are used to measure hospital's performance are visualized in Figure 5.

As it could be noticed from the Figure 5, these criteria groups are inter-related: two transversal perspectives (safety and orientation to patient) cut across four dimensions of hospital performance (clinical effectiveness, staff orientation, responsive governance, efficiency). According to Veillard et al. (2005), safety relates to clinical effectiveness (patient safety), staff orientation (staff safety), and responsive governance (environmental safety) when patient centeredness relates to responsive governance (perceived continuity), staff orientation (interpersonal aspect items in patient surveys), and clinical effectiveness (continuity of care within the organization).

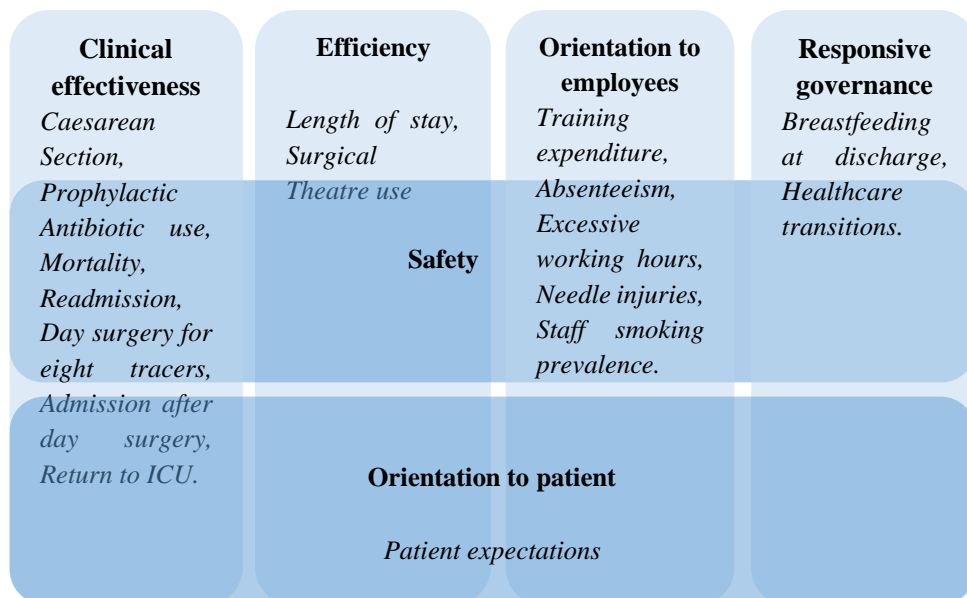


Fig. 5. PATH framework (created by the author, based on Jankauskienė, 2016 and WHO, 2007)

Relevant indicators express each of the criteria. Indicators are divided into two groups – core indicators, that are relevant to all contexts and present a low burden of data collection (WHO, 2007) and tailored indicators, that are relevant to limited number of contexts or present a high burden of data collection (WHO, 2007). The core set has been designed to allow international benchmarking in the future—when quality of gathered data will be considered good enough (Veillard et al., 2005). There are total 17 core indicators, while tailored set includes 24 indicators and are suggested only in specific contexts. According to WHO (2007), core indicators are preferred and hospital can decide which of the tailored indicators could be included in performance measurement additionally. The output of performance measurement using PATH model are performance reports. They support hospital managers in comparing the performance of their hospitals with the performance of a peer group of hospitals and help managers to identify weaknesses and strengths, areas of improvement of hospital’s performance. Therefore, the output of application of PATH is related to the main aim of this method – improvement of performance of hospital and the gathered information is the main input of that improvement. Other benefits of PATH application including, but not limited to:

- developed specifically for healthcare organizations (hospitals), therefore, model reflects the specifics of healthcare organizations;
- multidimensional method (Veillard et al., 2005; WHO, 2007);
- supports quality enhancement strategies in healthcare organization.

Nevertheless, besides these benefits, method has some limitations, for example:

- method is designed for internal use. it is not intended to be used for external reporting, accountability, accreditation or other external purposes, thus does not pose all the features of performance measurement, as described by figure 2;
- it is complicated to choose appropriate indicators for particular hospital;
- low rate of real-life implementations of the framework, feedback from the hospitals, thus feasibility of practical application is questionable.

Overall, PATH seems to be promising framework for performance measurement of hospital not only in the context of individual hospital performance measurement and improvements, but also in building the dynamical system of national and international comparisons within various hospitals throughout benchmarking processes. By merging six afore mentioned criteria, PATH defines high hospital performance – application of professional competencies of staff, based on current knowledge and state of the art in technologies and available resources, efficiency in the use of resources, minimal risk to patient, and optimal contribution to health outcomes and overall responsibility in hospital management. On the other hand, directions of improvements are foreseen – currently PATH is designed for hospitals, but taking into the account that National Health System consists of several types of healthcare organizations which provide clinical services, PATH shall be adopted to broader type of healthcare organizations by including (or excluding) relevant (or irrelevant) performance measurement indicators.

Performance measurement of healthcare organizations indicators. An indicator is defined as “measurable element that provides information about a complex phenomenon (e.g. quality of care)” (Veillard et al., 2005, p. 488). After performance measurement systems were assessed, it could be observed, that various measures and indicators are used in measuring healthcare organization’s performance, and mostly, indicators differ from other public organizations, because of the specifics of healthcare sector. Cinaroglu and Baser (2018) use accessibility of services and utilization as two main dimensions. Indicators of accessibility of healthcare services are number of hospitals and number of physicians, while indicators of utilization are average length of stay and number of surgical operations. The study found strong relation between accessibility indicators and health outcomes: this study shows that an increase in accessibility leads to improvement in healthcare outcomes, such as, life expectancy and general satisfaction from healthcare services. These results enhance the understanding of the relationship among key performance measures to improve health systems performance and quality. It could be observed, that performance measures in healthcare organizations are mostly referred to healthcare outcomes and financial indicators (Cinaroglu and Baser, 2018; Emami and Doolen, 2015; Nuti et al., 2018). More particular, financial indicators, which include, but are not limited to: return on investment (Pourmohammadi, Hatam, Shojaei and Bastani, 2018; Si, You, Liu and Huang, 2017), asset turnover (Pourmohammadi et al., 2018; Si et al., 2017), return on assets (Pourmohammadi et al., 2018; Si et al., 2017; Wang, et al., 2018), profit margin (Pourmohammadi et al., 2018; Si et al., 2017), current ratio (Pourmohammadi et al., 2018) could be observed in the literature. However, financial measures tend to measure the past (Regragui et al., 2018) and organizations without operational measures usually have higher rate of employee change due to lack of satisfaction their (Emami and Doolen, 2015). Therefore, key performance measures, as afore mentioned, could be improved, for example, by integration of intellectual capital (IC) measures (Pirozzi and Ferulano, 2016) or future looking metrics (Emami and Doolen, 2015) in order to make performance measurement more informative and reflect organizations capabilities so sustain innovation and change.

Taking into the account Lithuanian practice, the list of 26 hospital healthcare quality assessment indicators was approved in accordance to the Order V-1073 of the Minister of Health of the Republic of Lithuania in 2012 (Lietuvos Respublikos Sveikatos Apsaugos Ministerija [LRSAM], 2012). Order V-1073 of the Minister of Health of the Republic of Lithuania states that every public healthcare institution shall provide Ministry of Health of The Republic of Lithuania and State Healthcare Accreditation Agency by the data of performance indicators. Moreover, in 2015, the correction of the

indicators list was approved (by the Order V-929) and the list was updated. In 2019, the list of indicators was updated and total 19 indicators are left (V-731) (LRSAM, 2019). According to the Law on Healthcare Institutions (*Republic of Lithuania Law on Healthcare Institutions, 6 June 1996 No I-1367.*, 1996), the expected values of performance indicators are proved by the Minister of Health every year. As performance of healthcare institutions measurement in Lithuania is new, the development of these indicators is a huge step in general performance measurement system implementation. The comparison of settled indicators within 2015 and 2019 is provided in Appendix 2. It could be observed, that indicators confirmed in 2015 could be divided into two groups according to two dimensions – quality and effectiveness. While by 2019 performance indicators, qualitative and quantitative performance measurement is implemented, thus financial and non-financial and additional indicators are included. Although number of indicators is reduced in 2019, they are more evenly distributed within three perspectives compared to 2015 indicators, which significantly highlighted quality indicators versus effectiveness indicators. The number of financial indicators is smaller than number of non-financial indicators, financial indicators include fairly comprehensive information about healthcare organization: profit (or loss), personnel and management costs, absolute liquidity, financial liabilities to total budget and additional financial resources engagement. Indicators provide multidimensional measurement, because measures financial and non-financial performance of organization, thus reflects already described PMS definition, as a result, it could be stated that these indicators stand as strong basis for Lithuanian healthcare sector PMS implementation. According to settled indicators, performance of healthcare organization, quality of provided services and patient service is intended to be measured. Nevertheless, currently, there is no performance measurement model which involves these indicators created or intended to be used, therefore it is not feasible to compare the indicators within the hospitals, to draw appropriate conclusions from the results regarding each of the healthcare organization performance based on their provided indicators. The weighting of each indicator should be described and the characteristics of healthcare organizations shall be taken into account.

It is important to bear in mind, that performance measurement (and PMS) could meet some challenges. For example, investments of financial, non-financial and time resources are needed in order to realize performance measurement of organization. Organizations must ensure PMS' relation to the strategy of organization in order to give true and fair information from performance of that organization measurement (Nutti et al., 2018). Similar organizations could not be compared within each other in every case – cultural differences and organizational characteristics (e.g., size, location, ownership and others) may limit ability of comparison. Furthermore, human factor plays a crucial role in performance measurement. Therefore, some measures could be chosen incorrectly; the valuation of especially qualitative measures is mostly based on personal or group judgments, which are subject to inaccuracies and could be interpreted individually. Finally, performance measurement needs to be continuously monitored and adapted to the changes of environment organization operates in order to reflect true and fair view of organization. Taking into the account the last aspect, as mentioned in sections above, one of the main changes that affects performance measurement is digitalisation. New expectations of governments are stimulating modernization of all organizations that exist in public sector. ***Digital transformation is playing a key role in modernizing public services, as it is expected to increase service productivity and reduce labor intensity, increase the level of satisfaction services and enhance the openness of public organizations, trust in and engagement with governments. On the other hand, in some of the cases, digital transformation benefits are questionable against drawbacks. Nevertheless, in any case, digitalisation in public***

sector organizations including healthcare institutions is unavoidable and widely applied, its trends are rapidly increasing and is expected to grow over the years.

2.2. Digitalisation in public healthcare organizations

Digitalisation in healthcare sector overview. As digital revolution is broad term, which refers to the overall process of the transition of technology from analog to digital, the term *digitalisation* could be used to illustrate the application of digital technologies in organizations to add value in several of the forms. Digitalisation refers to that use of digital technologies in the context of the production and delivery of a product or service. Digitalisation is therefore not only a technical term (like, digitisation), it is also an organizational process. It could be also highlighted, that adoption of technology-based change is focused on following technology enablers: cloud, mobile, social and big data, data analytics. Taking into the account healthcare organizations, one of the factors influencing performance of healthcare organizations is technological change, including the ongoing process of digitalisation of health services. Digitalisation, in terms of application of health wearables to home monitoring of patients, electronic medical devices, and the application of computer aided visualization and decision support systems, has affected and is expected to affect many aspects of healthcare systems and the way healthcare will be provided in the future (EXPH, 2018; Reddy and Sharma, 2016), it is also one of the factor influencing patients' choice of healthcare organization (Janušonis, 2018). Digitalisation in healthcare services refers to the transition in which more health services and processes will be digitalised. Digitalisation introduces new digital information and communication technologies and corresponding new processes into the healthcare sector (EXPH, 2018). Digital technologies offer wide spectrum of opportunities for delivery of healthcare, thus the digital ones support conventional healthcare services. According to EXPH (2018), WHO published a classification of *digital health services* (see Table 1), by dividing them into four categories: clients, healthcare givers, managers and data.

Table 1. WHO classification of digital health services (by EXPH, 2018)

Category	Description
Interventions for clients	Clients are members of public who are potential or current users of health services, including health promotion activities.
Interventions for healthcare providers	Healthcare providers are employees of the healthcare organization who deliver health services.
Interventions for health system and resource managers	Health system and/or resource managers are involved in the administration and oversight of public systems. Interventions within this category reflect managerial functions related to supply chain management, health financing, human resource management.
Interventions for data services	Support for wide range of activities, related to data collection, safety, management, use, and exchange.

This classification reflects what parts of healthcare organization are intervened by digitalisation. It could be observed, that digitalisation involves fairly all stakeholders of healthcare organizations when taking a look from the perspective of healthcare organizations performance: patients, healthcare professionals, management and data services. To take a look deeper, OECD (2016) provided healthcare digitalisation trends within relevant parts of health system (Table 2). This point of view provides more comprehensive information about particular types of digitalisation trends in each (or most common) category of health services.

Table 2. Digitalisation trends observed in healthcare services (by OECD, 2016)

Healthcare service categories	Examples of digitalisation trends
Administration of health units	Back-office administration, data reimbursements of health expenses, e-procurements and other administration functions.
Health information and data	Electronic health records (EHR) of the patient data.
Communication with patients and relatives	Access to patient health data and its management. Helps increase in trust in the public sector.
Bookings	Digital appointments (e-bookings) for doctor bookings.
Prescriptions	Digital prescriptions (e-prescriptions) which are prioritized before paper filling.
Clinical decisions	While doctors still play key role in patient clinical analysis, different elements of diagnosis could be segmented. Scans can take place in one location and the analysis can take place in another.
Patient care and monitoring	Patient care and monitoring is increasingly being digitised and online treatments are being introduced. Processes are re-designed and value chain is reconstructed.
Prevention	EHR combination with digital drugs recommendations help consider medical intolerances.

Health service categories. While WHO proposed classification of health services (EXPH, 2018) is wider than proposed by OECD (2016), both classifications contribute to each other and each health service category defined by WHO is related to certain category(-ies) remarked by OECD. For example, bookings, prescriptions and patient care and monitoring are related to patients (healthcare organizations' clients), therefore digitalisation trends which assigned to patients (see Table 2) are considered as interventions for clients (see Table 1). It is reasonable that digitalisation intervenes clients by introducing *e-bookings*, *e-prescriptions*, digital patient communication and treatment means (e.g., *health wearables*, *telemedicine* and others). *E-bookings* provide patients with fast efficient way to register for certain medical services, while *e-prescriptions* eliminate the need of handling paper forms. Other important digitalisation trends which intervene patients are *telemedicine* (EXPH, 2018; OECD, 2016) and *health wearables* (Reddy and Sharma, 2016). Health wearables contain various sensors which stream data to healthcare organization and could help in disease management, improve home-based care. According to OECD (2016), in most countries, rural areas are typically not served at the same levels as urban areas and populations – including in healthcare, notwithstanding, online communications and services provide a way to address this, including the reduction of healthcare costs, therefore, telemedicine seems promising not only for financially strong healthcare organizations. Taking into the account category which represents healthcare providers (see Table 1), clinical decisions and prevention (see Table 2) are strongly related to it. Digitalisation based *clinical decisions* represent digitalisation trend itself which intervene healthcare professionals. Additional digitalisation trend which is widely used by healthcare professionals and even for clinical decisions support is digital imaging in *DICOM* (Digital Imaging and Communications in Medicine) standard, transmitted via picture archiving and communication system (*PACS*). Further analyzing healthcare service categories proposed by WHO and OECD it is noticeable, that health units' administration (Table 2) is similar to interventions for health system and resource managers. The examples of digitalisation trends applicable to this category could be connected to human resources – *digital schedules*, or management – *strategy*, *managers' attitude* towards digitalisation. Additional example of digitalisation trend attributable to health units' administration is *e-procurements*. Taking into the account last aspect – health information and data, it is attributable to interventions to data services. Taking into the account *Electronic Health Records* (hereinafter, EHR), it is one of the most

known and applied digitalisation trends within different healthcare organizations (Adler-Milsiten et al., 2017; Atasoy et al., 2019). EHR is alternative for paper forms of patient's health records. EHR includes data about the patient which is gathered during his/her interaction with healthcare professional or by additional means – lab results, diagnostic images and etc. Ideally, this data should be filled by all the institutions patient receives health care and shared among other health providers. According to Atasoy et al. (2019), EHR provides plenty of opportunities for healthcare professionals: data accesibility and exchange across professionals, avoidance of medication errors, enhanced transparency. EHR is not only useful in terms of individual patient, it could also be used as a management tool or decision support system to prevent medication errors and applied to a broad range of functions. From this point of view, it could be noticed, that features which incorporate EHR are similar to features that are pose by performance measurement (refer to Figure 2). Overall, by the synthesis of these two classification concepts providing in Table 1 and Table 2 more comprehensive view about digitalisation interventions to each healthcare organization stakeholders, their explanation and applicable digitalisation trends to each category is gathered. As more digitalisation trends are adopted by the organization and more frequently they are used in its activities, the higher digital maturity level organization is expected to obtain.

Above mentioned digitalisation trends produce wide variety of information (data). Some researchers refer it to big data. According to (Reddy and Sharma, 2016), the demand of data in healthcare is increasing – it was predicted that the amount of data in 2020 will be 44 times bigger than was generated in 2009. The predictions could be considered as reasonable, as digitalisation trends are more and more applied and implemented by healthcare organizations. The challenges of making digitalisation usable is highlighted by the literature (Adler-Milsiten et al., 2017; Reddy and Sharma, 2016). Digitalisation information application extends to prediction and prevention of diseases or epidemics (Rogge et al., 2017; Reddy and Sharma, 2016), that strongly refers to big data analytics. According to Reddy and Sharma (2016), by receiving and analyzing various data, including medical records healthcare providers are able to predict diseases by investigating appropriate tendencies. Furthermore, digital data could be applied in genomics, data analytics is expected to provide information about the causes of diseases that refer to changes in genomics, as a result, pharmacies will be able to develop personalized medicines. That would lead to custom-made healthcare to satisfy each individual medical needs, thus personalized medicine would be empowered not only in theoretical but also in practical level. On the other hand, digitalisation by its application is not limited to clinical aspects. As digitalisation trends from various types of healthcare organization activities are generating data, digital data application in performance measurement is promising (Adler-Milsiten et al., 2017), could provide improvements in organization performance and relevant inputs for decision making process, notwithstanding digital data application in performance measurement is shaped by its digital capabilities (stage of digital trends application). ***Overall, it could be observed, that various healthcare services categories including all relevant healthcare organization stakeholders are strongly intervened by digitalisation. Digitalisation effects in healthcare are not only patient-centered or provider-centered, digitalisation affects completely healthcare system, including each healthcare organization performance. The amount of digital information in healthcare sector is increasing rapidly, thus making digitalisation usable is one of the challenges that performance measurement should address.***

Stages of digitalisation. As digital trends are rapidly growing, it is also important to assess the stages of digital transformation. Eggers and Bellman (2015) did the research about the journey of public

sector digital transformation within 70 countries. Stages of digital transformation could be expressed by term “digital maturity”. According to the authors, digital maturity refers to the extent to which digital technologies have transformed. The stages of digital transformation, based on the research, are “early,” “developing,” and “maturing”. Digitalisation stages are shown in Figure 6. Five factors are shaping digital transformation: strategy, leadership, workforce skills, digital culture, and user focus. What separates digital leaders from the rest of organizations is a clear digital strategy combined with a culture and leadership ready to drive the transformation. Thus, from the point of organization performance view, digital transformation could be seen as organization objective and organization’s strategy alignment is important condition for that objective achievement. According to Eggers and Bellman (2015), global digital maturity distribution of public organizations is: 26% corresponds to early digital maturity level, 60% stands to developing digital maturity level, and 13% takes place in highest maturity level – digital maturing.

	Early	Developing	Maturing
Strategy	Aimed at cost reduction	Aimed at improving customer experience and decision making	Aimed at fundamental transformation of processes
Leadership	Lacks awareness and skills	Digitally aware	Digitally sophisticated
Workforce development	Insufficient investment	Moderate investment	Adequate investment
User focus	Absent	Gaining traction	“Central” to digital transformation
Culture	Risk averse; disintegrated	Risk tolerant; accommodates innovation and collaboration	Risk receptive; fosters innovation and collaboration

Fig. 6. Digitalisation stages (by Eggers and Bellman, 2015)

The main challenges that affect the organization in digital transformation: too many competing priorities (41%), insufficient funding (37%), security concerns (32%), lack of overall strategy (31%), lack of organizational agility (27%), insufficient technical skills (23%), lack of entrepreneurial spirit, willingness to take risks (19%), lack of understanding (19%), lack of collaborative, sharing culture (13%), legislative and legal constrains (11%). As it could be noticed, mostly public organizations are in the second generation of digitalisation, notwithstanding, the research was done in 2015, therefore nowadays more public sector organizations are expected to be in highest maturity digitalisation level. In addition, considering the digital transformation in healthcare organizations. Considering challenges of digitalisation faced by healthcare organizations, researches found users stagnancy to change against digitalisation (Adler-Milstein et al., 2017; Atasoy et al., 2019) or financial constraints Adler-Milstein et al. (2017) as common challenges of EHR adoption. Besides these, interruption of organizational processes, technical and maintenance issues were reported (Atasoy et al., 2019). Taking into the account Lithuanian practice, particular healthcare public organizations, digitalisation is relatively recent and started since Lithuania became a member of European Union (EU). Digitalisation stages described above could also be observed in Lithuanian healthcare sector (see Figure 7).

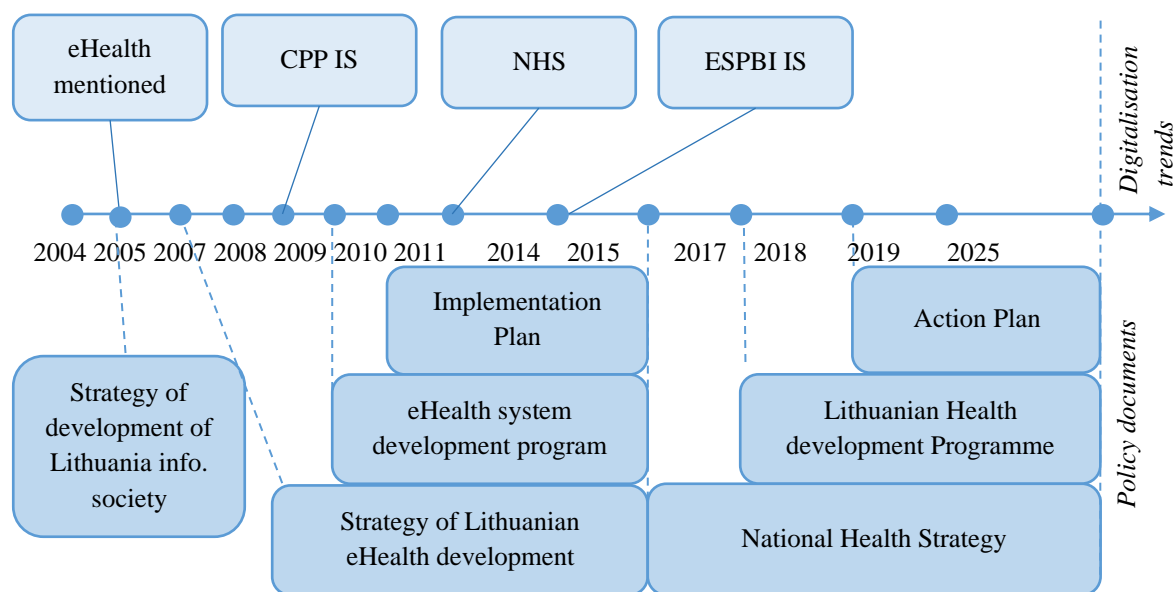


Fig. 7. Digitalisation in Lithuania (created by the author, based on EC, 2019; Kiškienė et al., 2010; LRV, 2005; VK, 2017)

Electronic health (hereinafter, eHealth) development was mentioned in 2005, this was a part of modernization of public administration (*Dėl Lietuvos informacinės visuomenės plėtros strategijos patvirtinimo, 2005 m. birželio 11 d. Nr. 625.*, 2005). In 2007 Lithuanian Minister of Health adopted Lithuanian eHealth strategy “Strategy of Lithuanian eHealth development for the years 2007-2015”. In 2008 Central Public Procurement Information System (CPP IS or eProcurement) was started to be used as official procurement portal in Lithuania and involved healthcare organizations together with other sectors (European Commission [EC], 2019), thus a sudden and unambiguous transition from paper forms to electronic ones was started and changed Lithuanian procurement system significantly. In addition to strategy, which afterwards was accompanied by eHealth System Development Program in 2009, Implementation Plan of the strategy was adopted in June 2010 (Kiškienė, Giest and Dumortier, 2010). The main output of the strategy was a creation of user-friendly, digitalised information system which intended to be used by all healthcare stakeholders. According to Kiškienė et al. (2010), strategy described three stages of eHealth implementation. First stage lasted until 2011 and was supposed to define main parameters of National Health System. The second stage covered the period within 2011 and 2014, Electronic Health Services and Cooperation Infrastructure Information System (*lith. ESPBI IS*) were introduced, which covered other healthcare sub-systems, such as EHR, e-prescriptions, e-bookings and others. In the third stage, universal application of eHealth tools was foreseen: patients data management and complex clinical decision-making based on information available in database. The main objectives of eHealth, covered within E. Health System Development Program for 2009-2015 are as follow: involve all Lithuanian healthcare stakeholders in electronic database, improve accessibility to patients-data and healthcare services for both sides – patients and healthcare providers, save time and improve efficiency of healthcare services, enhance cooperation between healthcare providers by sharing patient’s health data and clinical experience, reduce the costs of eHealth implementation and healthcare services, reduce and control the risk of eHealth failure. However, after the eHealth system implementation was considered as finished, it was used passively, mainly due to questionable quality and safety of the system

(Valstybės Kontrolė [VK], 2017). Subsequently, “National Health Strategy 2015-2025” was adopted by Lithuanian Parliament in 2014 (EC, 2019). In addition to the strategy, “Lithuanian eHealth Development Programme 2017–2025” was adopted by Minister of Health of the Republic of Lithuania in 2017 (*Isakymas dėl Lietuvos e. Sveikatos sistemos 2017–2025 metų plėtros programos patvirtinimo, 2017 m. liepos 17 d. Nr. V-878.*, 2017), which goes along with “Action Plan 2018-2025”, which was adopted by Minister of Health of the Republic of Lithuania in 2018 with Order No V-362. The main idea of the renewed strategy is to finish development of Lithuanian eHealth system and expand its opportunities including integration with EU eHealth. In addition, Programme aims to involve all healthcare institutions in participation of eHealth development (EC, 2019). Since 2018 healthcare organizations mandatory need to provide data to Electronic Health Services and Cooperation Infrastructure Information System (hereinafter, EHSCI IS). On the other hand, according to audit of period 2011-2016 performed by Supreme Audit Institution of Lithuania (VK, 2017), it was observed, that eHealth does not fully work, the level of application of eHealth is minimal: not all healthcare organizations provide clinical data to EHSCI IS (31% healthcare organizations do not provide data to database), supply patients with electronic prescriptions (17% healthcare organizations are not able to generate electronic prescriptions to the patients). Moreover, from the patient point of view, 1229089 patients were registered to EHSCI IS in 2016, however, patients’ interest in eHealth portal is relatively low over the years. Overall, it could be observed that situation is improving over the years, since 2019, about 94,4% of healthcare institutions were connected to the central eHealth system and have sent at least one document to that database, 91% of medicines were prescribed electronically and all birth and death certificates were issued electronically (EC, 2019).

Thus, implementation of digitalisation trends in Lithuanian healthcare system faced many challenges, considering the future, digitalisation becomes more and more promising. Taking into the account the types of digitalisation trends in Lithuania, it could be seen that *eHealth* covers various types of digitalisation of healthcare services and tools, eHealth could be defined as the application of information and communication technologies (ICT) in healthcare systems applied in order to improve healthcare services by provision of full-scale personal health information to improve management of healthcare (*Resolution of Approval of the Lithuanian Health Strategy, 26 June 2014 No XII-964.*, 2014). Centralized database of eHealth is EHSCI IS. This database aims to ensure higher level of patient awareness about their health, improve the provision of healthcare services by involving patients, healthcare professionals and institutions (Griškevičius and Kizlaitis, 2012). EHSCI IS functions include but not limited to: ability to maintain several types of documents, create certificates, cover vaccination calendars. According to the factsheet, issued by European Commission (EC, 2019, p. 24), “structure of the EHSCI IS is based on a repository database, which consists of separate databases of patients’ EHR, medical devices, classifiers, medical images, electronic prescriptions, as well as reports and statistical information”. Therefore, eHealth is considered as wide term as representation of digitalisation in healthcare sector, which contains other tools or sub-systems. *E-prescriptions* understood as the processes of the electronic transfer of a prescription by a healthcare provider to a pharmacy for supplying patient with prescribed medicine (Kiškienė et al., 2010). Electronic prescriptions give more convenience for patients and make patients free from carrying prescriptions in paper format: patients need to provide their ID to the pharmacy when acquiring prescribed medicines. Electronic prescriptions is one of the representative digitalisation trend applied by Lithuanian healthcare sector. *E-bookings* reduce the waiting lines in healthcare institutions, provide an ability to see particular healthcare professional schedule and availability, thus also enhancing convenience for patients. *E-procurement* works separately from eHealth, nevertheless, it

also could be considered as one of digitalisation application in healthcare sector (EC, 2019). Electronic procurements are being done via Central Public Procurement Information System (CPP IS), this portal works as one-stop-shop for public procurement. The portal is used for tender announcements, as a tool for signing the contracts and as an aid for communication. Electronic procurements information is available publicly thus it is expected to increase the transparency and social accountability of public organizations. ***Based on analysed Lithuanian healthcare sector digitalisation trends (including but not limited to: eHealth, EHR, e-prescriptions, digital appointment bookings, e-procurements), it could be seen that Lithuania faced difficulties of digital transformation in healthcare organizations, nevertheless the situation is improving and Lithuania is among other OECD countries in terms of digital trends application (not considering efficiency, effectiveness and time aspects). Moreover, with the support of Policy documents, digitalisation in healthcare sector is further moving forward.***

Assessment of digitalisation. The digitalisation of public services introduces new measures. Taking into the account assessment of digitalisation, it could be assessed in regard several different dimensions – timeframe, comparison of digitalisation between different countries, sectors or in individual organization. For example, Digital Adoption Index (DAI) was introduced by the World Bank in order to assess digitalisation within three parts of the economy, which are as follow: businesses, people and governments. This index represents the extent of digitalisation across country's economy and could be used in order to compare different sectors, for example, public to private sector (Kokkinakos et al., 2016). This method could be used to assess digitalisation in external way (national level), nevertheless, it is clearly noticeable that each organization differ regarding its individual progress towards digitalisation trends application. Thus, Frach et al. (2017) proposed Public Services Digitalisation Index (hereinafter, PSDI) to assess the digitalisation level in individual organization. It encompasses three dimensions – ***strategy*** (extent to which strategic objectives are based on digitalisation), ***services*** (organization products, services, functions and interaction with customers) ***and enterprise*** (digitalised internal organization processes/workflows), which are further defined in four sub-dimensions which are assessed by proposed criteria and graded from 1 (no digital) to 5 (fully digital) and the average compromises the public services digitalisation index. The framework has so far been applied to public agencies in three policy fields: pension's administrations, public employment services and policing. PSDI correlates to three key financial performance indicators: return on equity, return on sales, and revenue growth. Various organizations (including healthcare institutions) have adopted different level of digitalisation. However, digitalisation is unavoidable part of overall environment changes and, as afore mentioned, it affects all perspectives of healthcare system and involves mainly all stakeholders of healthcare organizations.

Healthcare organizations apply a variety of digitalisation trends in different healthcare service categories. The scale of digital trends adoption within healthcare organization could determine its digital maturity level: numerous and frequently used digitalisation trends could shape higher digital maturity level. Various organizations struggle with digital transformation, not an exception is Lithuanian public healthcare sector organizations, nevertheless digitalisation is increasing, by generating huge amounts of information which application extends beyond clinical purposes to performance measurement of organizations. Therefore, the following part of this research paper presents conceptual model which could be used to assess the application of digitalisation in performance measurement in healthcare organizations with respect to organizations' digital maturity.

2.3. Development of conceptual model of digitalisation application in performance measurement in healthcare organizations

According to the literature analysis covered within this research thesis, conceptual model is proposed. Model could be used to assess the level of application of digitalisation in performance measurement of healthcare organization, taking into the account the maturity level of digitalisation within particular public healthcare organization. Conceptual model is visualized in Figure 8.

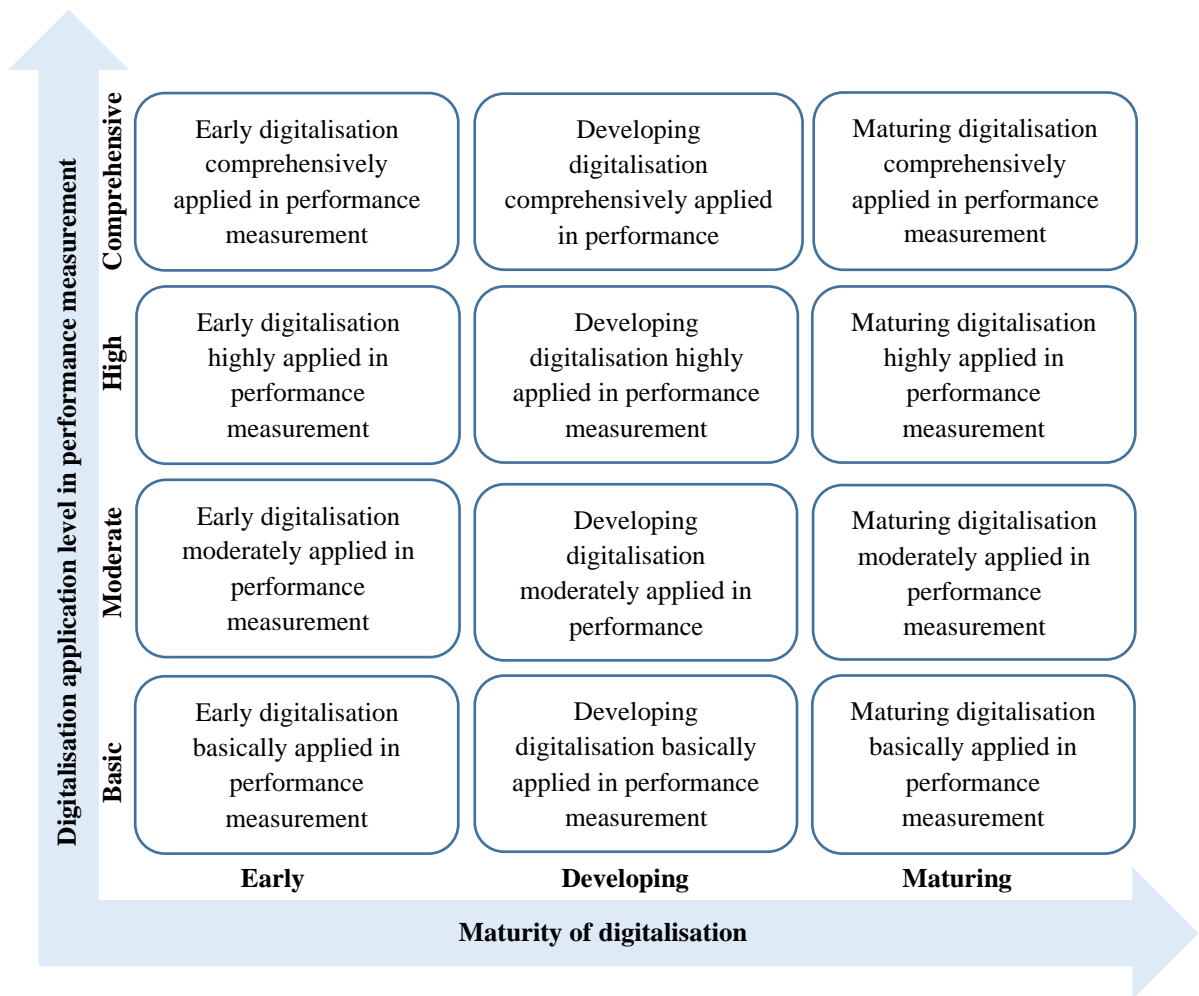


Fig. 8. The conceptual model of digitalisation application in healthcare organizations performance measurement (created by the author)

Horizontal direction of proposed conceptual model represents digitalisation maturity which is divided into three levels: *early*, *developing* and *maturing*. Each of the level takes particular range of scores within the horizontal axis, the percentage values of intervals is adopted from research done by Eggers and Bellman (2015): 60% of scale takes early level of digital maturity, 20% of scales takes developing level, 20% takes mature level of digital maturity. As the values of horizontal and vertical axes range from 0 to 20, each digital maturity level takes particular range of scores. In terms of digital maturity, model assess scope and frequency of digitalisation trends application within healthcare organization (in order to reflect specifics of healthcare sector), additionally, including several aspects taken from Eggers and Bellman (2015) research key findings: strategy, leadership (in terms of managers' standpoint), employees' skills, data safety. It is not accurate to determine organization's, which pose

certain digital maturity level, general characteristics. Nevertheless, several common things within each digital maturity level could be estimated. *Early digitalisation maturity* takes 0-12 interval of scores on the horizontal axis. Organizations which belong to early digitalisation maturity level are more likely to have difficulties with strategy development regarding digital transformation. According to the research done by Eggers and Bellman (2015), one of the obstacles for early digitalisation stage organizations is lack of digitally oriented strategy – it was found that most strategies of organizations with early stage digitalisation level, are more focused on efficiency, costs optimization, rather than digitalisation. In addition, early digitalisation stage organizations are more likely to have insufficient workforce skills, lack of investments in employees's digital skills improvements or low managers attitude to digitalisation. Moreover, early digitalisation stage organizations have not adapted main digitalisation trends in their operations, or planning to adapt them in future, or have implemented digitalisation trends in their operations but the application of them is fragmentic. *Developing digitalisation maturity* takes the scores above 12 up to 16 on horizontal axis. This digital maturity level shows that organization is already in process of digital trends implementation and expected to reach mature digitalisation level. Organization invests in personnel digital competences in order to increase personnel involvement in digitalisation trends application within organization. Taking into the account strategy, it is more digitally oriented than early stage digitalisation maturity level, meaning that it is more likely to include customer experience and decision-making process improvements with digitalisation (Eggers and Bellman, 2015). More than half of employees of developing digital maturity organizations are more likely to have sufficient digital skills for independent work. Developing digitalisation maturity organizations have adopted most digitalisation trends to their performance activities and the application of them is switching from fragmentic to frequent. *Maturing digitalisation maturity* takes scores above 16 up to 20 on horizontal axis of proposed conceptual model. Maturing digitalisation level organizations usually have strategy strongly related to digitalisation, it reflects organization's processes transformation towards digitalisation (Eggers and Bellman, 2015; Frach et al., 2017). According to Eggers and Bellman (2015), clear digital strategy separates leaders from rest organizations in terms of digital maturity. Organization's employees are more likely to pose high digital literacy level and abilities of working independently. Maturing digitalisation maturity level organizations invest in workforce skills improvements, encourage employees' digital literacy. Managers's attitude regarding digitalisation is positive, they encourage development, application and design of digital systems. In addition, such organizations have adopted digitalisation trends in all (or most) of performance activities and they are applied frequently or always in all (or most) organization's activities.

As already described, model assess public healthcare organization's maturity level in terms of scope, frequency of digital trends application in each of healthcare service category, taking into the account several additional managerial (strategy, data security, leadership) and human resources (employee digital literacy and encouragement) related aspects. Healthcare service categories and related trends are already defined by Table 1 and Table 2 of this research thesis and this information is used for development of proposed conceptual model. In order to reflect healthcare sector organizations specific characteristics (e.g., patients, healthcare professionals and others), digitalisation maturity is determined using four criteria discussed above: interventions for healthcare providers, interventions for clients, interventions for health system and resource, interventions for data services (see Figure 9).

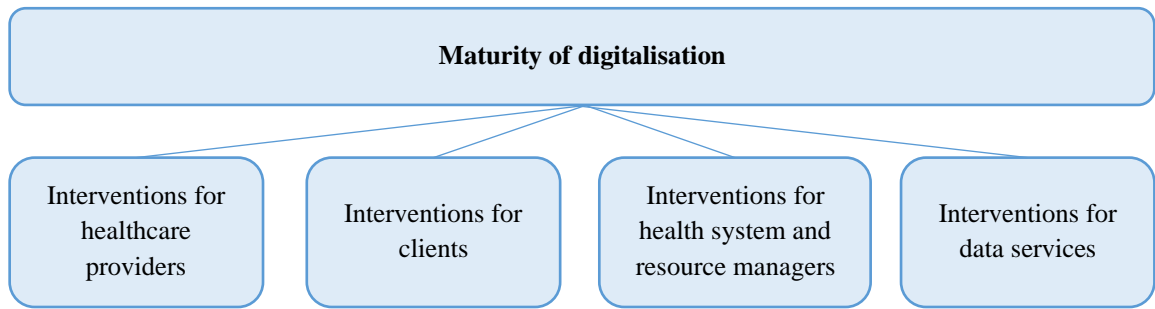


Fig. 9. Horizontal dimension of conceptual model (created by the author)

Interventions for clients (patients) mostly include digitalisation trends, specific to healthcare organizations and their application level that involve patients, these include but are not limited to: e-prescriptions, e-bookings, telemedicine and others. Interventions for healthcare providers involve digitalisation trends, which are applied in healthcare organization, and their application level that involve doctors, surgeons, nurses and other healthcare organizations staff, such as, clinical decisions, digital imaging and others. Interventions for health system and resource managers mostly cover digitalisation trends which are used for administration, control and other managerial functions in healthcare organization, for example, operating room occupation schedule, e-procurements, staff schedules. Interventions for data services involve digitalisation application in data gathering, usage management and others.

Vertical direction of proposed conceptual model reflects the digitalisation application in performance measurement of public healthcare organization. It depends on digitalisation intervention level in healthcare organization performance measurement. The axis is divided into four levels, which are listed according to increasing order: *basic*, *moderate*, *high*, *comprehensive*. *Basic* level takes range of 0-8 scores in vertical scale and shows that digitalisation is basically applied in performance measurement in healthcare organization. Meaning, that digitalisation is used rarely in certain perspective or not used in performance measurement, nevertheless, organization could have digitalisation application in future plans. Mostly, performance measurement is performed in traditional (e.g., using paper formatted data) approach. *Moderate* level takes range from 8 to 14 scores in vertical scale and shows that digitalisation is moderately applied in healthcare organizations performance measurement: digitalisation is used but not feasibly or used fragmentary in several perspectives. Mostly, performance is measured in traditional approach, nevertheless moving towards digitalisation and expected to improve performance measurement in future. *High* level takes range from 14 to 18 scores in vertical scale and shows that digitalisation is highly applied in healthcare organizations performance measurement: digitalisation is used in most of the cases for most indicators within all perspectives. Performance is measured more in digital approach than in traditional, using digitalisation trends generated data and digital means, however, has some improveable aspects. *Significant* level takes range from 18 to 20 scores in vertical scale and shows that digitalisation is significantly applied in healthcare organizations performance measurement: it is always used by means of all indicators within all perspectives. Performance is measured in digital approach, using digital trends generated data and means, additionally incorporating comprehensive data analytics.

Digitalisation application in performance measurement is assessed with respect to different perspectives, gathered from literature, which represent performance measurement. Taking into the account literature analysis in theoretical part of this research paper, various authors use different

perspectives/dimensions of healthcare system performance measurement. For example, Veillard et al. (2005) describe three dimensions in applied performance assessment framework: clinical effectiveness, safety and efficiency. According to Cinaroglu and Baser (2018), performance measurement model in healthcare institutions needs to involve measures for clinical, financial, productivity, and operational performance. In addition, Reragui et al. (2018) proposed four perspectives for BSC framework: resources, output, flexibility, learning and growth, while other authors apply original BSC perspectives in assessment of healthcare organizations performance: finance, internal business (process), customer, learning and growth. Having in mind that there is no officially confirmed performance measurement method in Lithuania and based on analysed literature that covers performance measurement of healthcare organizations, BSC is considered as one of the most applicable performance measurement frameworks to healthcare institutions (Reragui et al., 2018). Therefore, BSC framework perspectives: financial, learning and growth, customer and internal business, are applied to proposed conceptual model in order to determine digitalisation application in performance measurement of healthcare organizations regarding each of four perspective which are usually incorporated in performance of healthcare organizations' measurement (see Figure 10).

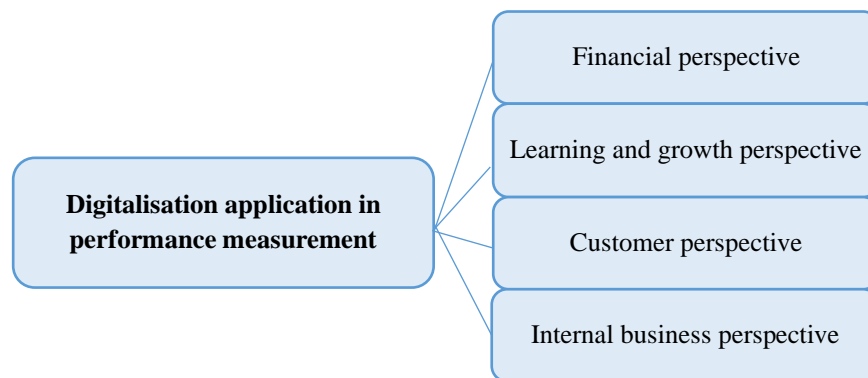


Fig. 10. Vertical dimension of conceptual model (created by the author)

Vertical axis of performance measurement reflects the evaluation of each BSC perspective in the context of digitalisation – how much digitalisation is applied in each perspective of performance measurement. As already discussed, the universal approach of performance measurement is not realistic, it shall be tailored to particular type of organization, therefore these four perspectives reflect healthcare organization's specifics when appropriate indicators are assigned to each of the perspective.

Thus, proposed conceptual model provides a comprehensive view of organization digitalisation maturity regarding its intervention into different healthcare service categories: customers (patients), healthcare providers, health system and resource managers, data services and its application in each of four perspectives: financial, customer, internal process, learning and growth. Proposed method is going to be practically implemented in order to assess the digitalisation maturity of selected public healthcare organizations and determine the level of digitalisation is applied in performance measurement, according to research methodology.

3. Methodology of practical implementation of proposed model of digitalisation application in the performance measurement in public healthcare organizations

This chapter contains main parts of designed research on digitalisation application in performance measurement in public healthcare institutions methodology.

Research problem. As already revealed in this research thesis, public healthcare organizations are characterized with complexity, especially in terms of performance measurement. Performance measurement of public sector healthcare organizations is widely analysed by the literature, including but not limited to: its features, application means, performance measurement systems and indicators, developed particularly for healthcare organizations, which reflect the specifics of this sector. As revealed by the literature analysis, healthcare sector (together with other public sector organizations) is rapidly growing and changing due to competitive environment. One of the main causes of changes, digitalisation, is also defined by the literature, including particular healthcare organizations. The benefits of digitalisation have been widely studied however digitalisation application in performance measurement has been far from conclusive, as there are various types of digitalisation trends in healthcare, this gap is considered as relevant. Therefore, conceptual model is proposed as an instrument for healthcare organizations to assess digitalisation in its performance measurement, to reveal improvable processes in terms of performance measurement or digitalisation and to compare the organization under assessment with other healthcare organizations.

Research question. What is the level of application of digitalisation in public healthcare organization's performance measurement with respect to its digital maturity?

Research aim is to practically implement proposed model for determination of the level digitalisation is reflected in healthcare organization's performance measurement while taking into the account digitalisation maturity level within that organization.

Research objectives:

- to analyse selected public healthcare organizations' financial and performance reports in order to characterize included organizations using selected key performance indicators;
- to perform semi-structured interviews with representative participants of selected public healthcare organizations. Based on gathered and analysed data, to assign each healthcare organization to horizontal and vertical axis of proposed conceptual model and make cross-case analysis;
- to provide recommendations for each organization and directions for further improvements.

Research methods. Research utilizes a case study method to practically apply the conceptual model proposed in theoretical part of this research thesis. Case study is a qualitative method in which detailed data regarding one case or multiple cases is collected (Creswell, Hanson, Clark Plano and Morales, 2007). Practical examples illustrate that it could be used to gain information on performance measurement in the context of digitalisation (Ukko, Saunila and Rantala, 2020). One of the main reasons to choose the qualitative approach is that this approach is exploratory: it explores social or human problem in deep (Creswell and Creswell, 2018). When there is not much published regarding the topic which is being researched, this type of research is suitable (Creswell and Creswell, 2018). As there is lack of studies regarding digitalisation intervention in public healthcare organizations performance measurement, this approach is considered as suitable to build an understanding of the

research problem. Although this method has its drawbacks, such as, subjectivity, difficulties for generalization of results because samples do not represent the all cases (Bryman and Bell, 2016), this research does not seek to generalize results or provide statistics regarding research problem, it is more dedicated to gain a deep view of organizations' capabilities to apply digitalisation in performance measurement by applying proposed model for selected public healthcare organizations. Therefore, characteristics posed by qualitative research: researcher is close to the phenomena under research and conducts research in their natural environment in order to see "through their eyes" (Bryman, 2012, p. 408) and the rich data being generated under this approach, satisfy the needs for this research. As multiple cases show different perspectives and more comprehensive view of phenomena (Creswell et al., 2007), multiple-case study was carried out.

Research tool. In order to assess application of digital information to particular public healthcare organization's performance measurement with respect to organization's digital maturity, conceptual model is proposed in theoretical part of this research project. Conceptual model could be represented in matrix which is comprised of horizontal and vertical axes. Criteria of digitalisation trends involved within horizontal axis of proposed conceptual model are used to determine the digitalisation maturity level within the organization and to assign it to particular value – early, developing or maturing. Criteria for digital maturity determination are provided in Table 3.

Table 3. Criteria for digital maturity determination (created by the author)

Digitalisation trends (EXPH, 2018)	Healthcare service category (OECD, 2016)	Sub-criteria
Interventions for healthcare providers	Clinical decisions, Prevention	DICOM/PACS
		Digital literacy
		Availability to digital technologies
		Resources in workforce skills
		Clinical decisions
Interventions for clients	Bookings; Prescriptions; Patient monitoring	Patient communication
		Health wearables
		Telemedicine
		E-prescriptions
		E-Bookings
Interventions for health system and resource managers	Administration of health units	E-procurement
		Digital schedules
		Operating (or clinical procedures) room availability
		Strategy
		Managers standpoint
Interventions for data services	Health information and data	Electronic health records
		Data accessibility
		Data security
		Data management
		Data use

Sub-criteria are obtained using the synthesis of literature sources: each digital healthcare service category provided by OECD (2016) is assigned to digitalisation trends (EXPH, 2018) which are the

criteria of horizontal axis of proposed conceptual model, thus it is easier to assign each of the criteria to particular set of sub-criteria. It could be observed that these sub-criteria inter-relate different sources (literature and policy documents) they are defined from. For example, digital literacy, identified by Eggers and Bellman (2015) or digital enablement (Frach et al., 2017) as one of the factors that shape digital maturity of organization, is related to organization's employees, mentioned by EXPH (2018) as intervention for employees. In addition, managers' standpoint regarding digitalisation in the context of organization performance is another factor shaping digital maturity of organization (Eggers and Bellman, 2015) and it is related to the management and administration of healthcare units (OECD, 2016), thus is assigned as one of intervention for health system and resource managers sub-criteria. Moreover, it is important to highlight that organizations' strategy is also reflected as one of the sub-criteria in determination digital maturity (Frach et al., 2017; Eggers and Bellman, 2015), because as already discussed, it plays a huge role in organization performance including its digital transformation processes.

Taking into the account vertical axis, which represents level of digital information application to PMS of public healthcare organization: basic, moderate, high, comprehensive, four perspectives, adapted from BSC as one of the most suitable frameworks for performance of healthcare organization measurement, which is described in theoretical findings of this research thesis, shall be evaluated. According to Rezagui et al. (2018, p. 54), key performance indicators are "the heart" of any PMS. Therefore, four perspectives are further divided into indicators. Selection of appropriate indicators plays a key role in performance measurement, Lobont and Bociu (2017) specified that indicators of performance measurement shall be the most relevant in order to perform representative measurement and analysis afterwards, thus indicators must be tailored to particular type of organization, as well as be valid and reasonable. It is noticeable, that each organization can have its' own performance measurement system which involves unlimited number and type of indicators, as it was found in theoretical part of this research thesis, PMS can incorporate over 300 indicators (Nutu et al., 2018). In order to reflect the specifics of public healthcare organizations of Lithuania, the list of performance indicators approved by Minister of Health of the Republic of Lithuania (LRSAM, 2019), which is already analyzed in the theoretical part of this research thesis, is used as a base list of indicators. This adopted list is used because Lithuanian public healthcare organizations shall measure their performance using these indicators and compare gathered values with pre-defined ones (expected results). The calculation of these indicators is mandatory for public healthcare organizations according to the order V-731 (LRSAM, 2019). These calculated indicators are provided in annual performance reports of Lithuanian public healthcare sector organizations. Furthermore, indicators, which are the most relevant to BSC performance measurement method, and described by the literature in common, are selected. Thus, the most relevant indicators, which intersect from all these mentioned sources, are chosen in order to distribute them over four perspectives of vertical axis of proposed conceptual model. Comprehensive set of indicators defined by legislation and literature is gathered. Indicators of vertical axis of proposed conceptual model are provided in Table 4.

Table 4. Indicators for assessment of digitalisation application in performance measurement in public healthcare organization (created by the author)

Perspective	Indicator	Source
Learning and Growth	Employee satisfaction	LRSAM, 2019; Rahimi et al., 2017; Rezagui et al., 2018; Schoten et al., 2016; Taufik et al., 2018; Pourmohammadi et al., 2018; Si et al., 2017
	Employee turnover	Rezagui et al., 2018; Rahimi et al., 2017; Si et al., 2017
	Number of employees	LRSAM, 2019; Veillard et al., 2005; Cinaroglu and Baser, 2018
	Technological growth, Implementation and development of IT level	LRSAM, 2019; Rezagui et al., 2018; Emami and Doolen, 2015
	Training	Rahimi et al., 2017; Rezagui et al., 2018; Veillard et al., 2005
Internal business	Infection	Rezagui et al., 2018; LRSAM, 2015; Rahimi et al., 2017; Pourmohammadi et al., 2018
	Bed occupancy	LRSAM, 2019; Taufik et al., 2018; Rahimi et al., 2017; Rezagui et al., 2018; Gurevičius, 2015; Si et al., 2017
	Length of stay	LRSAM, 2019; Taufik et al., 2018; Rahimi et al., 2017; Rezagui et al., 2018; Veillard et al., 2005; Cinaroglu and Baser, 2018; Gurevičius, 2015; Si et al., 2017
	Waiting time	LRSAM, 2019; Rahimi et al., 2017; Rezagui et al., 2018; Nuti et al., 2018; Pourmohammadi et al., 2018; Si et al., 2017
	Amount of provided healthcare services	LRSAM, 2019; Veillard et al., 2005; Cinaroglu and Baser, 2018; Si et al., 2017
Customer	Patients' satisfaction	LRSAM, 2015, 2019; Rezagui et al., 2018; Veillard et al., 2005; Schoten et al., 2016; Cinaroglu and Baser, 2018; Pourmohammadi et al., 2018; Si et al., 2017
	Patients' complaints	LRSAM, 2019; Rezagui et al., 2018; Si et al., 2017
	Mortality	Di Meglio et al., 2015; Taufik et al., 2018; LRSAM, 2015; Veillard et al., 2005; Si et al., 2017
	Customer acquisition	Taufik et al., 2018
	Readmission	Rezagui et al., 2018; Veillard et al., 2005; Bradley et al., 2018; Si et al., 2017
Financial	Net profit or net profit margin	LRSAM, 2019; Rezagui et al., 2018; Si et al., 2017
	Personnel cost of total costs	LRSAM, 2019; Rahimi et al., 2017; Pourmohammadi et al., 2018
	Consolidated procurements	LRSAM, 2019
	Value of medicines acquired via CPO of total value	LRSAM, 2019
	Additional financial resources	LRSAM, 2019

Each sub-criterion and indicator are assigned with the closed-ended question and provided in *questionnaire* which is additionally accompanied by open-ended questions (Appendix 3). The questionnaire is constructed based on the insights from literature presented in the theoretical backround of this research thesis. Each closed-ended question contains five options of answers which are assigned to Likert scale with the values 1-5, which measure the intensity or the level of agreement (Bryman, 2012), additionally, 0 value is also possible, if there is no answer presented. Likert scale is widely used format of asking the agreement level (Bryman, 2012), moreover, it was found to be applied in researches of similar context (Nuti et al., 2018; Taufik et al., 2018). Each perspective (Table 4) and criterion (Table 3) are assigned with 5 indicators and 5 sub-criteria respectively, thus the value of each perspective and criteria is represented by the arithmetic mean of set of 5 indicators or 5 sub-criteria. The total value (sum) of all 4 perspectives or all 4 criteria could be 0-20 scores. As already

described in theoretical part of this research thesis, digitalisation maturity levels, adopted from literature, are as follow: early (0-12 scores), developing (from 12 to 16 scores), maturing (from 16 to 20 scores). Regarding digitalisation application in performance measurement, as there were no similar researches found, the intervals of each level score values are selected based on constructed questionnaire, where the answers of closed-ended questions represented each level: basic (0-8 scores), moderate (from 8 to 14 scores), high (from 14 to 18 scores), comprehensive (from 18 to 20 scores). As a result, each organization under evaluation is positioned within the particular section of proposed model based on its digital maturity and digitalisation trends application in performance measurement system. When several selected healthcare organizations are evaluated, the comparisons between the gathered results with respect to vertical and horizontal axis of proposed model could be made.

Research participants. According to Creswell and Creswell (2018), sample size depends on research type, in case studies usually 4-5 cases are included. Cases for the research were selected purposefully – it was considered that healthcare organizations of Lithuanian public sector which perform performance measurement and have adopted any kind of digitalisation trends would help to understand research question. Four different-sized and hospitality level organizations (research participants) were selected in order to gain understanding from different perspectives: Organization A, Organization B, Organization C, Organization D. Chief executive officer (CEO) of healthcare organization or head of one of the healthcare organization departments were selected to be interview taking into the account they work in performance of the organization measurement or digitalisation related activities, therefore, such respondents will provide a comprehensive view of the organization they represent. One representative person (respondent) was selected from each organization.

Data collection procedures. The information was collected via qualitative face-to-face semi-structured interviews and qualitative documents (public and organizational). Triangulation – multiple sources of qualitative data provide a more comprehensive view about the phenomena under research and also helps to improve research validity. In addition, according to Creswell and Creswell (2018), researcher is also an instrument for collection of research data. Respondents of the interviews can provide detailed information about the problem, including the context or history (Creswell and Creswell, 2018), moreover, they can reveal evidence of the nature of the problem under research (Miller and Glassner, 2016), nevertheless, not all the respondents are equally responsive and researcher may bias the answers to questions provided to the respondent during the interview. Interview protocol was created prior to each interview and was used consistently in all interviews. The information from interviews was gathered by taking handwritten notes and, additionally, by audiotaping the interviews with representatives of Organization A, Organization B, Organization C, nevertheless representative of Organization D disagreed audio recording of the conversation during the interview. All four interviews were carried out and all transcripts (which are stored safely but not provided here) were gathered in Lithuanian language (citations of respondents provided in this project are translated into English language). Information about the interviews is provided in Table 5.

Table 5. Information about the interviews (created by the author)

Case	Duration of interview	Transcript pages	Number of interviews
Organization A	90 min	9	1
Organization B	130 min	11	1
Organization C	50 min	6	1
Organization D	70 min	7	1

Research ethics. Ethical considerations of qualitative researches pose a high importance (Creswell and Creswell, 2018). Research participants were informed about the research problematics, aim, objectives, procedure, risks, benefits associated with research, confidentiality and how the information gathered during the interview will be used. In addition, respondents were notified that they can withdraw at any time. Such information was provided for participants in oral and written form prior to each interview. As far as each participant understood the mentioned aspects about the research and agreed to proceed interview, each participant was asked to sign the Agreement to Interview form. As qualitative research is based on words rather than numbers (Bryman, 2012), each respondent's words are their intellectual property. This property is used for the research thesis only if the final consent is obtained. Thus, after the interviews, each respondent was provided with final products (outputs) of interview – transcript and questionnaire filled with the answers they provided in verbal form during the interview. Besides ethical considerations, this strategy (research members checking) also incorporates the research validity aspects (Creswell and Creswell, 2018). As research members (respondents), provided with the interviews' outputs, check, if the obtained information is accurate and, if necessary, specify the changes that need to be applied. Information, gathered during each interview, was used for the research only after final consent of each respondent was obtained. Respondents were notified that information gathered during interview will be treated as confidential and would only be used for research purposes. According to (Demircioglu and Audretsh, 2017), anonymity of respondents is one of the important things which help to minimize bias. Each respondent, as well as public healthcare organization they represent, were anonymized.

Process of research activity. Research data was collected in March 2020, the duration of interviews vary from 50 to 130 min. Types of research data collection are already discussed above. Considering data analysis methods, content analysis of documents and interviews transcripts were performed, as interview transcripts are raw data (Pope, Ziebland and Mays, 2000), in addition, interview transcripts which cover open-ended questions were analysed using coding method: there were two main themes distinguished for analysis of open-ended questions: *digitalisation application* and *performance measurement*. Each theme was assigned with several codes. Each code and its description is provided in Appendix 4. The process of research activity is provided in Figure 11.

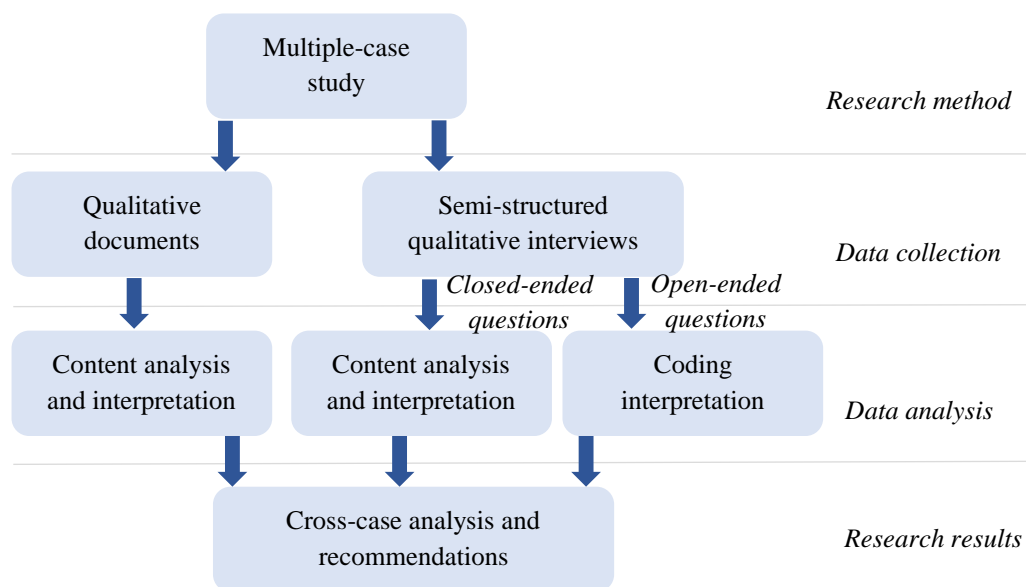


Fig. 11. Process of research activity (created by the author)

4. Results of practical implementation of model of digitalisation application in the performance measurement in public healthcare organizations

This chapter contains main findings on practical implementation of proposed model for assessment of digitalisation in performance measurement of healthcare organizations: each research participants' results and cross-case analysis. Subsequently, recommendations were provided, and further research directions were determined.

4.1. Characterization of reseach participants by key performance indicators

Research participants are characterized by key elements from literature and legislation which the most appropriately reflect research participants. Moreover, characterization includes several financial performance indicators. To ensure anonymity of research participants, public and organizational documents are not provided in this research thesis. The characterization of research participants consists of general characteristics and financial characteristics.

General characteristics. The most appropriate healthcare organizations' characteristics were adjusted from the literature (Adler-Milstein et al., 2017; Janušonis, 2018) to this research thesis. For example, several characteristics of healthcare organization that have influence on patients' selection of healthcare organizations were adapted from research done by Janušonis (2018): legal form, size, the level of provided services. Moreover, couple of characteristics that are associated with digitalisation (i.e., EHR), such as, size and ownership of healthcare organization were taken from Adler-Milstein et al. (2017) research. To ensure anonymity of research participants and respondents, the exact values of characteristics are not provided (excluding respondents's position), alternatively, the range of values for each characteristic is used. As already defined in methodology part of this research thesis, four respondents were included in research. Therefore, each case (public healthcare organization) was represented by one respondent. General characteristics of research participants, including respondents are provided in Figure 12.

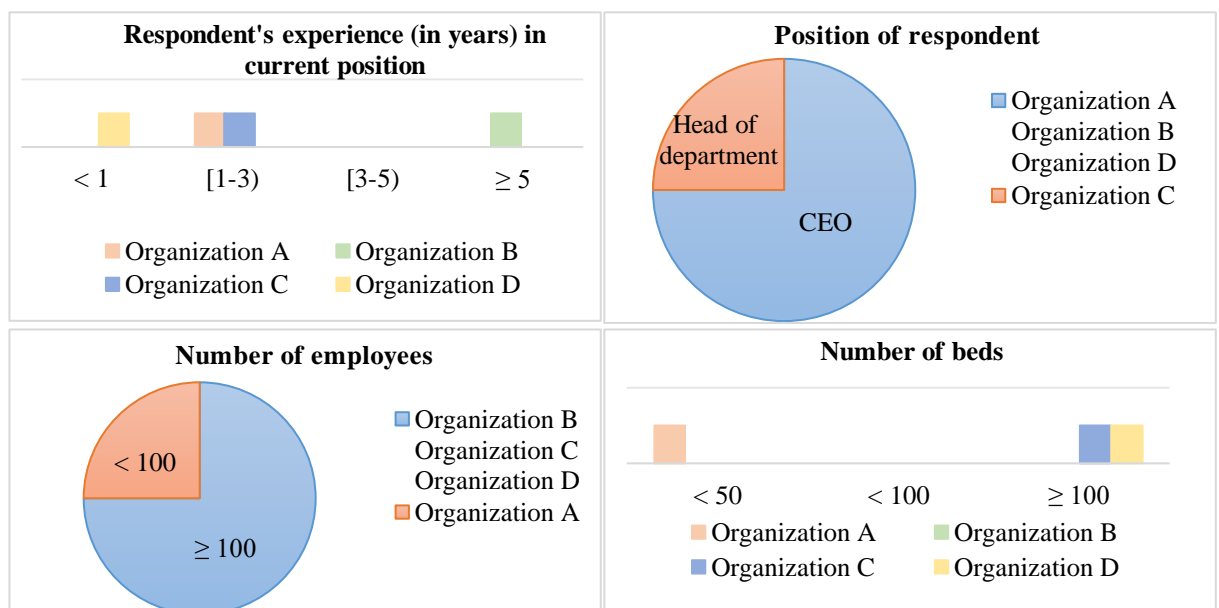


Fig. 12. General characteristics of research participants (created by the author, based on research participants' financial reports and performance reports)

Position of three respondents of semi-structured interviews were CEO of the organization they represented, while respondent's, who represented organization C, position was a Head of Department. Taking into the account respondent's experience in current position (CEO or Head of Department), as shown in Figure 12, respondent of Organization A is working for the shortest period (up to 1 year), while respondent of Organization B is working for the longest period (more than 5 years) when compared within four cases included in this research. It could be observed from Figure 12, that this research included different sizes organizations. In terms of number of employees, organization A has the least number of employees (when compared within four cases) while Organization B, Organization C, Organization D have more than 100 employees. The size of the healthcare organization could also be defined by the number of beds – more beds healthcare organization has, more short-term or long-term inpatient services it could provide, thus more revenue it could generate. Organization A has the lowest number of beds (up to 50), while Organization C and Organization D have more than 100 beds, when compared within four cases. Organization B does not incorporate beds, because it does not provide inpatient services (as shown in Table 6). It could be observed, that number of employees is related to number of beds and these two criteria could be used to identify the size of healthcare organization – based on the results, Organization A is the smallest when compared to remaining three organizations. *Legal form and ownership.* As already defined in the first chapter of this research paper, according to The Republic of Lithuania Law on Health System, Lithuanian National Health System (hereinafer, LNHS) is comprised of four main elements – services, service providers, managerial institutions and resources (*Republic of Lithuania law on health system, 19 July 1994 No I-552.*, 1994) and his thesis is focused to service providers, nevertheless, they could be in several types of legal form – budget institution, public institution or private entity. Thus, this research thesis is focused particularly, to personal public healthcare institutions which are owned by the State or by municipalities (*Republic of Lithuania law on health system...*, 1994). Legal characteristics of research participants are provided in Table 6.

Table 6. Legal characteristics of research participants (created by the author, based on Articles of Association and healthcare organization's licences)

Research participant	Organization A	Organization B	Organization C	Organization D
Owned by	Municipality	Municipality	State	State
Legal form	Public institution	Public institution	Public institution	Public institution
Services by the time and place	Inpatient healthcare and out-patient healthcare	Out-patient healthcare	Inpatient healthcare and out-patient healthcare	Inpatient healthcare and out-patient healthcare

All four research participants are public institutions while Organization A and Organization B are owned by municipality of district in which they operate, furthermore, Organization C and Organization D are owned by State (i.e., Ministry of Health). According to Republic of Lithuania Law on Healthcare Institutions, services by the time and place they are provided could be classified into inpatient, out-patient and mixed (*Republic of Lithuania law on healthcare institutions, 6 June 1996 No I-1367.*, 1996). In order to get a comprehensive view from different perspectives, organizations that provide inpatient and/or out-patient services were included: one organization provides out-patient services only (Organization B), while remaining three organizations provide both types of healthcare services.

Financial performance indicators. Several indicators revealed in theoretical part of this research thesis are used to characterize selected healthcare organizations. The indicators were selected based on their appropriateness for characterization of research participants, taking into account particularly relative indicators in order to ensure anonymity of participants. The input data for calculation of financial indicators was gathered by analyzing financial reports of the accounting period 2018-2019 of research participants. Financial reports of healthcare organizations are prepared in accordance to Republic of Lithuania Law on Public Sector Reporting and the Public Sector Accounting and Financial Reporting Standards. The output data of calculations is provided in Table 7.

Table 7. Organizations' financial performance indicators (created by the author, based on financial reports)

All values provided in %	Organization A	Organization B	Organization C	Organization D
Distribution of operating revenue	100	100	100	100
<ul style="list-style-type: none"> ▪ Financial revenues ▪ Other operating revenues 	<ul style="list-style-type: none"> ▪ 13 ▪ 87 	<ul style="list-style-type: none"> ▪ 7 ▪ 93 	<ul style="list-style-type: none"> ▪ 16,6 ▪ 83,4 	<ul style="list-style-type: none"> ▪ 2 ▪ 98
Distribution of financial revenues	100	100	100	100
<ul style="list-style-type: none"> ▪ State budget ▪ Municipalities ▪ EU ▪ Other 	<ul style="list-style-type: none"> ▪ 19,8 ▪ 76,8 ▪ 1,8 ▪ 1,6 	<ul style="list-style-type: none"> ▪ 1,5 ▪ 73,7 ▪ 1,6 ▪ 23,2 	<ul style="list-style-type: none"> ▪ 14,5 ▪ 0 ▪ 10,8 ▪ 74,7 	<ul style="list-style-type: none"> ▪ 42,9 ▪ 0 ▪ 39,7 ▪ 17,4
Personnel costs ratio	83,2	82,9	59,8	75,0
Qualification cost ratio	0,2	0,1	0,02	0,1
ROA	3,7	0,1	1,2	0,5
Operating profit margin	6,9	0,1	0,4	0,3
Net profit margin	7,8	0,1	0,5	0,2
Absolute liquid ratio	0,2	109	118	73

Operating revenues of healthcare organizations could be received via several channels: State budget, municipalities budget, EU or foreign resources, other funding sources – these revenues are considered as financial revenues (*Dėl viešojo sektoriaus apskaitos ir finansinės atskaitomybės 20-ojo standarto patvirtinimo, 2008 m. birželio 9 d. Nr. 1K-205.*, 2008) and other operating revenues which could be received from National Health Insurance Fund (hereinafter, NHIF) or directly from the physical/juridical persons. It could be observed that other operating revenues take the biggest part of operating revenues of all four research participants (from 83,4% to 97,6%), therefore it could be concluded that main financial sources are NHIF and physical/juridical persons. Taking into the account particular financial revenues, each organization receives different part of each funding source (State budget, municipalities, EU and other) in total value of financial revenues. The distribution of financial revenues is provided in Table 7. As it could be observed, organizations, which are owned by State (Organization C and Organization D), do not receive finances from municipalities. As Organization A and Organization B are owned by the municipalities, the biggest part of their financial revenues is received from municipalities budget (76,8% and 73,7% respectively). Personnel cost ratio shows personnel costs part in total operating costs (Rahimi et al., 2017) and it could be noticed that Organization A and Organization B has the highest personnel cost ratio, while Organization D takes the middle place and Organization C has the lowest personnel cost ratio, when compared within four cases. Qualification cost ratio is used to evaluate part of operating costs assigned to personnel qualification improvement: the bigger the value of indicator, more financial resources are dedicated

to improvement of personnel qualification. Organization C has the lowest personnel qualification ratio (0,02%) when compared to other three organizations which gather from 0,1% (Organization B and Organization C) to 0,2% (Organization A) values of this indicator. Organization capabilities to utilize assets while generating income, is reflected by return on assets (ROA) (Si et al., 2017; Wang et al., 2018), therefore, higher ROA shows higher efficiency of assets. The highest assets efficiency is shown by Organization A (3,7%) when compared within other three research participants. Comparatively low assets efficiency is in Organization B (0,1%) and Organization C (0,5%) which show that more assests are used to generate income. Although included healthcare organizations are non-profit, they perform in strictly regulated environment and have a requirement generate profit rather than loss (LRSAM, 2019), therefore, profitability indicators are also included in characterization of research participants in order to get an informative view. Operating and net profit margins describe the part particular type of profit takes in total revenue of organization. Calculations show that Organization A has the biggest part of operating and net income in total revenue (6,9% and 7,8% respectively), while Organization's B operating profit and net profit take the smallest part (0,1%) in its total revenue when compared among research participants. Although profitability indicators are not critical, if public healthcare organization is operating without loss, it could be noticed that Organization A has the highest percentage of revenues which were turned into profit, compared with Organization B, Organization C and Organization D. Taking into the account organizations' capabilities to pay off short-term liabilities without utilization of external capital, liquidity ratios could be used to evaluate it (Pourmohammadi et al., 2018). One of the additional indicators of Lithuanian healthcare institutions performance measurement listed by the Minister of Health is absolute liquid ratio (LRSAM, 2019). Absolute liquid ratio shows what part of short-term liabilities take absolute liquid assets (cash and bank, short-term securities), the appropriate range of this value is 0,5-1 (LRSAM, 2019). Based on the results, provided in Table 7, Organization B, Organization C and Organization D are capable to pay off their short-term liabilities with their absolute liquid assets – the highest value of absolute liquid ratio is attributed to Organization C (118%). While organization A has relatively small absolute liquid ratio (0,2%) which shows that organization is not available to cover its short-term liabilities with current assets (particularly – monetary resources and short-term securities) it has. Based on the calculated results, non of the organizations included in this research operate at loss, however it could be observed that organizations differ in terms of financial performance indicators used to characterize them.

4.2. Results of assessment of digitalisation application in performance measurement in public healthcare organizations

4.2.1. Organization A

Organization A is public healthcare organization operating in Lithuania, which provides inpatient and outpatient personal healthcare services. In order to determine organization's digital maturity level and the application of digitalisation in its performance measurmement (PM), propsed model was applied and interview with organization's CEO was performed. Based on the gathered results of proposed model application, it was found that organization's digital maturity level is *early*, as it has collected 11,6 scores regarding its digital maturity. While level of digitalisation application in organization's performance measurement is *moderate*, as it has gathered 13,6 scores in vertical axis of model. Results of model application in each criterion and perspective are provided in Figure 13.

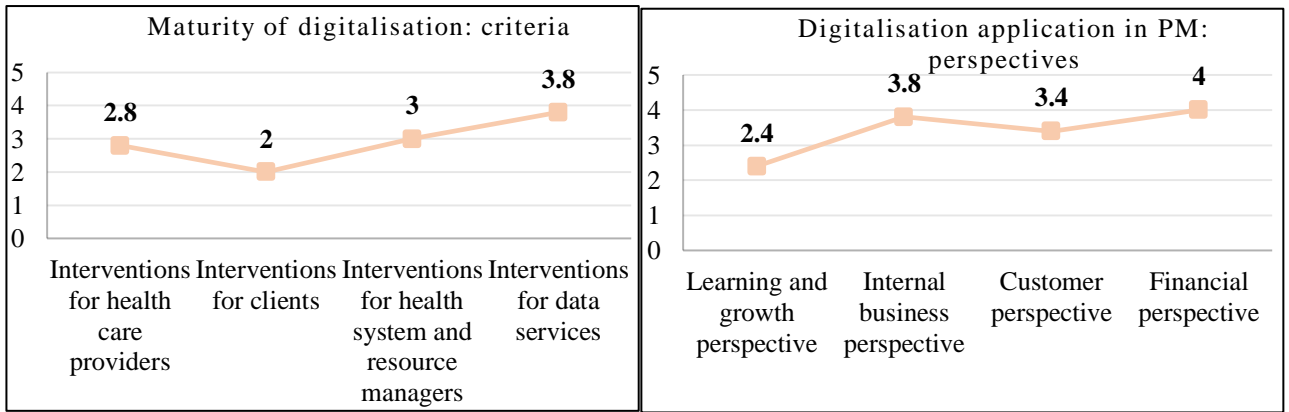


Fig. 13. Results of model application in Organization A: criteria and perspectives

Considering each criterion (see Figure 13) and sub-criterion (see Figure 14) that determine digital maturity level in proposed model, it could be observed that digitalisation intervenes the clients (patients) the least. That could be reasoned that e-bookings system, which is expected to manage healthcare service waiting lines, is still under development, therefore, patients need to book their visit via phone or by visiting organization. Organization does not have its individual information system (hereinafter, IS), therefore, patients could check their EHR only using national system (EHSCI IS). Taking into the account health wearables, which are promising digitalisation trends in healthcare organizations according to the literature (OECD, 2016), in order to enhance diseases management and reduce costs, organization does not see necessity for this digitalisation trend, as it provides second-level outpatient services, therefore, is not planning to adapt it in the future. Telemedicine and e-prescriptions already took the first steps: telemedicine services are expected to be provided in near future by means of teleradiology, while e-prescriptions are already adopted and being used, nevertheless Organization A provides much lesser e-prescriptions than paper prescriptions (as stated by Respondent A: “<...> the demand of prescriptions in our institution is lower, nevertheless, there are existing paper prescriptions and e-prescriptions options, when compared, part of e-prescriptions is lesser”). Aspects related to healthcare providers (doctors, surgeons, nurses and other healthcare organizations staff) are intervened by digitalisation more when compared to patients. Digital imaging with attributes (DICOM and PACS) are already implemented and being used. Clinical decisions are rarely based on digital data, as healthcare professionals digitalise patient-related information, nevertheless, the cooperation regarding clinical data digitalisation by other healthcare organizations is missing, therefore clinical information is distorted. The need of all healthcare organizations contribution to EHSCI IS is highlighted. Further considering employees, as one of the most important intangible assets of organization (Emami and Doolen, 2015), it could be noticed that personnel digital skills are moderate, nevertheless Organizations’ A CEO noticed enhancement of employees’ digital literacy over the year due increased digital technologies availability. Taking into the account account availability of digital technologies, it is considered as low, while the demand is increasing. Thus, the direct relation between availability and digital skills could be observed. Moreover, digital skills depend on organizations’ investments in it: currently organization does not allocate resources to improve employees’ digital literacy, while its qualification cost ratio (0,2%) is highest across all research participants. Therefore, investment in enhancement of employees’ digital skills could be foreseen as improveable area. These results contribute to theoretical findings, as early digitalisation maturity level organizations are more likely to have lack of digitally competent employees, and insufficient resources for digital skills improvements (Eggers and Bellman, 2015).

Considering administration and management of healthcare organizations, it could be observed, that human resources-related aspects (employees schedules and rooms availability schedules) are not digitalised yet, employee digital schedules are foreseen as usefull to improve management of employees, notwithstanding, current availability of digital technologies in organization limits such digitalisation trend application, as not all the employees have computers at their workplace. Administrative aspects are more digitally intervented. For example, from the managers' point of view (CEO and owner), application of digital technologies is evaluated positively, their application and development within Organization A is being encouraged. Respondent A remarked that procurement process is fully digitalised and highlighted that e-procurement process is effective. Organization's strategy does not involve digitalisation aspects, although Organization A is planning to update their strategy including digital transformation. Lack of digital strategy, as one of the main characteristics of early digital maturity level organizations, was also highlighted by the literature (Eggers and Bellman, 2015). Therefore, organization's strategy is foreseen as one of the obstacles of digital transformation. Taking into the account interventions for data services, digitalisation is the highest among all four criteria. One of the main resources of digital data – EHR are being filled in most of the cases instead of paper-based records, as organization is liable for inputing digital data to EHSCI IS. According to Repondent A, digital data is further used in most of the cases, for example, financial analysis of digital data: cost of cleaning services, cost of provided services, personnel costs and others. Taking into the account accesibility to digital data, most of data is easily accessible for employees who have access to it. Nevertheless, safety and management of digital data could be improved: organization does not have documents management system, documents are being registered manually. Therefore, as amount of digital data is expected to increase (Reddy and Sharma, 2016), organization could face challenges regarding digital data management and safety and that could lead to allocation of time and financial resources.

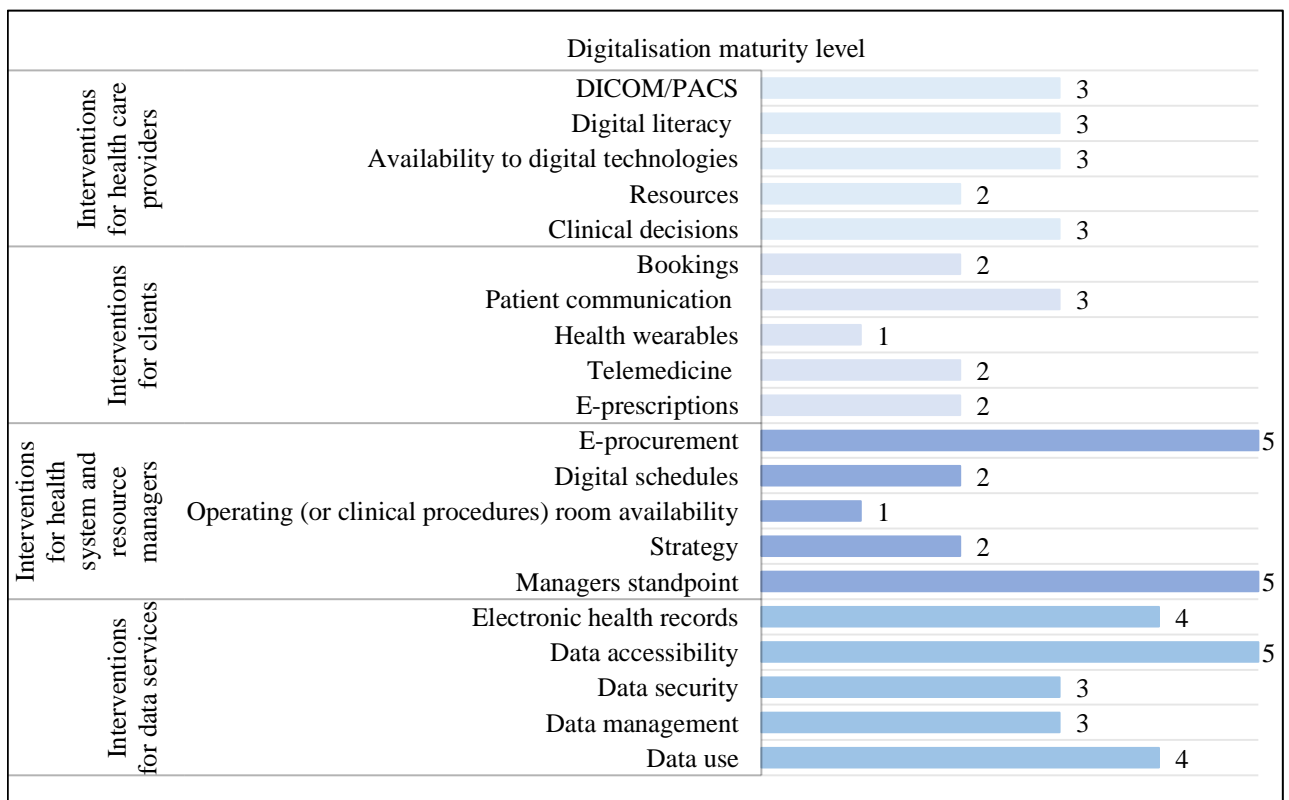


Fig. 14. Sub-criteria of digitalisation maturity in Organization A

Taking into the account digitalisation application in different performance measurement perspectives (see Figure 13), mostly digitalisation is reflected within financial perspective. It could be grounded as digital accounting system is used in Organization A and all accounting data is digitalised. Respondent A remarked that financial indicators, such as net profit, personnel costs, engagement of additional resources are very important and are calculated using digital data. It was noticed that digitalisation is directed to the indicators (see Figure 15) which are critical for organization survival, as Organization's A absolute liquid ratio is 0,2 which shows that it is not capable to cover its short-term liabilities with the liquid assets it has. For example, additional financial resources engagement (as disclosed by Respondent A: "*<...> our welfare depends on additional financial resources <...>*"). Organization A obtains the value of additional financial resources engagement using digital data from accounting system. Employees of Organization A analyze the changes of this indicator, when comparing to previous year's value and determine reasons of the changes. Moreover, consolidated procurements are performed via e-procurements system, therefore the digital data is applied in determination of this indicator. On the other hand, organization does not evaluate the value of medicines acquired via CPO, as all the procurements are proceeded electronically.

Internal business perspective reflects lesser digitalisation when compared to financial. It could be noticed that indicators, related to obtainment of operating revenues are intervened by digitalisation – amount of provided services, bed occupancy rate, length of stay are calculated from digital data in EHSCI IS and are always used in performance measurement of Organization A. Contrary, waiting time of healthcare services or infections rate are not determined digitally. Taking into the account customer (patient) perspective, patient's satisfaction is measured but the measurement does not include digitalisation (e.g., e-prescriptions, e-bookings or EHR), measurement is more related to inpatient and out-patient services and corruption prevention. Patient complaints could be provided digital (via email or website) and all the complaints are included in Organization's A performance measurement. Considering customer acquisition, this indicator shows number of patients served during particular time period. Customer acquisition and the mortality indicator is measured using digital data from EHSCI IS. The indicators are always included while measuring performance. Customer acquisition is also directly related to organization's operating revenues, because organization receives revenue from NHIF or physical/juridical persons to cover the costs of provided healthcare services, thus the more services provides (or more patients serves) the higher operating revenue it generates. Taking into the account learning and growth perspective, which involves employee related indicators and organization's technological growth, it could be observed, that digitalisation is reflected within two indicators – employee turnover and number of employees. These indicators are being calculated using digital data from accounting system and are compulsory included in monthly report regarding the number of employees, personnel constitution and average remuneration. Organization does not register employee training and does not assess personnel satisfaction, nevertheless Respondent A foresees it as an improvement of personnel management.

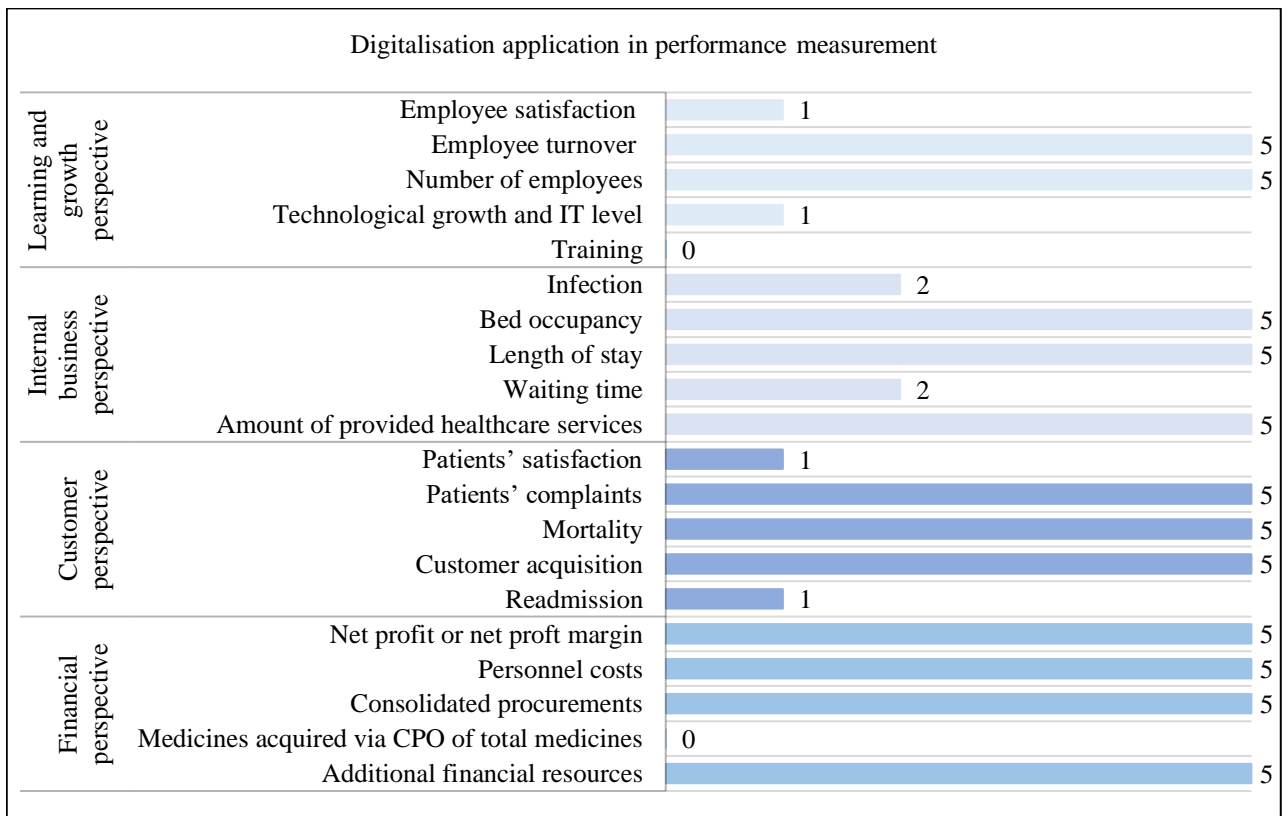


Fig. 15. Indicators of digitalisation application in performance measurement in Organization A

Overall, it was determined that early digitalisation is moderately applied in performance measurement in public healthcare Organization A. Considering Organization's A digital maturity, strategy, employee and investments in staff digital skills related obstacles had been observed which correlate to literature findings regarding early digital maturity stage. Mostly digitalisation is used in Organizations' A performance measures which are related to financial aspects, for example, revenues or costs. Digitalisation is used for more than half measures and its application is planned to be increased in certain measures.

4.2.2. Organization B

Organization B is public healthcare organization operating in Lithuania, which provides outpatient personal healthcare services. According to gathered results of applied model, it was found that Organization B is at *maturing* digital maturity level and have collected 18,4 scores of horizontal axis. The level of application of digitalisation in Organization's B performance measurement is *high*, as it has collected 16,05 scores of vertical axis of applied model. Results of model application in each criterion and perspective is provided in Figure 16.

Considering each criterion (see Figure 16) that determine digital maturity level in proposed model, it could be observed that all four criteria are similarly intervened by digitalisation, while patients and management are intervened the least and healthcare providers and data services are intervened mostly.

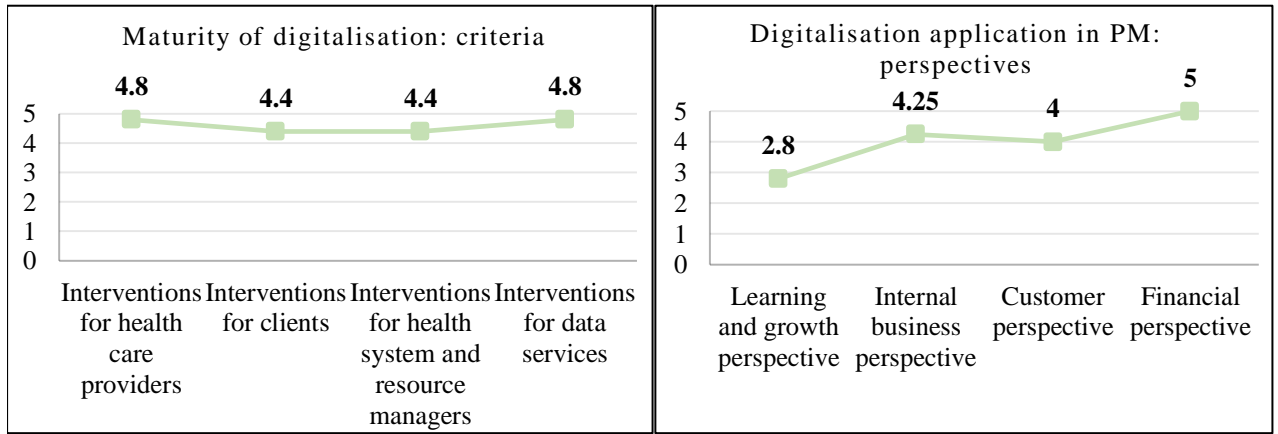


Fig. 16. Results of model application in Organization B: criteria and perspectives

Analyzing each criterion separately, it is important to take a look to set of sub-criteria attributed to each criterion (see Figure 17). Digital trends related to healthcare providers are applied in a wide scope and frequently – healthcare providers of Organization B widely use digital imaging technology and digital images are stored or shared in PACS via DICOM. It was observed that clinical decisions are more often made using digitalisation when compared to other research participants which digital maturity level is lower. It could be grounded that organization, which is more digitally mature, has implemented digital tools (algorithms) which aim to support clinical decisions. For example, organization B has adapted system which checks compatibility of prescribed medicines with clinical diagnosis and warns, if any precautions should be addressed, therefore, clinical decisions are made based on digitalisation in certain cases, nevertheless, intervention of healthcare professional plays more important role in making clinical decisions. Taking into the account staff digital skills and organization’s investments in digital literacy promotion, according to the literature, organizations, which digital maturity level is maturing, invest in staff digital skills and possess higher digitally skilled employees (Eggers and Bellman, 2015). While analyzing sub-criteria regarding employees, it could be noticed that in this particular case, practical remarks contribute to theoretical findings – level of personnel digital literacy is considered as very high: 95% employees are able to work with digital systems independently. According to Respondent B, it is a result of 6 years efforts: “*We have developed organization’s vision and six years ago we have started to train employees regarding digital literacy – we have hired lecturers, our IT staff performed training for employees, in all the ways we encouraged our employees to use digital systems*“. And currently, organization possess sufficient amount of digital systems, tools and every year increases it. Moreover, organization has a plan to dedicate more resources to employees’ digital literacy and digital systems availability increasement every year (as disclosed by Respondent B: “*Management is very oriented to availability of digital technologies*“). Taking into the account sub-criteria related to patients, Organization B provides wide abilities for patients regarding e-bookings, availability to their EHR records (patients communication), telemedicine services and e-prescriptions. Organization has its individual IS which possess plenty of integrated functions for internal use (employees) and external use (patients), thus organization provides options for patients to sign in patient portal and check their EHR or book the visit online. Organization B aims to minimize physical stream of patients in its premises, therefore, encourage patients to use digital services. As a result, patient’s portal is used frequently and the number of e-bookings is higher than traditional registration options. Signed e-prescriptions take the biggest part (86%) of all signed prescriptions in Organization B. Considering digitalisation trends,

related to future (Reddy and Sharma, 2016), Organization B is moving forward regarding their implementation. For example, telemedicine services (e.g., consultations, prescription of medicines) are already provided for patients via phone, while health wearables are planned to be implemented in the future.

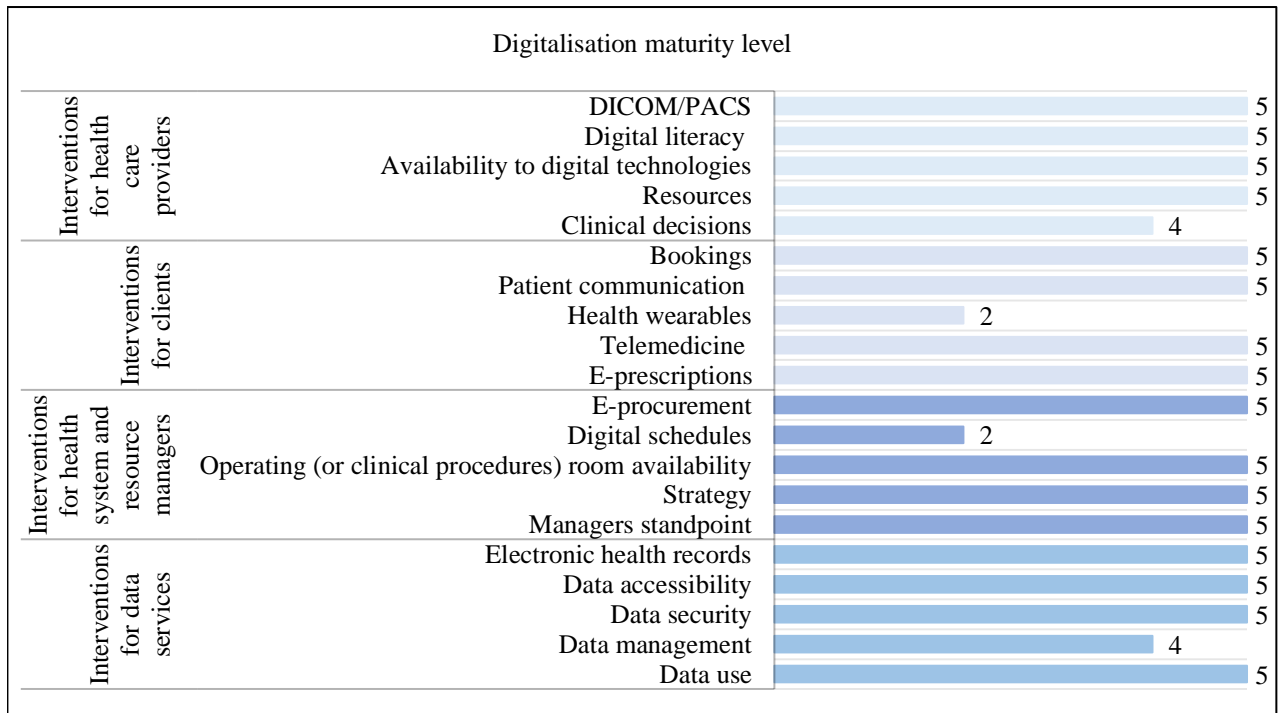


Fig. 17. Sub-criteria of digitalisation maturity in Organization B

Analyzing sub-criteria related to system and resource managers, it could be stated that Organization B strategy and managers' attitude are digitally oriented, therefore, the link between strategy oriented to digitalisation and organization's digital maturity level could be observed as in research done by Eggers and Bellman (2015). Looking to administration of organization activities, besides digital schedule of clinical procedures rooms, employee digital schedules are missing in Organization B, nevertheless, are planned to be implemented in future, as there is a need to improve employee management. Considering interventions for data services, Organization B generates huge amounts of digital data, as it has eliminated all paper-based health records and fully implemented EHR in its clinical activities. According to Respondent B, digital data is accessible for persons who have rights for that, however, in some of the cases, misuse of digital data is found. Therefore, besides passwords, Organization B has implemented additional data security aids: external IT security audit, internal control system which registers who signed in to a particular patient's EHR and this information is reviewed periodically or when incidents occur, subsequently, selected persons shall clarify the reasons they signed in to particular person's EHR. In such a way Organization B tries to avoid patients information safety issues when employees use the data not for clinical purposes. It should be bear in mind, that although data security is considered as very high, the complete security of data could not be ensured. According to Respondent B, the management of digital data could be improved, but the application of digital data is comprehensive – digital data is always applied in performance measurement and decision making in Organization B. It could be stated that scope and frequency of adopted digitalisation trends contribute to maturing digital maturity level organizations described in

theoretical part of this research paper: most digital trends are used all the time while remaining ones are planned to be implemented, therefore, Organization's B digital maturity level is grounded.

Taking into account digitalisation application in different performance measurement perspectives and indicators (see Figure 18), mostly digitalisation is reflected within financial perspective, as the indicators within financial perspective are obtained from digital data and always used in performance measurement. Respondent B highlighted the need to measure these indicators. For example, additional resources engagement is accounted using digital information and used in performance measurement, as the employees are encouraged to support Organization B with a certain percent of their income tax, as a result, employees are promised to be provided with qualification trainings, therefore, the exact amount of additional resources engagement shall be measured. Considering internal business perspectives, bed occupancy rate is not applicable for Organization B, as it does not provide inpatient services (see Table 6), therefore this indicator was not involved in calculations. In a similar manner than in Organization A, internal business indicators, which are related to operating revenues, are measured using digitalisation. For example, length of stay (in terms of duration of treatment), waiting time and amount of provided services are determined using digital data and always involved in performance measurement of organization and annual Organization's B performance report. Organization B measures the amount of services provided was by individual healthcare professional or in individual procedure room, that helps to determine efficiency and encourage employees for good working results. Therefore, due to healthcare organizations' specifics, non-financial indicators could be strongly related to its financial performance and are essential in measuring performance. As all health records are digital in Organization B, moreover, there are additional digital information sources, it has abilities to determine the infections rate in its premises using digital data, however, according to Respondent B, currently there is no need for that. Considering customer perspective's indicators, patient's satisfaction in most cases is measured in Organization B, for example, they have done research regarding elimination of paper-based health records and how it changes interaction between patient and healthcare professional during the visit. According to the results, the application of EHR increases the efficiency while reducing time from 2 to 5 minutes in each case. Therefore, it shows that the measurement of patient's satisfaction is useful for improvements of organization's performance. Organization B manages patients' complaints in a same manner – complaints are received digitally and systematized in order to investigate weaknesses of Organization's B performance and to allocate resources for problem solving. Mortality and customer acquisition are also obtained digitally and always used in performance measurement. Organization pays huge attention to customer acquisition indicator and performs detailed analyses regarding the number of registered and unregistered patients every month. According to Respondent B, they analyze the numbers and their structure (e.g., patients age, gender, insurance status and other) in order to determine the need of workforce in Organization B, the need of financial revenues and medical equipment. The reasons of patients leaving are analyzed and information is used in decision making in order to improve Organization's B performance. Therefore, it could be observed that digital data and its analyses are promising in improving performance, as discussed by Adler-Milstein et al. (2017). Patient readmission rate, which could show quality and effectiveness of provided healthcare services are not investigated by Organization B, nevertheless the need and importance was expressed by Respondent B: "*...>it is really important indicator and we are going to work on it in future*". Human resources related indicators within learning and growth perspective are digitalised fragmentary: employee satisfaction is measured, nevertheless does not include digitalisation, as some of the trends are considered as compulsory. The number of employees and its turnover is retrieved

and involved in performance measurement, notwithstanding, does not apply digitalisation, as Organization B does not have personnel management system. While, the trainings of employees are always registered, measured digital and involved in measuring performance in order to equally allocate financial resources for employee qualification. Organization's technological growth is also investigated applying digitalisation, as part of e-prescriptions and e-epicrisis in total part of prescriptions and epicrisis and the data is used in performance measurement. It could be observed that most of the indicators are involved measuring performance, except readmission rate and infection rate, while employee related indicators do not apply digitalisation. However, digitalisation is applied in remaining indicators which reflect Organization's B performance measurement.

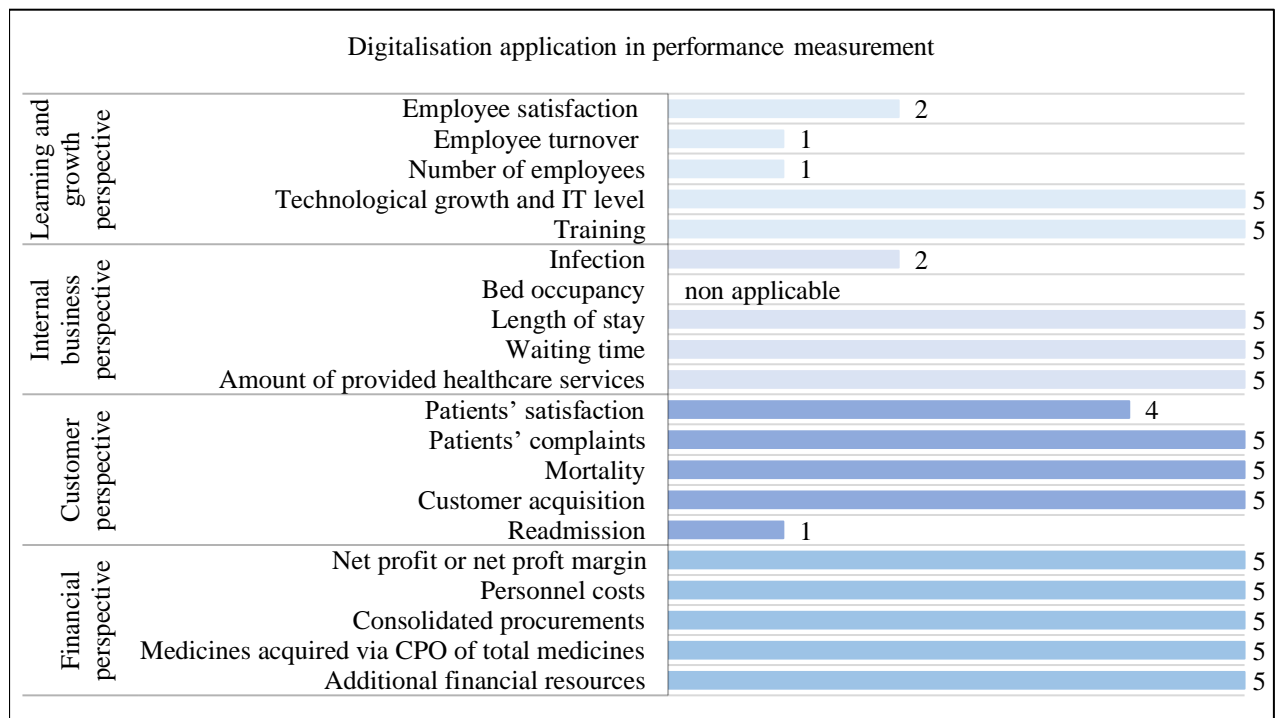


Fig. 18. Indicators of digitalisation application in performance measurement in Organization B

To sum up, it was investigated that maturing digitalisation is highly applied in performance measurement in public healthcare Organization B. Considering its digital maturity, Organization B foresees data security and management issues, moreover, digital employee management and future oriented digital trends should be taken into the account. Organization's strategy, investments and managers' standpoint reflect the characteristics of digital maturing organization defined by the literature. It could be observed that digitalisation is not applied in three indicators only, while additional two indicators (e.g., readmission rate, infections rate) are not involved in performance measurement in Organization B. Therefore, digitalisation is used in Organization's B performance measurement widely and only several aspects should be addressed.

4.2.3. Organization C

Organization C is public healthcare organization located in Lithuania, which provides inpatient and out-patient personal healthcare services. After the proposed model was applied, based on received results, it was determined that Organization C is at **maturing** digital maturity level and have collected 17,8 scores in horizontal axis. The level of application of digitalisation in Organization's C

performance measurement is *high*, as it has collected 17,2 scores in vertical axis of applied model. Total scores of each criterion and perspective is provided in Figure 19.

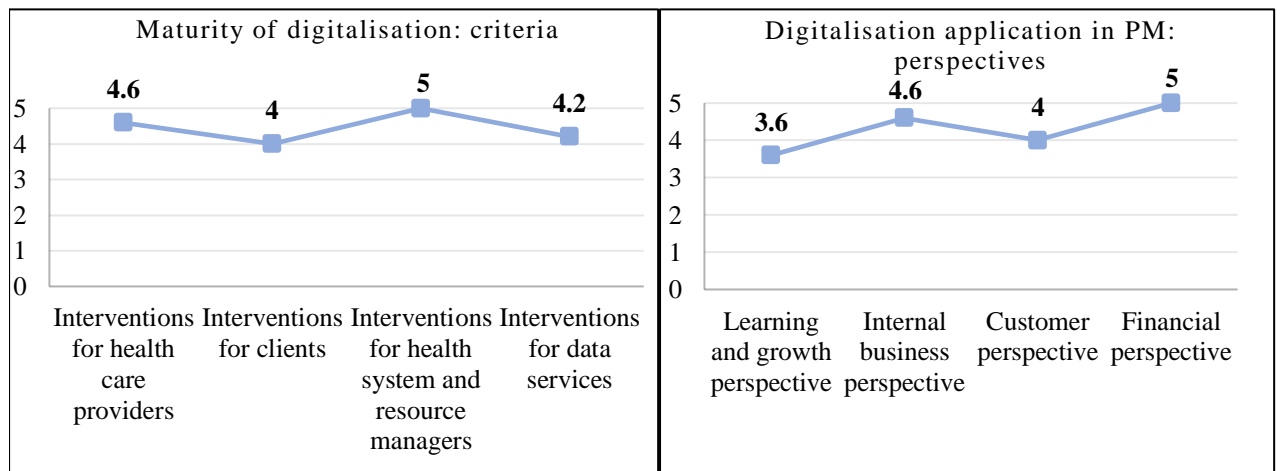


Fig. 19. Results of model application in Organization C: criteria and perspectives

Based on the total scores of each criterion that is used to determine organization's digital maturity, health system and resource managers are intervened the most, while clients (patients) are intervened the least when compared within four indicators each other. Considering sub-criteria (see Figure 20) attributable to health system and resource managers, all criteria were evaluated by highest mark by Respondent C, as all procurements are carried out digitally using Organization's C IS, employees work schedules, all operating rooms availability (or occupation) schedules are digital. Organization's C strategy includes digitalisation, essential processes transformation towards digitalisation, while management encourages digitalisation, its development and application in Organization's C activities. As already discussed, digital strategy and digital maturity level are strongly related (Frach et al., 2017), as higher digital mature organizations are more likely to have strong digital strategy (Eggers and Bellman, 2015). Healthcare providers is the second most digitally intervened criterion. Digital imaging is widely used and clinical decisions in most of the cases are based on digital data, especially, in radiology. As Organization C has implemented clinical decisions support system, which uses certain clinical data and generates clinical decisions, by applying artificial intelligence. Digital skills of Organization's C personnel are evaluated as very high: 85% of employees are able to work individually with digital systems. There are many digital technologies in Organization C, but the demand is increasing, while Organization C allocates insufficient amount of resources regarding employees' digital skills promotion. That is also reflected by calculations provided in Table 7, Organization C allocates 0,02% of its operating costs for employee qualification, this value is 10 times lower than Organization's A and five times lower than Organization's B and Organization's D, as the insufficient fundings for employee digital literacy was highlighted by Respondent C, it could be foreseen as improveable area. Considering digital data generation, accessibility, management and use, Respondent C highlighted that there are huge amounts of data generated in organization. Organization C has implemented its individual IS, thus EHR are always filled instead of paper-based health records. Digital data within Organization C is accessible for persons who have rights. According to Respondent C, digital data accessibility is based on trust and control of employees. Organization has implemented artificial intelligence system, which sends alerts to the safety department in order to secure data. Further considering safety of digital data, although Organization C follows the legislation requirements and have developed additional safety tools (artificial

intelligence, passwords, video recording), the data is not completely safe, and security related issues are very relevant. When amount of digital data is huge and rapidly increasing, the data security becomes a challenge (Rogge et al., 2017), as healthcare organizations shall provide data accessibility for relevant employees while ensuring data is stored securely. According to Respondent C, digital data is managed and used fairly well, but there are improveable areas, as digital data is used not in all cases. Taking into account digital trends application within patients, e-prescriptions is leading sub-criteria, as e-prescriptions take the biggest part in total prescriptions. However, only up to one third patients use e-bookings. Organization C provides telemedicine services for patients (e.g., teleradiology, telecardiology) and has adopted health wearables, which are used by cardiologists, these future-looking digitalisation trends (Reddy and Sharma, 2016), are used in certain cases. Organization C is the only one organization, which have implemented health wearables, among research participants.

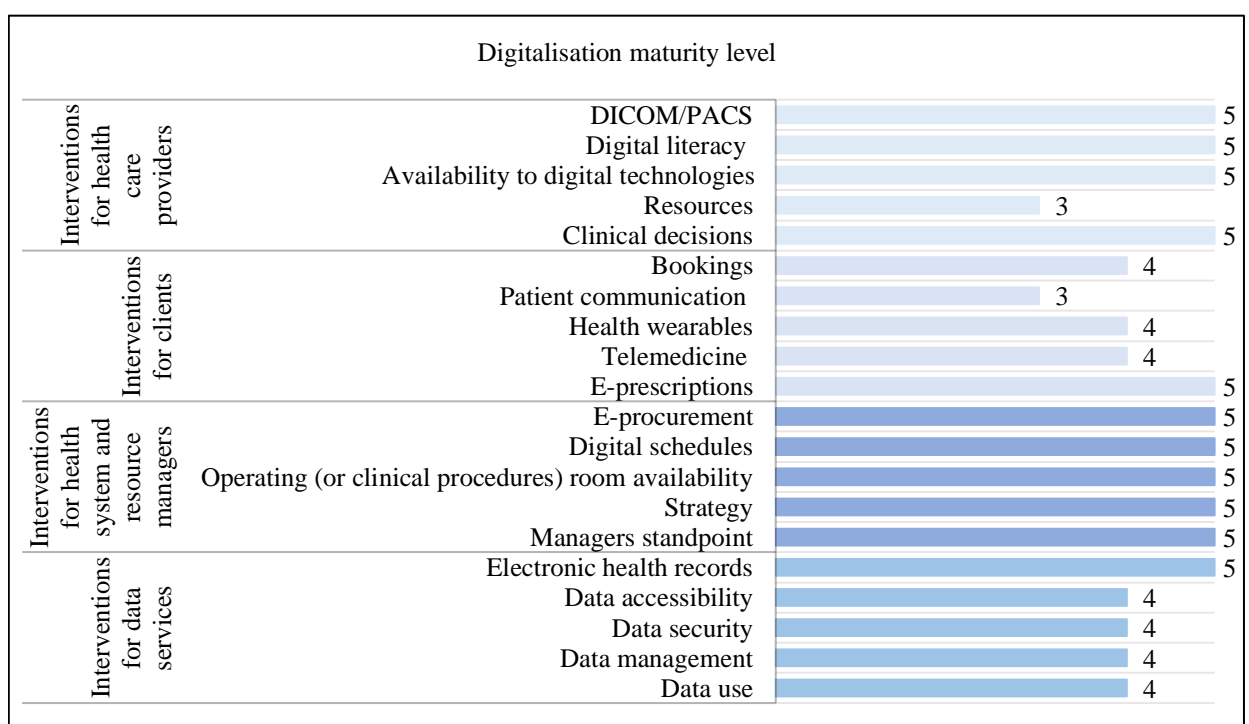


Fig. 20. Sub-criteria of digitalisation maturity in Organization C

Further considering digitalisation application in performance measurement, indicators of each perspective are provided in Figure 21. Consistently with other research participants, mostly digitalisation is applied in financial perspective, as indicators within financial perspective reflect organization's financial performance, therefore, organizations are making sure financial performance is measured efficiently. Digitalisation is realized with digital accounting systems which incorporate digital data, therefore, financial perspective's indicators are retrieved digitally. Considering indicators, attributed to internal business perspective, Organization C could be distinguished from other research participants because it measures infections rate in its premises, using digital data and involves information in performance measurement. Waiting time and amount of provided healthcare services are measured using digitalisation and involved in performance measurement in most of the cases. While analyzing customer related indicators, it could be observed, that besides patients' complaints, mortality and customer acquisition which are usual indicators retrieved from digital data, readmission rate is being investigated by Organization C and involved in performance measurement

in most of the cases. As stated by Respondent C: „<...>in most of the cases, doctors use it for measuring the quality of clinical treatment <...>“. Further considering patients related indicators, patient’s satisfaction is being evaluated by Organization C, however, digitalisation (e.g., EHR, e-prescription, telemedicine and others) is not involved in evaluation. Finally, taking into account learning and growth perspective, there was no answer obtained regarding employee satisfaction measurement, while employee turnover is measured using digital personnel management system and obtained information is always used in performance measurement. In similar manner Organization C obtains indicators: number of employees and employees trainings and use the information while measuring its performance in most of the cases. As there is huge amount of digital data being generated in Organization C, its performance measurement process involves the calculation of e-prescriptions and e-epicrisis part in total number of prescriptions and epicrisis respectively, which are obtained from digital data.

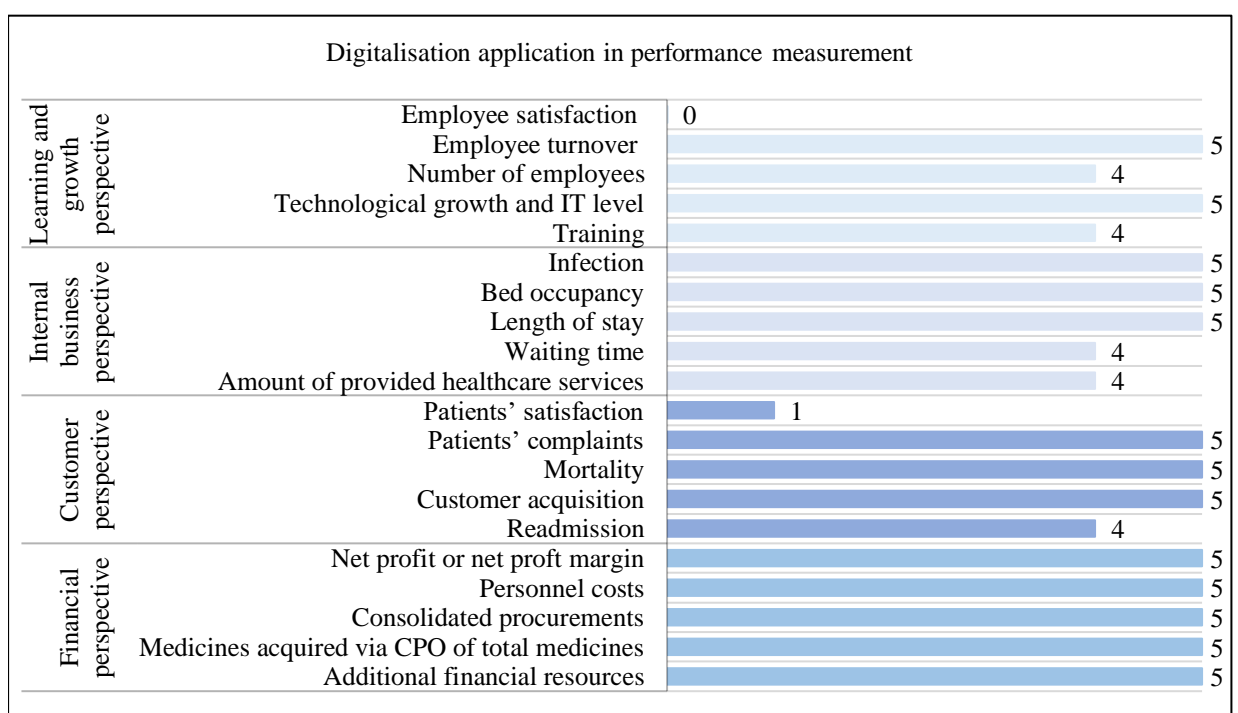


Fig. 21. Indicators of digitalisation application in performance measurement in Organization C

Overall, it was determined that maturing digitalisation is highly applied in performance measurement in public healthcare Organization C. It was found that organization has adapted digital trends which are, according to the theoretical findings, oriented to the future: telemedicine and health wearables. Although Organization C represents several characteristics of maturing digital maturity organization described by the literature (strategy, managers’ standpoint, employees’ digital skills), however there are findings that practically disagree with characteristics found in literature, such as, insufficient investments in employee digital competences. Additionally, as Organization C generates huge amount of digital data, concerns, related to digital data management and security, have been found. Taking into the account digitalisation application in performance measurement, it could be stated that organization is performing well in terms of digitalisation utilization in performance measurement. As organization is the only one among research participants which use digitalisation in determination of infections rate and readmission rate. Additionally, across all the indicators involved in model, there has been found only one indicator in which digitalisation is not applied. Thus, it is foreseen as

enhanceable aspect, which, if corrected, could increase Organization’s C level to comprehensive regarding digitalisation application in performance measurement.

4.2.4. Organization D

Organization D is public healthcare organization operating in Lithuania, which provides inpatient and outpatient personal healthcare services. Based on the gathered results of applied model, it was found that Organization D is at *developing* digital maturity level and have collected 16 scores in horizontal axis. While level of digitalisation application in Organization’s D performance measurement is *moderate*, as it has gathered 13,6 scores in vertical axis of applied model. Results of model application in each criterion and perspective is provided in Figure 22.

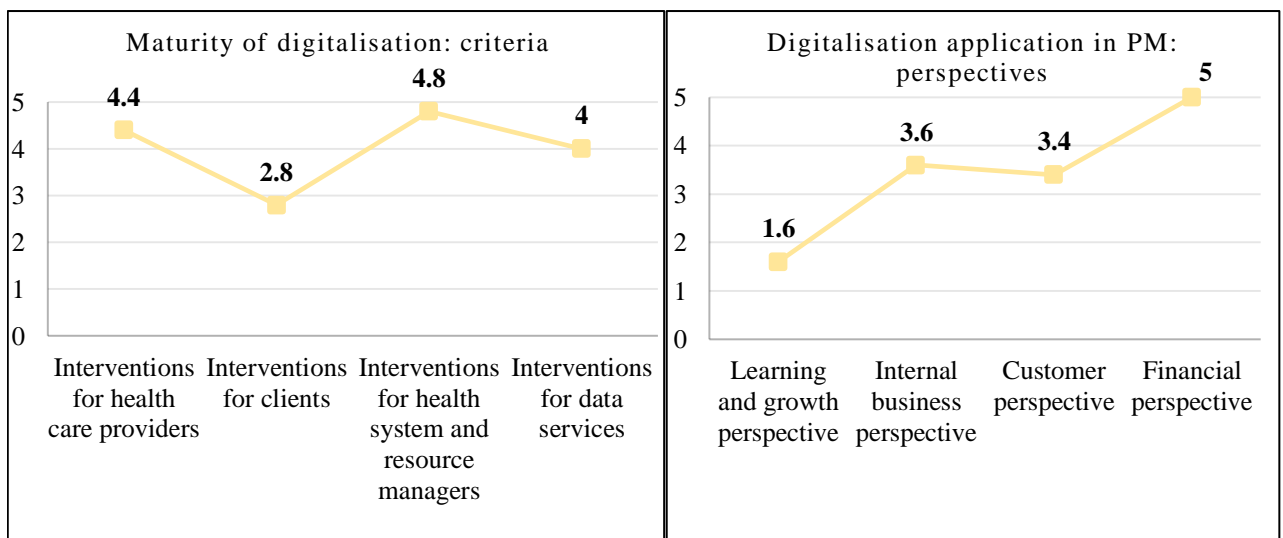


Fig. 22. Results of model application in Organization D: criteria and perspectives

Taking into the account each criterion (see Figure 22) and sub-criterion (see Figure 23) that determine digital maturity level of organization, it could be observed that digitalisation intervenes the clients (patients) the least, while health system and resource managers are intervened by digitalisation the most. Considering patients related criteria, e-prescriptions is leading digitalisation trend, applied by Organization D, e-prescriptions take the biggest part (above 75%) of all signed prescriptions and the amount of e-prescriptions is increasing every year. While other patient related digital trends are not applied in such a wide scope: Organization D provides abilities for patients to digitally book appointments, nevertheless only 20% of patients use e-bookings. Organization has its own IS, however it is intended to be used by Organization’s D personnel, but not patients. Therefore, patients access their EHR or other related information only via national system – EHSCI IS. Considering adoption of future-looking digital trends, such as, health wearables and telemedicine, only telemedicine is planned to be adopted in the future. Second from the lowest digitally intervened criterion – interventions for data services, encompass data generation (EHR), data accessibility, data security, management and use sub-criteria. In most of the cases (80%), digital data is generated while filling patient’s records in digital format (EHR). While data is accessible for employees who have permission, data security is ensured using passwords for computers, in addition, Organization D has employee responsible for data security, moreover, it is regulated by legislation. Digital data in Organization D is managed by application of documents management system. According to Respondent D, digital data is managed sufficiently, however there are improveable aspects, as

Organization D has implemented more digital systems, such as, intranet, digital adverse events system, accounting system, which should be interconnected, therefore, digital data could be exchanged within systems for different purposes. By evaluating digital data application in organization, Respondent D foresees improveable aspects, as organization’s individual IS is not ready yet to perform analyzes of digital data, therefore its application is still limited. Considering how digitalisation intervenes healthcare providers, it could be observed, that employee pose high digital literacy level: 70% of organization’s employees are able to work with digital systems independently and solve related issues. According to calculations provided in Table 7, Organization D allocates 0,1% of costs to qualification improvement, this includes digital literacy qualification. Respondent D believes that sufficient amount of resources are allocated to employees’ digital literacy promotion, nevertheless employees shall make personal efforts to improve digital skills. Digital literacy is closely related to availability to digital technologies, which is considered as moderate, 50%. Taking into the account digitalisation in clinical diagnostics, digital imaging is used frequently. Organization also has adopted system of surgical images management, which could be used to store, share and stream images of endoscopic surgeries. Notwithstanding, not all the clinical decisions are based on digitalisation (about 50%), as clinical decisions are based on patient’s clinical condition and descriptions. Digital data is not always informative for clinical decisions. As already mentioned, digitalisation is mostly applied in managerial and administrative activities – all organization’s procurements are excuted digitally, employees’ schedules are digital, operating and clinical procedures room availability is registered digitally in most of the cases, managers (CEO and owners) evaluate digitalisation positively and encourages it, while strategy includes processes digital transformation. It could be observed that organization is rapidly moving towards digitalisation process and is expected to reach mature digitalisation level, as organization has implemented most digitalisation trends in its activities and uses them in most of the cases or always, moreover, plans to make several improvements regarding digitalisation.

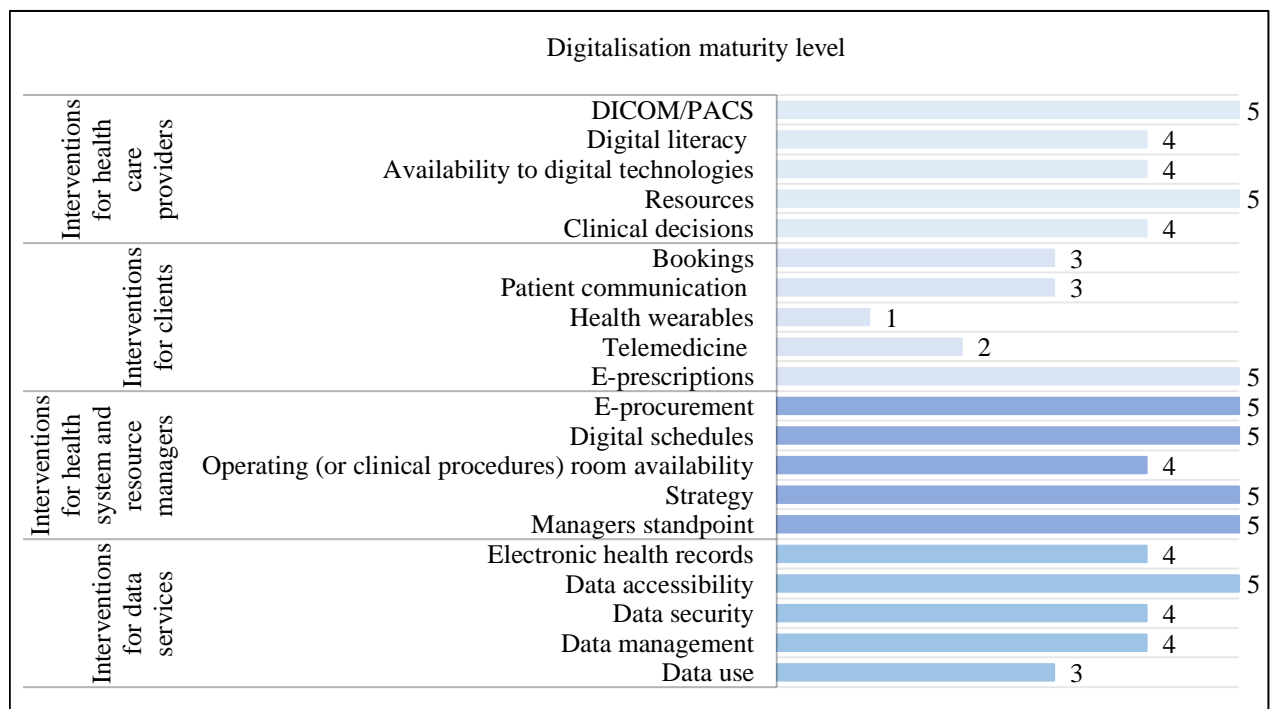


Fig. 23. Sub-criteria of digitalisation maturity in Organization D

Taking into account digitalisation application in different performance measurement perspectives and analyzing the values of attributed indicators (see Figure 24), as in all the previous analyzed cases, mostly digitalisation is applied in financial perspective of performance measurement: all financial indicators are obtained and calculated using digital data and digital tools. Digital data is always used in performance measurement of Organization D and included in annual performance report. Internal business perspective's indicators – bed occupancy, length of stay, amount of provided healthcare services are determined using digital data from organization's IS, for example, length of stay is calculated using digital forms No. 066/a-LK and are always used in performance measurement of organization D. While waiting time is calculated measuring Organization's D performance but not using digitalisation. Taking into the account infection control, infection rate is not determined in organization, however, Respondent D highlighted the need of digitalisation in this field. It would be necessary and useful that infection rate could be determined using infected patient's EHR. Digitalisation is used in three indicators of customer perspective – patients' complaints, mortality and customer acquisition, all indicators are retrieved from digital data and always applied in performance measurement. Correspondingly to other research participants, Organizaion D evaluates patient's satisfaction with provided healthcare services, but does not include applied digitalisation trends in evaluation. Evaluation of patient's satisfaction mostly includes inpatient, outpatient services and corruption prevention. Considering patient's readmission rate, Respondent D remarked it as necessary indicator to evaluate the quality of healthcare services, although it is not included in performance measurement, Respondent D foresees possibilities of its implementation with digital tools. Taking into account learning and growth perspective, digitalisation is applied in technological growth indicator only: e-prescriptions and e-epicrisis parts of all prescriptions and epicrisis respectively are evaluated using digital data and always applied in performance measurement. Number of employees and employee turnover are used as measures of Organizaion D performance but are not determined using digitalisation. While employee satisfaction and training are not registered and evaluated, only employee satisfaction is planned to be evaluated including digitalisation.

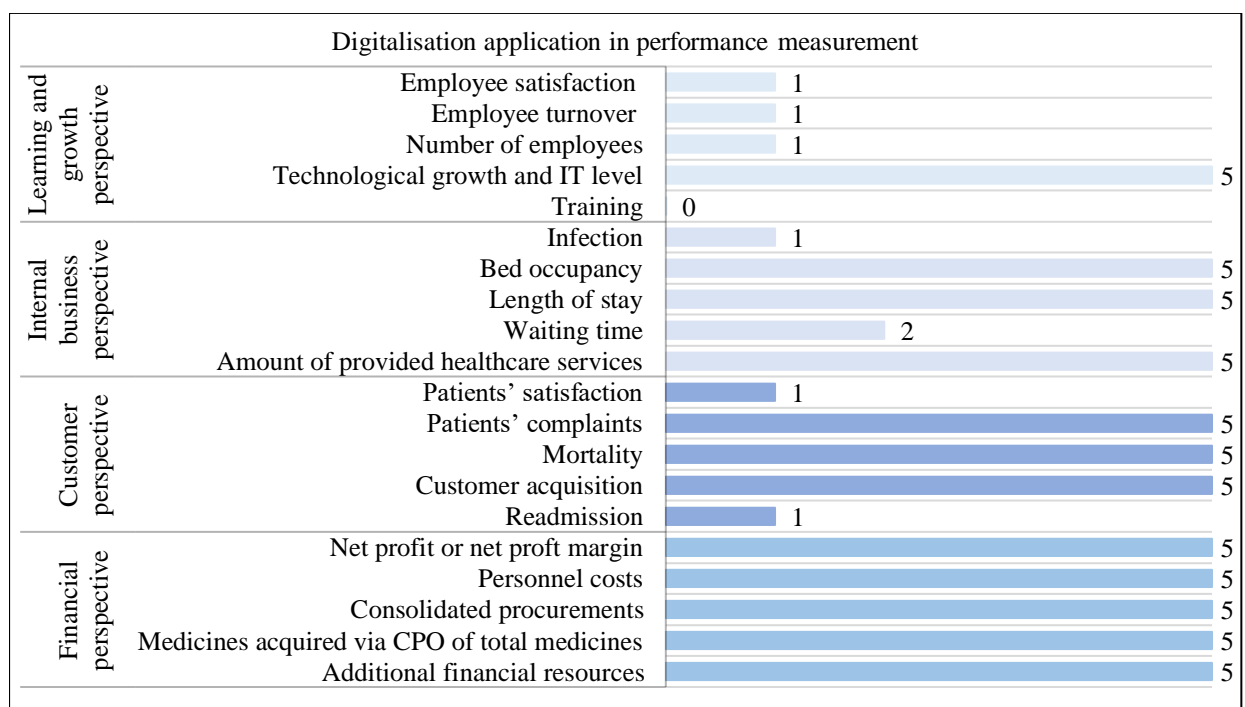


Fig. 24. Indicators of digitalisation application in performance measurement in Organization D

It was determined that developing digitalisation is moderately applied in performance measurement in public healthcare Organization D. Considering Organization's D digital maturity, lack of organization's IS interconnection, insufficient capabilities regarding digital data analysis and deficient patients' involvement have been observed as obstacles across Organization's D digital maturity pathway. Mostly digitalisation is used in Organizations' D performance indicators which are related to financial aspects. More than half performance measures use digitalisation, while several measures, such as, employee satisfaction, infection rate, readmission rate are not included in performance measurement, the remaining are involved in performance measurement, but obtained using traditional methods (not involving digitalisation). Therefore, it could be stated that Organization's D performance measurement is moving towards digitalisation and is expected to apply digitalisation in wider scope in the future.

4.2.5. Cross-case analysis

Based on the results, gathered after model, proposed in theoretical part of this research thesis, was practically implemented, it could be observed that Organization B and Organization C are the leading organizations regarding digital maturity level and application of digitalisation in performance measurement among research participants, as it was determined that maturing digitalisation is highly applied in performance measurement. Organization A and Organization D have reached similar level of digitalisation application in performance measurement (moderate), however Organization's D digital maturity level is higher (developing) when compared to Organization's A digital maturity level (early). The results of practical model implementation in selected research participants are provided in Figure 25.

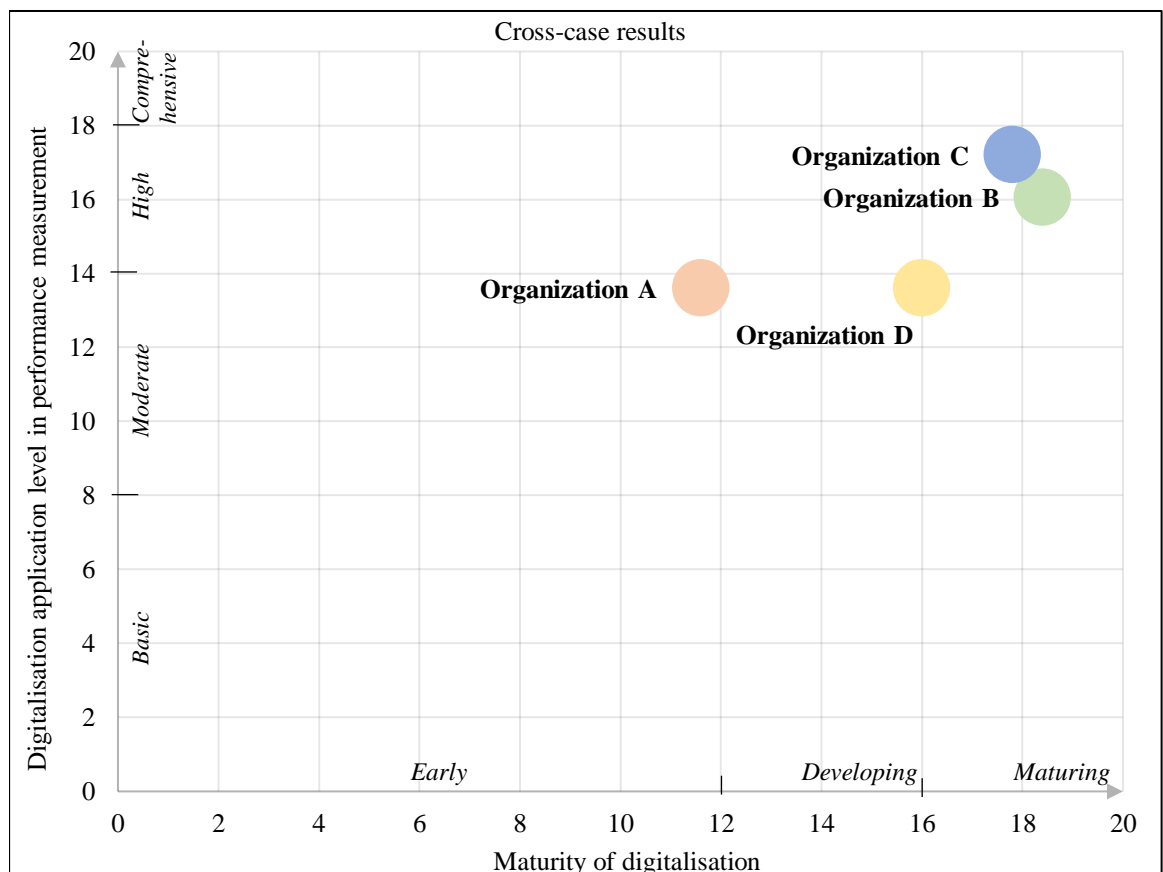


Fig. 25. Distribution of research participants according to model implementation results

Maturity of digitalisation. It was found that larger organizations – Organization B, Organization C, Organization D (in terms of number of employees and beds, see Figure 12) are more digitalised than smaller organization – Organization A. Results support theoretical findings, as Adler-Milstein et al. (2017) found that EHR adoption varied, depending on hospital characteristics, and size was one of the key hospital characteristics: larger hospitals were more expected to adapt a comprehensive level of EHR than small hospitals. Additionally, Demirioglu and Audesh (2017) highlighted that bigger organizations have better financial opportunities regarding digitalisation. More digitally mature organizations have adapted digital trends associated with future: telemedicine and health wearables which are expected to decrease costs of health care while increasing quality and efficiency of provided healthcare services (OECD, 2016): Organization C have implemented health wearables and telemedicine and use these trends in most of the cases, Organization B is providing telemedicine services, while health wearables are involved in its future plans regarding digitalisation. Contrary, research participants with lower level of digital maturity, such as, Organization A and Organization D have not adapted mentioned digitalisation trends in such a wide scope, both organizations are planning to provide telemedicine services, while health wearables are not planned to be implemented in the future. It could be observed that more clinical decisions are made based on digitalisation in more digital mature organizations (Organization B, Organization C, Organization D), when making comparisons among research participants. It could be reasoned as research participants with higher digital maturity level have more advanced IS which help in clinical decision-making process. Notwithstanding, there was found consistent opinion among research respondents, that clinical decisions could not be based on digital data solely, therefore, intervention of healthcare professional is essential.

Furthermore, manager's standpoint has been found consistent among research participants – positive attitude to digitalisation was noticed. To get deeper view of performance improvements caused by digitalisation, code “performance improvements” (see Appendix 4) was applied in analysis of open-ended questions. Performance improvement is noticed in administrative/managerial activities and patients-related activities. The examples of administrative/managerial activities include but are not limited to:

- information exchange and management improvement (e.g., e-mails, e-documents management, as mentioned by Respondent A);
- enhanced internal control (Respondent B: “<...> we have strong control mechanism <...>”);
- improved performance measurement (Respondent B: “<...> we monitor how many procedures are performed per day and control the streams, therefore we can encourage individual professionals for intensive work.”). As digitalisation provides a plenty of digital data that is used in performance measurement in organization, these remarks contribute to literature (Adler-Milstein et al., 2017).

Patients-related activities are improved by digitalisation regarding the following aspects:

- increased availability of medical services to patients (Respondent B and Respondent C). Organization is able to provide more services as the efficiency of services is increased. For example, by reducing the number of visiting patients – some patients do not need the face-to-face visit to doctor, they can easily access to the service they need via digital means – to check the results of diagnostic tests, to book an appointment online, to get an e-prescription;

- attracting patients (Respondent A). Healthcare organization which applies digitalisation is expected to attract more patients, as they are more linked with innovative healthcare. These findings verify theoretical findings – digital technologies adapted by healthcare organization is one of the factors that shape patient’s selection of healthcare organization (Janušonis, 2018);
- improved quality of medical services (Respondent C: “<...> *as much you will use innovative solutions (artificial intelligence), the better quality of medical services will be and the higher value organization will have*“);
- reduced the waiting lines (Respondent B) – as part of patients do not need to visit healthcare institution and rather can use its digital services, the processes efficiency is increased and, thus waiting lines are reduced.

There have been found that organizations (Organization B, Organization C and Organization D) which digital maturity level is above early digital maturity level, have strategies which are more oriented to digitalisation, when compared to the organization, which digital maturity level is early (Organization A), similar remarks regarding digital maturity level and organization’s strategy relation have been found in literature (Emami and Doolen, 2015). In addition, research participants with higher digital maturity, comprise more digitally skilled employees. It could be stated that organization’s employees play important role in its digital transformation, therefore, enhancement of employees’ motivation and investments in improvement of employees’ digital skills are very important. Over and above that, digital data management and security concerns are consistent among all research participants. The comparison of the values of each digital maturity criterion among research participants is provided in Appendix 5.

It should be bear in mind that despite digital maturity level of organization, all research participants face challenges towards the pathway of application of digital trends. By analyzing the code „challenges“, it was observed that the main obstacles of digitalisation application in healthcare organizations are related to: financial resources (as stated by Respondent A: “<...> *we are limited by the finances and must distribute them very carefully.*“), while Respondent B provided opposite opinion regarding finances as a challenge of digitalisation application („*Transparently distributed financial resources should be enough.*“). Other challenges were related to employees – their stagnation (Respondent A:“ <...> *personnel stagnation against innovations, changes and qualification improvement*“; Respondent D: “<...> *employee stagnation and unwillingness to change*“), lack of competent employees (Respondent C), lack of new ideas for digitalisation development (Respondent C). Respondents agree that personnel-related challenges are significant and personnel changes towards digitalisation is a must, otherwise, such employees shall be replaced. In addition, Respondent A and Respondent B highlighted obstacles which are related to external environment: National digital systems are unpractical and there is lack of contribution to digitalisation by other healthcare organizations in Lithuania. Unpractical and time-requiring usage of digital systems is an obstacle of digitalisation. Taking into the account the second challenge, it was mentioned, that currently there is insufficient number of institutions that provide data to NHIS, therefore, in such case, as stated by Respondent B (“<...> *digitalisation is distorted* <...>“). This remark match the theoretical findings, as it was observed that E-health does not fully work and not all the organizations provide data to EHSCI IS (VK, 2017). The underlying causes of such an issue were revealed: differences in IS of each healthcare organization, lack of resources for IS maintenance and lack of organizations’ digital capabilities. It is evident, that healthcare organizations, by applying digital trends, face internal and external challenges. The main challenges, based on the frequency they

were mentioned among four cases, are related to financial resources and employees of healthcare organization. These results support literature findings, as Atasoy et al. (2019) found users resistance to change as one of EHR adoption challenges, moreover, Adler-Milstein et al. (2017), besides lack of physicians' cooperation, reported ongoing costs as the most important challenges faced by US hospitals. Additionally, According to Eggers and Bellman (2015), inadequate fundings are one of the obstacles for digital maturity.

On the other hand, by analyzing code "encouragement", there have been found factors that encourage digitalisation application, such as: sense of inevitability, financial resources, competitive working conditions and expanded opportunities, provided by digitalisation. Sense of inevitability as promoting factor was highlighted the most frequently (as stated by Respondent B: "*<...> that irrevocability factor motivates employees to make individual efforts to contribute to digitalisation of processes because it is unavoidable*"). When employees know that they must adapt to inevitable changes, it encourages them to use digital technologies, as there is no other choice (as stated by Respondent D: "*<...> if there wouldn't be any other option, understanding would come up, that by changing environmental conditions, employees must change according to digital direction*"). Besides sense of inevitability, finances were mentioned in two meanings – organizations' financial resources (as stated by Respondent A) and financial encouragement to employees (as stated by Respondent B: "*<...> our decision to pay for extra efforts of working groups motivates employees because then they are putting efforts to reach better objectives*"). In addition, competitive environment was highlighted, for example, the results of different departments progress towards digitalisation are being publicly announced every month within Organization B and, according to Respondent B, it helps to encourage application of digitalisation trends. As it could be noticed, motivated employees play important role in digitalisation application. According to Respondent C, motivation of employees increases if they see real benefits digitalisation provides.

Digitalisation in performance measurement. It was found that all research participants apply digitalisation in more than half of performance measurement indicators. High level of digitalisation application in performance measurement is observed in organizations which digital maturity level is maturing (Organization C and Organization B). Moderate maturity level of digitalisation application in performance measurement is observed in organizations which digital maturity level is early (Organization A) and developing (Organization D). Although, due to limited number of included research participants, general trends could not be estimated, the results show that research participants with higher level of digital maturity use more digitalisation in their performance measurement, because, as already discussed, based on literature findings and this research remarks, digitalisation improves performance measurement in healthcare organization. Research outputs are reasonable when compared to theoretical findings, as Adler-Milstein et al. (2017) found that healthcare organizations with higher EHR adoption level used EHR data in more performance measurement functions, than those with lower level of EHR adoption, as in order to use digital data for performance measurement, IT and organizational capacities are needed. The comparison of the values of each perspective among research participants is provided in Appendix 5.

When analyzing the indicators of performance measurement, it was noticed that organizations pay attention to utilization of digitalisation in indicators, related to organizations' financial performance, such as, personnel costs, profit (or loss), additional financial resources engagement and indicators, related to organization's operating revenue: bed occupancy rate, length of stay, customer acquisition, amount of provided services (as more healthcare services are provided, more operating revenue is

generated). This could be grounded as organizations are required to work profitable (or at least not to be unprofitable (LRSAM, 2019)), even if they are non-profit organizations. Respondents highlighted that from organization's performance results depend their future plans and future financial and operating revenues. Therefore, organizations are intended to measure, analyze and manage the indicators which are connected to financial welfare which lead to overall welfare of the organization. Considering the differences between the leaders and laggards regarding digitalisation application in performance measurement, it was found that digital data is used to obtain such indicators as readmission rate and infection rate by Organization C in order to determine effectiveness of clinical treatment and level of infections in healthcare organization's premises respectively. While remaining research participants remarked readmission rate as needed and useful indicator, nevertheless, do not retrieve it. Therefore, it could be observed that higher digitalisation level leads to more advanced performance metrics which utilize digitalisation.

Further considering indicators of performance measurement of healthcare organizations, it is needed to investigate, whether the indicators, required for healthcare organizations, are feasible and reflect their performance comprehensively, as this strongly relates to digitalisation application in performance measurement. Therefore, "indicators" code was used in transcripts analysis. Steady opinion among research participants could be generalized – existing performance indicators reflect fair view about organizations' performance, nevertheless more indicators are needed to get more comprehensive view of organization. For example, Respondent D highlighted that indicators, which measure individual employee work efficiency, are missing. As stated by Respondent D: "*<...> not all the employees work in similar manner, but single employee remuneration could be evaluated based on work results, therefore, information on work results of individual employee is missing*". While Organization B involves more indicators (in addition to the required ones) measuring its performance. Organization B compares results not only to previous year, but also to the results of other organizations and to the city's average value. Therefore, it could be concluded that existing indicators are relevant, nevertheless, additional indicators are needed. Taking into the account "improvements" associated to performance measurement, several aspects were distinguished:

- Future-looking metrics. Performance measurement should provide the information whether organization is able to sustain changes and satisfy customers needs in the future. As stated by Respondent B: "*<...> it is important to align performance measurement in such a direction, that it would be possible to forecast how healthcare system and patient needs will change in five years*". The need of future-looking metrics contribute to theoretical findings, as Emami and Doolen (2015) provided insights that forward-looking indicators are necessary to investigate aspects of prospective performance in terms of finances and quality of services, therefore, suggested several metrics within learning and growth perspective of BSC framework. According to Emami and Dolen (2015), using of future-looking indicators would increase patients' satisfaction, organization's profit and enhance internal processes.
- Employee-oriented metrics. Respondent D explained that there is a need to measure each individual employee performance which contribute to whole organization performance measurement. As stated by Respondent D: "*The report which contains each employee tasks and achieved results is missing <...>*". That would expand organization performance measurement and enhance internal control while improving each employee accountability. As already defined in theoretical findings of this research thesis, human capital is important metric to measure healthcare organization performance (Emami and Doolen, 2015).

Considering employees as one of the component of organization human capital, the need of specific employee-oriented metrics was distinguished.

In order to minimize limitations of model and get more comprehensive view of digitalisation application in performance measurement in healthcare organization, “digital data” code was used in analysis of the transcripts. Respondents mostly remarked that there exist digital data which is not applied in performance measurement and these findings contribute to literature. According to Adler-Milstein et al. (2017), many healthcare organizations face challenges making digital data useful in performance measurement. In more detail, Respondent C revealed that occupancy of equipment in certain department is digital data which is not further used. In addition, Respondent D highlighted that although most digital data are used in performance measurement, not all the gathered data is informative, therefore real conversations with employees are still relevant. Contrary to Organization A, Organization C and Organization D, Organization B tries to minimize unnecessary digital documents in order to ensure all the digital data is used appropriately. As stated by Respondent B: “<...> we create only those digital forms that are surely needed <...>”. According to information, provided by Respondent B, organization invests in digital systems only after the assessment of real benefits they provide to employees and patients and that helps to avoid data surplus. As Organization B stands for high level of digitalisation application in PM, based on the results of model application, it could be stated that, according to Organizations’ B experience, elimination of unnecessary documents or forms and other digital data generators could help organization to increase the level of digital data application in performance measurement.

Overall, higher utilization of digitalisation was found in organizations which digital maturity level is higher. Moreover, future oriented digital trends and more advanced performance measures were noticed in leading organization regarding digital maturity and digitalisation application in performance measurement. In addition, coding analysis and interpretation revealed the consistency of managers’ standpoint regarding digitalisation improvements. There were found relations between this research findings and theoretical findings presented in this research thesis. Organizations should not limit their performance measurement with the indicators settled by the Minister of Health of Lithuania, contrary, there is a need to expand existing indicators with employee-oriented metrics and forward-looking metrics in order to get more comprehensive view of organizational performance and, by using that information, make appropriate decisions and performance improvements. Based on gathered results, besides factors that encourage digitalisation application, it was revealed that organizations face challenges while implementing digital trends and using digitalisation in their performance measurement. Therefore, the improveable areas in performance measurement and digitalisation application in performance measurement within each research participant were determined.

4.3. Recommendations and directions for further improvements

Recommendations for each research participant were constructed on the strength on theoretical findings in previous parts of this research thesis and based on good practice or shared experience of other research participants. Taking into the account, that most performance measurement of public sector organizations methods were adapted from private sector, it shows that sharing the experience within organizations could lead to enhanced performance.

The common improveable areas applicable to all four research participants are: measurement of employee satisfaction which involves digitalisation, measurement of patients' satisfaction regarding digital technologies adapted by healthcare organization and digital data and safety concerns. Considering employee satisfaction, as it was found by the literature (Emami and Doolen, 2015), human capital is one of the most important from intangible assets of organization, which should be addressed while measuring organization's performance. Taking into account patients, customer perspective in performance measurement is highly important because main activity of healthcare organizations is health care provision to patients. As organization has adopted digital trends related to patients in its activities, customer satisfaction measurement should be comprehensive and include digitalisation, as, according to the literature (Cinaroglu and Baser 2018; Janušonis, 2018) it is one of the most important quality indicators. Considering data security and management, established and improved internal control system and performance of digital data safety audits should be considered.

In addition, based on the results of applied model, improveable areas applicable to particular organization were determined. Employee skills enhancement, digital strategy development, digitalisation orientation to non-value-added activities, implementation of digital data management system, are assigned to Organization A. Utilization of future-looking metrics, digital employee management and performance measurement integration, implementation of future-oriented digital trends are recommended for Organization B. To increase costs and investments related to digitalisation, to increase the frequency of digitalisation application in performance metrics and to enhance employee motivation is recommended for Organization C. Paper-based records elimination, application of digitalisation in employee-oriented metrics, enhancement of internal integration is recommended for Organization D. The descriptions of proposed recommendations are provided in Appendix 6.

Limitations and further directions. Taking into the account further directions of research, it would be beneficial to perform similar study of practical model application after the provided recommendations were realized by each participated public healthcare organization. Subsequently, the comparison of results could be made, whether the application of digitalisation in performance measurement is enhanced. Furthermore, as this research is mainly limited by sample size and the findings could not be generalized, it is feasible to perform quantitative study of model application in order to investigate trends of digitalisation application in organizations' performance measurement on statistically representative sample. As a result, comparisons could be made among different groups in terms of organization size, location, ownership, type of provided services (inpatient, outpatient) or other healthcare organization characteristics.

Conclusions

1. Based on undertaken scientific literature analysis in the field of performance measurement of public healthcare organizations and digitalisation, existing research gap was revealed. Performance measurement in healthcare organizations is complex because of the specifics of this sector. Performance measurement in Lithuanian public healthcare sector organizations was introduced fairly recently. Moreover, with the increasing demand and use of digital trends, performance measurement should reflect current situation of healthcare organization and shall be brought up to date. Digitalisation is expected to bring advantages not only to performance of organization but also to performance measurement. Nevertheless, researches that merge these two concepts exist fragmentary. Therefore, the necessity of further research on digitalisation application in public healthcare organization's performance measurement was disclosed.
2. Theoretical findings of this research thesis cover two concepts: performance measurement in public healthcare organizations and digitalisation. Based on the theoretical findings in each direction, conceptual model for the assessment of digitalisation in performance measurement in healthcare organization with respect to its digital maturity level, was developed:
 - The need and importance of performance measurement to healthcare organizations was revealed. After several performance measurement models were analyzed, it was decided to represent the performance measurement in healthcare organization with several perspectives, as found in literature. As digitalisation could be applied in different perspectives of performance measurement. BSC framework's perspectives were adapted to conceptual model, as according to the literature, it is one of the most suitable performance measurement frameworks for public healthcare organizations. Taking into the account that performance measurement in Lithuanian public healthcare sector is relatively recent and there is no officially established performance measurement method which incorporates indicators tailored to Lithuanian healthcare organizations, each perspective was assigned with the most suitable indicators adapted from legislation and literature.
 - It was revealed that the demand and implementation of digital trends in healthcare organizations is increasing. Healthcare service categories (and stakeholders) are intervened by digitalisation. Various digitalisation trends (e.g., EHR, telemedicine, eHealth, e-prescriptions and others) are applied in different activities of healthcare organizations. Making digitalisation usable is one of the challenges for performance measurement. Therefore, model is used to evaluate digital maturity of organization and assess the level of digitalisation use in performance measurement. It was decided to assess public healthcare organization's digital maturity level in terms of scope, frequency of digital trends application in each of healthcare service category, retrieved from the literature, taking into the account several additional management and human resources related aspects.
3. In order to practically implement proposed conceptual model, the research methodology was designed. Research utilized multiple-case study involving four research participants – public healthcare organizations operating in Lithuania in order to gain a comprehensive view of research problem and analyze each research participant in deep. In order to improve research validity, data triangulation was used, therefore, information was collected via documents and qualitative semi-structured interviews with the representative persons of public healthcare organizations involved in this research. Subsequently, content analyses of documents and interviews transcripts were

performed, additionally incorporating coding analysis and interpretation of interview transcripts which cover open-ended questions. Multiple sources of data provided exhaustive view of organizations under research.

4. Proposed model of digitalisation application in the performance measurement in public healthcare organizations was practically implemented for selected Lithuanian public healthcare organizations. It was determined that the application of proposed model enables:
 - To assess the level of application of digitalisation in public healthcare organization's performance measurement with respect to its digital maturity. By the application of proposed model, it was investigated that early digitalisation is moderately applied in performance measurement in public healthcare Organization A, maturing digitalisation is highly applied in performance measurement in public healthcare Organization B and Organization C, developing digitalisation is moderately applied in performance measurement in public healthcare Organization D. Results show position of each organization involved in this research regarding two directions – digitalisation maturity and its application in performance measurement.
 - To make comparisons among organizations according to the gathered results in each of two directions of proposed model in terms of digitalisation maturity level and level of digitalisation application in performance measurement and visualize organization results within the matrix of proposed model. Based on the research results, higher level of application of digitalisation was found in organizations which digital maturity level is higher and these findings contribute to the literature. Moreover, strong digital strategy, more advanced digital trends, performance measures and digitally competent employees were noticed in dominating organizations regarding digital maturity and digitalisation application in performance measurement. However, due to small sample of this research, the findings could not be generalized.
 - To determine improveable areas in each healthcare organization across its digital maturity pathway (in each criterion of digitalisation) and application of digitalisation in performance measurement (in each perspective of performance measurement). As performance measurement is time-intensive process while public healthcare organizations seek to satisfy stakeholders' needs, proposed conceptual model can help to identify the pitfalls of organizational performance measurement practice, and reveal the areas, including but not limited to strong digital strategy, future-oriented performance measurement indicators, orientation to employees, security and management of digital data, implementation of forward-oriented digital trends, regarding which the improvements of digitalisation application in performance measurement could be implemented.

List of references

1. Aidemark, G. L. (2002). Balanced scorecards in healthcare: experiences from trials with balanced scorecards in five country councils. In M. J. Epstein, & J. F. Manzoni (Eds.), *Performance Measurement and Management control: A Compendium of Research* (pp. 235-270). Amsterdam: Elsevier.
2. Adler-Milstein, J., Holmogren, A. J., Kralovec, P., Worzala, C., Searcy, T., & Patel, V. (2017). Electronic health record adoption in US hospitals: the emergence of a digital “advanced use” divide. *Journal of the American Medical Informatics Association*, 24(6), 1142-1148. doi: 10.1093/jamia/ocx080
3. Atasoy, H., Greenwood, B. N., & McCullough, J. S. (2019). The digitization of patient care: a review of the effects of electronic health records on healthcare quality and utilization. *Annual Review of Public Health*, 40, 487-500. doi: 10.1146/annurev-publhealth-040218-044206
4. Balabonienė, I., & Večerskienė, G. (2015). The aspects of performance measurement in public sector organization. *Procedia – Social and Behavioral Sciences* 213, 314-320. doi: 10.1016/j.sbspro.2015.11.544
5. Baraldi, S. (2002). The balanced scorecard in hospitals: performance measurement as a driver of change: a case study. In M. J. Epstein, & J. F. Manzoni (Eds.), *Performance Measurement and Management control: A Compendium of Research* (pp. 209-233). Amsterdam: Elsevier.
6. Bawole, J. N., & Ibrahim, M. (2016). Contesting Claims on Measuring Performance in the Public Sector Using Performance Audits: Evidence from the Literature. *Public Organization Review*, 16, 285-299. doi: 10.1007/s11115-015-0312-4
7. Bradley, R. V., Esper, T. L., In, J., Lee, K. B., Bichescu, B. C., & Byrd, T. A. (2018). The Joint Use of RFID and EDI: Implications for Hospital Performance. *Production and Operations Management*. doi:10.1111/poms.12955
8. Bryman, A. (2012). *Social Research Methods* (4th ed.). New York: Oxford University Press.
9. Bryman, A., & Bell, E. (2016). *Business Research Methods* (4th ed.). New York: Oxford University Press.
10. Cinaroglu, S., & Baser, O. (2018). Understanding the relationship between effectiveness and outcome indicators to improve quality in healthcare. *Total Quality Management & Business Excellence*, 29(11), 1294-1311. doi: 10.1080/14783363.2016.1253467
11. Creswell, J. W., & Creswell, J. D. (2018). *Research design: qualitative, quantitative, and mixed methods approaches* (5th ed.). Los Angeles: SAGE.
12. Creswell, J. W., Hanson, W. E., Clark Plano, V. L., & Morales, A. (2007). Qualitative Research Designs: Selection and Implementation. *The Counseling Psychologist*, 35(2), 236-264. doi: 10.1177/0011000006287390
13. Demircioglu, M. A., & Audretsch, D. B. (2017). Conditions for innovation in public sector organizations. *Research Policy* 46(9), 1681-1691. doi: doi.org/10.1016/j.respol.2017.08.004
14. Di Meglio, G., Stare, M., Maroto, A., & Rubalcaba, L. (2015). Public services performance: an extended framework and empirical assessment across the enlarged EU. *Environment and Planning C: Government and Policy*, 33, 321-341. doi: 10.1068/c12264r
15. Eggers, W, D., & Bellman, J. (2015). *The journey of government’s digital transformation*. Deloitte University Press. [viewed 2 November 2019]. Retrieved from

- <https://www2.deloitte.com/us/en/insights/topics/digital-transformation/digital-transformation-in-government-summary.html?top=4#endnote-sup-2>
16. Emami, S., & Doolen, T. L. (2015). Healthcare performance measurement: identification of metrics for the learning and growth balanced scorecard perspective. *International Journal of Industrial Engineering*, 22(4), 426-437 [viewed 19 June 2019]. Retrieved from <https://web.a.ebscohost.com/ehost/detail/detail?vid=0&sid=b30fb0f5-11af-4517-8468-3982835508a9%40sessionmgr4008&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#AN=109265422&db=a9h>
 17. Expert Panel on Effective Ways of Investing in Health. (2018). *Opinion on Assessing the impact of digital transformation of health services*. [viewed 9 June 2019]. Retrieved from https://ec.europa.eu/health/expert_panel/sites/expertpanel/files/022_digitalisation_en.pdf
 18. European Commission. (2019). *Digital Government Factsheet 2019 – Lithuania*. [viewed 20 January 2020]. Retrieved from https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Government_Factsheets_Lithuania_2019_0.pdf
 19. Frach, L., Fehrmann, T., & Pfannes, P. (2017). Measuring Digital Government: How to Assess and Compare Digitalisation in Public Sector Organisations. *Springer International Publishing Switzerland*, 25-38. doi: 10.1007/978-3-319-38795-6_2
 20. Franceschini, F., Galetto, M., & Maisano, D. (2019). *Designing performance measurement systems: theory and practice of key performance indicators*. Switzerland: Springer [viewed 10 January 2020]. Retrieved from <https://link.springer.com/book/10.1007%2F978-3-030-01192-5>
 21. Gomes, P., Mendes, S., & Carvalho, J. (2017). Impact of PMS on organizational performance and moderating effects of context. *International Journal of Productivity and Performance Management*, 66(4), 517-538. doi: 10.1108/IJPPM-03-2016-0057
 22. Griškevičius, J., & Kizlaitis, R. J. (2012). *Informacinės sistemos medicinoje. Mokomoji knyga*. Vilnius: Technika [viewed 10 January 2020]. Retrieved from http://dspace.vgtu.lt/bitstream/1/1373/1/1353_skevicius_Kizlaitis_Informacines_web.pdf
 23. Gurevičius, R. (2015). Lietuvos rajoninių ligoninių veikla kartu vertinant kelis rodiklius pagal Pabon Lasso modelį. *Visuomenės sveikata* 3(70), 46-51 [viewed 12 April 2020]. Retrieved from https://www.researchgate.net/publication/290440887_Hospital_performance_of_municipality_hospitals_in_Lithuania_through_simultaneous_application_of_several_indicators_using_Pabon-Lasso_model
 24. Habran, E., Saulpic, O., & Zarlowski, P. (2018). Digitalisation in healthcare: An analysis of projects proposed by practitioners. *British Journal of Healthcare Management*, 24(3), 150-155. doi: 10.12968/bjhc.2018.24.3.150
 25. Hailey, J., & Sorgenfrei, S. (2005). *Measuring success. Issues in Performance Measurement*. [viewed 12 April 2020]. Retrieved from <https://pdfs.semanticscholar.org/614b/4e2e235ac74c7b7135d17b08435d0dc478b2.pdf>
 26. Jankauskienė, D. (2016). Lietuvos sveikatos priežiūros kokybės rodiklių vertinimo modelis. *Health Policy And Management*, 1(9), 42-68. doi: 10.13165/SPV-16-1-9-03
 27. Janušonis, V. (2018). Paciento sveikatos priežiūros (ligoninės) pasirinkimas ir kokybė: literatūros apžvalga ir atvejo (Lietuva) analizė. *Sveikatos Mokslai*, 28(7), 90-109. doi: 10.5200/sm-hs.2018.100
 28. Jennings E. T. (2010). Strategic Planning and Balanced Scorecards: Charting the Course to Policy Destinations. *Public administration review*, 224-227. doi: 10.1111/j.1540-6210.2010.02280.x

29. Kiškienė, A., Giest, S., & Dumortier, J. (2010). *Country Brief: Lithuania*. [viewed 12 December 2019]. Retrieved from http://www.ehealth-strategies.eu/database/documents/Lithuania_CountryBrief_eHStrategies.pdf
30. Klovienė, L., & Speziale, M. T. (2014). Sustainability Reporting as a Challenge for Performance Measurement: Literature Review. *Economics and Business*, 26, 44-53. doi: 10.7250/eb.2014.019
31. Kokkinakos, P., Markaki, O., Koussouris, S., Psarras, J. (2016). Digital Transformation: Is Public Sector Following the Enterprise 2.0 Paradigm? *Springer International Publishing AG*, 96-105. doi: 10.1007/978-3-319-49700-6_11
32. *Dėl viešojo sektoriaus apskaitos ir finansinės atskaitomybės 20-ojo standarto patvirtinimo, 2008 m. birželio 9 d. Nr. IK-205*. (2008) [viewed 9 April 2020]. Retrieved from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.322219/brVTatXEYB?positionInSearchResults=0&searchModelUUID=2c85c840-10ca-47c7-b761-51228a749b56>
33. Lietuvos Respublikos Sveikatos Apsaugos Ministerija. (2012). *Įsakymas dėl asmens sveikatos priežiūros įstaigų, teikiančių stacionarines asmens sveikatos priežiūros paslaugas, veiklos kokybės ir veiklos efektyvumo vertinimo rodiklių sąrašų ir šių rodiklių duomenų suvestinių formų patvirtinimo (No. V-1073 of 29 November 2012)* [viewed 9 June 2019]. Retrieved from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.438838/asr>
34. Lietuvos Respublikos Sveikatos Apsaugos Ministerija. (2019). *Dėl Lietuvos nacionalinės sveikatos sistemos viešųjų ir biudžetinių įstaigų, teikiančių asmens sveikatos priežiūros paslaugas, veiklos rezultatų vertinimo rodiklių 2019 metų siektinų reikšmių patvirtinimo (No. V-731 of 20 June 2019)* [viewed 10 June 2019]. Retrieved from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/5f2ac901941e11e9aab6d8dd69c6da66>
35. *Dėl Lietuvos informacinės visuomenės plėtros strategijos patvirtinimo, 2005 m. birželio 11 d. Nr. 625*. (2005) [viewed 17 January 2020]. Retrieved from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.257174?jfwid=fhhu5mgsp>
36. Lobont, O. R., & Bociu, A. (2017). Difficulties Concerning Public Sector Efficiency and Performance Measurement. *Regional Formation & Development Studies*, 22, 16-27 [viewed 24 October 2019]. Retrieved from <http://journals.ku.lt/index.php/RFDS/article/view/1473>
37. Malekzadeh, R., Mahmoodi, G., & Abedi, G. (2019). A Comparison of Three Models of Hospital Performance Assessment Using IPOCC Approach. *Ethiop J Health*, 29(4), 543-550. doi: <http://dx.doi.org/10.4314/ejhs.v29i5.3>
38. Miller, J., & Glassner, B. (2016). The ‘inside’ and the ‘outside’ finding realities in interviews. In D. Silverman (Ed.), *Qualitative research* (pp. 51-66). London: Sage [viewed 2 March 2020]. Retrieved from <https://books.google.lt/books?id=9FALDAAAQBAJ&printsec=frontcover&hl=lt#v=onepage&q=evidence%20of%20the%20nature&f=false>
39. *Įsakymas dėl Lietuvos e. Sveikatos sistemos 2017–2025 metų plėtros programos patvirtinimo, 2017 m. liepos 17 d. Nr. V-878*. (2017) [viewed 10 January 2020]. Retrieved from <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/2d9e4b906af511e7aefae747e4b63286?jfwid=p60bbwei7>
40. Mollerup, A., Hitchiner, S., Lau, E., & Ubaldi, B. (2016). *Digital Government Strategies for Transforming Public Services in the Welfare Areas* [viewed 10 June 2019]. Retrieved from <http://www.oecd.org/gov/digital-government/Digital-Government-Strategies-Welfare-Service.pdf>

41. Moullin, M. (2017). Improving and evaluating performance with the Public Sector Scorecard. *International Journal of Productivity and Performance Management*, 66,(4), 442-458. doi: 10.1108/IJPPM-06-2015-0092
42. Moullin, M. (2007). Performance measurement definitions: Linking performance measurement and organisational excellence. *International Journal of Healthcare Quality Assurance*, 20(3), 181-183. doi: 10.1108/09526860710743327.
43. Nuti, S., Noto, G., Vola, F., & Vainieri, M. (2018). Let's play the patients music. A new generation of performance measurement systems in healthcare. *Management Decision*, 56 (10), 2252-2272. doi: 10.1108/MD-09-2017-0907
44. Organisation for Economic Co-operation and Development. (2004). *Glossary of Key Terms in Evaluation and Results Based Management* [viewed 10 April 2019]. Retrieved from <http://www.oecd.org/dac/evaluation/glossaryofkeytermsinevaluationandresultsbasedmanagement.htm>
45. Organisation for Economic Co-operation and Development. (2016). *Digital Government Strategies for Transforming Public Services in the Welfare Areas* [viewed 30 October 2019]. Retrieved from <http://www.oecd.org/gov/digital-government/Digital-Government-Strategies-Welfare-Service.pdf>
46. Oh, Y., & Bush, C. B. (2015). Assessing public sector performance and untangling the complexity of public performance measurement. *International Review of Public Administration*, 20(3), 256-272. doi: 10.1080/12294659.2015.1047143
47. Pirozzi, M. G., & Ferulano, G.P. (2016). Intellectual capital and performance measurement in healthcare organizations: An integrated new model. *Journal of Intellectual Capital*, 17(2), 320-350. doi: 10.1108/JIC-07-2015-0063
48. Pope, C., Ziebland, S., & Mays, N. (2000). Qualitative research in healthcare. Analysing qualitative data. *BMJ (Clinical research ed.)*, 320(7227), 114-116. doi: 10.1136/bmj.320.7227.114
49. Pourmohammadi, K., Hatam, N., Shojaei, P., & Bastani, P. (2018). A comprehensive map of the evidence on the performance evaluation indicators of public hospitals: a scoping study and best fit framework synthesis. *Cost effectiveness and resource allocation*, 16(64). doi: 10.1186/s12962-018-0166-z
50. Purbey, S., Mukherjee, K., & Bhar, C. (2007). Performance measurement system for healthcare processes. *International Journal of Productivity and Performance Management*, 56(3), 241-251. doi: 10.1108/17410400710731446
51. Puškorius, S. (2010). Veiklos matavimų viešajame sektoriuje raida ir tendencijos. *Viešoji politika ir administravimas*, 34, 7-20 [viewed 17 May 2019]. Retrieved from <https://www3.mruni.eu/ojs/public-policy-and-administration/article/view/1118/1070>
52. Rahimi, H., Kavosi, Z., Shojaei, P., & Kharazmi, E. (2017). Key performance indicators in hospital based on balanced scorecard model. *Journal of health management & informatics*, 4(1), 17-24 [viewed 21 January 2020]. Retrieved from https://www.researchgate.net/publication/312032295_Key_performance_indicators_in_hospital_based_on_balanced_scorecard_model
53. Reddy, P., & Sharma, B. (2016). Digitalisation: the future of healthcare. *Journal of Business Management*, 11, 126-135 [viewed 13 January 2020]. Retrieved from

<https://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=1&sid=e47d75d4-377e-4773-9c0b-d17be6825168%40sessionmgr4008>

54. Regragui, H., Sefiani, N., & Azzouzi, H. (2018). Improving performance through measurement: the application of BSC and AHP in healthcare organization. In *International Colloquium on Logistics and Supply Chain Management 2018, 26-27 April 2018, Tangier, Morocco* (pp. 51-56), IEE.
55. *Republic of Lithuania Law on Healthcare Institutions, 6 June 1996 No I-1367*. (1996) [viewed 15 April 2020]. Retrieved from <https://e-seimas.lrs.lt/portal/legalActPrint/lt?jfwid=5w7avz05m&documentId=TAIS.377604&category=TAD>
56. *Republic of Lithuania Law on Health System, 19 July 1994 No I-552*. (1994) [viewed 15 April 2020]. Retrieved from <https://www.vaspvt.gov.lt/files/EN/LAW%20ON%20HEALTH%20SYSTEM.pdf>
57. Rimkutė, E., Kirstukaitė, I., & Šiugždinienė, J. (2015). Viešojo sektoriaus veiklos valdymas Lietuvoje: pažanga ir iššūkiai diegiant į rezultatus orientuotą valdymą. *Viešoji politika ir administravimas*, 14(1), 9-24. doi: 10.5755/j01.ppa.14.1.11412
58. Riratanaphong, C., & Voordt, T. (2015). Measuring the added value of workplace change performance measurement in theory and practice. *Facilities*, 33(11), 773-792. doi: 10.1108/F-12-2014-0095
59. Rogge, N., Agasisti, T., & De Witte, K. (2017). Big data and the measurement of public organizations' performance and efficiency: The state-of-the-art. *Public Policy and Administration*, 32(4), 263–281. doi: 10.1177/0952076716687355
60. *Resulation of Approval of the Lithuanian Health Strategy, 26 June 2014 No XII-964*. (2014) [viewed 12 January 2020]. Retrieved from <https://e-seimas.lrs.lt/rs/legalact/TAD/608a896236f811e6a222b0cd86c2adfc/>
61. Schoten, S. V., Blok, C. D., Spreeuwenberg, P., Groenewegen, P., & Wagner, C. (2016). The EFQM Model as a framework for total quality management in healthcare: results of a longitudinal quantitative study. *International Journal of Operations & Production Management*, 36(8), 901-922. doi: 10.1108/IJOPM-03-2015-0139
62. Scott, P. J., Curley, P. J., Williams, P. B., Linehan, I. P., & Shaha, S. H. (2016). Measuring the operational impact of digitized hospital records: a mixed methods study. *BMC Medical Informatics and Decision Making*, 16, 143. doi: 10.1186/s12911-016-0380-6
63. Si, S. L., You, X. Y., Liu, H. C., & Huang, J. (2017). Identifying Key Performance Indicators for Holistic Hospital Management with a Modified DEMATEL Approach. *International journal of environmental research and public health*, 14(8), 934. doi: 10.3390/ijerph14080934
64. Štaras, K., & Šiopė, A. (2010). VŠĮ centro poliklinikos veiklos efektyvumo vertinimas. *Socialinių mokslų studijos*, 3(7): 163-175 [viewed 5 June 2019]. Retrieved from <https://www3.mruni.eu/ojs/societal-studies/article/view/1318/1265>
65. Taufik, A. R., Djamhuri, A., & Saraswati, E. (2018). Performance measurement using balanced scorecard (BSC) (Study at Hospitals in Pasuruan). *Journal of accounting and business education*, 3(1). doi: 10.26675/jabe.v3i1.11553.
66. Ukko, J., Saunila, M., & Rantala, T. (2020). Connecting relational mechanisms to performance measurement in a digital service supply chain. *Production Planning & Control*, 31: 233-244. doi: 10.1080/09537287.2019.1631466

67. Valstybės Kontrolė. (2017). *Elektroninės sveikatos sistemos kūrimas. Valstybinio audito ataskaita* [viewed 13 January 2020]. Retrieved from <http://www.vkontrolė.lt/failas.aspx?id=3707>
68. Varaniūtė, V. (2018). *Verte suinteresuotosiems šalims grįstas veiklos vertinimas aukštajame moksle: Lietuvos universitetų atvejis: daktaro disertacija*. Kauno Technologijos universitetas. Kaunas: Technologija.
69. Veillard, J., Champagne, F., Klazinga, N., Kazandjian, V., Arah, O. A., & Guisset, A. L. (2005). A performance assessment framework for hospitals: the WHO regional office for Europe PATH project. *International Journal for Quality in Healthcare*, 17(6), 487-496. doi: 10.1093/intqhc/mzi072
70. Venkatesh, S., & Ramachandran, S. (2014). Performance measurement and management system-intercompany case study approach—Tamilnadu, India. *International Journal of Information, Business and Management (IOSR-JBM)*, 16(1), 1-12. doi: 10.9790/487X-16160112
71. Vidaus reikalų ministerija. (2017). *2016 Metų viešojo sektoriaus ataskaita* [viewed 12 December 2019]. Retrieved from https://vrm.lrv.lt/uploads/vrm/documents/files/LT_versija/Veikla/Veiklos%20sritis/Viešasis%20administravimas/2016%20metų%20viešojo%20sektoriaus%20ataskaita.pdf
72. Vidaus reikalų ministerija. (2018). *2017 Metų viešojo sektoriaus ataskaita* [viewed 12 December 2019]. Retrieved from https://vrm.lrv.lt/uploads/vrm/documents/files/LT_versija/Teisine_informacija/Tyrimai_ir_analizes/Analize/2017%20metų%20viesojo%20sektoriaus%20ataskaita.pdf
73. Vidaus reikalų ministerija. (2019). *2018 Metų viešojo sektoriaus ataskaita* [viewed 12 December 2019]. Retrieved from https://vrm.lrv.lt/uploads/vrm/documents/files/LT_versija/Teisine_informacija/Tyrimai_ir_analizes/Analize/2018%20viesojo%20sektoriaus%20ataskaita.pdf
74. Wang, T., Wang, Y., & McLeod, A. (2018). Do health information technology investments impact hospital financial performance and productivity? *International Journal of Accounting Information Systems*, 28, 1-13. doi: 10.1016/j.accinf.2017.12.002
75. World Health Organization. (2016). *Global diffusion of eHealth: making universal health coverage achievable. Report of the third global survey on eHealth* [viewed 12 June 2019]. Retrieved from https://www.who.int/goe/publications/global_diffusion/en/
76. World Health Organization (2007). *Performance Assessment Tool for Quality Improvement in Hospitals* [viewed 24 October 2019]. Retrieved from <https://apps.who.int/iris/bitstream/handle/10665/107808/E89742.pdf?sequence=1&isAllowed=y>

Appendices

Appendix 1. Methods of performance measurement in foreign hospitals (created by author, based on Jankauskienė, 2016)

Method	Description	Indicator(s)	Features
Performance assessment framework for hospitals (PATH), developed by WHO	Project initiated by WHO in 2003. The main goal is to measure the performance of particular hospital, compare within the other hospitals and make particular decisions in order to improve each of the analysed hospital performance.	Consists of 17 mandator and 47 optional indicators. Indicators are grouped according to the dimensions: clinical effectiveness, safety, orientation to patient, orientation to personnel, efficiency, and responsible management.	Comparison/benchmarking in national and international level; Decision making.
Euro Health Consumer Index (Sweden)	Initiated 2005 and supported by various organizations including European Commission. The main goal is to compare healthcare systems within European Union.	Indicators are grouped: patients' eligibility and information, availability of healthcare, results of healthcare, prevention, and pharmacy. Almost 10 years of measurement shows that indicators are stable and some of the indicators have surprisingly good dynamics – show-increasing number of positive healthcare results in Sweden hospitals.	Comparison/benchmarking in national and international level.
Quality measurement framework (Scotland)	The results of measurement are used for rating and comparison of hospitals in order to reveal the first signs of decrease in performance of hospitals.	The model consists of three levels indicators: 1. National quality results indicators (connected to main objectives, such as, customer satisfaction, emergent help provision, indicator of death, etc.) 2. Short-term objectives related to management of hospitals. 3. Other indicators.	Comparison/benchmarking in national level.
Germany National hospitals performance quality measurement system	It is used in order to monitor proper performance of healthcare institution, to prevent decreased performance and improve quality of healthcare in hospitals. The results are published publicly. The logic of performance measurement system in Germany hospitals: patient-data gathering during appropriate procedures.	Over 300 indicators are evaluated. There were 464 quality indicators evaluated in 2012 in German Hospital Quality Report 2012.	Transparency of organization; Comparison in national level.
Norway national hospitals performance quality measurement system	Performance measurement system of hospitals is developed since 2003. The results are used to compare the hospitals and to provide the information for the patients in order to let them choose the hospitals themselves.	The indicators used could be as follow: number of beds out of capacity, pre-surgical waiting time in cases of femur fractures, number of hospital infections, level of patient satisfaction, number of delayed planned surgeries and etc.	Transparency of organization; Comparison in national level.

Appendix 2. List of performance of Lithuanian healthcare sector measurement indicators (created by author, according to the LRSAM, 2012; 2019)

2015		2019	
Quality indicators	<ul style="list-style-type: none"> – Number of Caesarean sections – Mortality during childbirth due myocardia infarct – Mortality during childbirth due encephalon stroke – Frequency of bedsores occurrence in active treatment departments – Frequency of bedsores occurrence in nursing departments – Frequency of bedsores occurrence in palliative assistance departments – Infection control assurance level – Patient satisfaction level – Periodic infections rate – Assurance level of monitoring of prevalence of antibiotics resistant microorganisms – Infection medicines prescription assurance level – Undesirable events registration and analysis development level – Healthy conditions for newborns assurance level – Myocardia infarct diagnostics and treatment assurance level – Personnel hand hygiene assurance level 	Indicators of financial performance	<ul style="list-style-type: none"> – Profit – Personnel cost of total costs – Management costs of total costs – Financial liabilities to total budget – Involvement of additional financial resources
Effectiveness indicators	<ul style="list-style-type: none"> – Average duration of treatment – Daily part of surgery services (when various kinds of surgeries are performed, in this table not specified) 	Indicators of non-financial performance	<ul style="list-style-type: none"> – Level of patients' satisfaction – Grounded complaints part in total number of patients' complaints – Grounded complaints part in total number of provided services per year – Applied instruments against corruption in organization – Implementation and development of IT level – Number of provided healthcare services per quarter year and year – Average waiting time for dedicated procedure – Number of employees working in healthcare organization – Average duration of hospitalized patients' treatment – Bed occupation rate – Number of diagnostics and procedures when expensive medical equipment is used, utilization of expensive medical equipment
		Additional indicators	<ul style="list-style-type: none"> – Absolute liquidity – Number of consolidated procurements – Medicines acquired via central acquiring organization electronic catalogue value part of total available value

Appendix 3. Questionnaire of proposed model (created by the author)

Closed-ended questions – digitalisation maturity				
No.	Question (provided in Lithuanian language)	Answer (provided in Lithuanian language)	Sub-criterion	Criterion
1	Ar organizacijoje naudojami sveikatos informacijos sistemos elementai (diagnostinės vaizdinės medžiagos standartas, bei vaizdinių archyvavimo bei komunikacijos sistema)?	0 – Negaliu atsakyti. 1 – Nėra naudojami. 2 – Nėra naudojami, tačiau planuojama naudoti ateityje. 3 – Naudojami tam tikrais atvejais, fragmentiškai. 4 – Naudojami daugumoje atvejų 5 – Naudojami visada.	DICOM/PACS	Interventions for healthcare providers
2	Kaip vertinate personalo kompiuterinį (skaitmeninį) raštingumą (gebėjimas savarankiškai ieškoti, analizuoti, dirbti skaitmeninėmis sistemomis, programomis, įranga bei spręsti susijusias problemas)?	0 – Negaliu atsakyti. 1 – Personalo skaitmeninio raštingumo lygis yra labai žemas (0-10% darbuotojų geba savarankiškai naudotis skaitmeninėmis sistemomis, programomis bei įranga). 2 – Personalo skaitmeninio raštingumo lygis yra žemas (11%-39 % darbuotojų geba savarankiškai naudotis skaitmeninėmis sistemomis, programomis bei įranga). 3 – Personalo skaitmeninio raštingumo lygis yra vidutinis (40-60% darbuotojų geba savarankiškai naudotis skaitmeninėmis sistemomis, programomis bei įranga). 4 – Personalo skaitmeninio raštingumo lygis yra aukštas (61-80 % darbuotojų geba savarankiškai naudotis skaitmeninėmis sistemomis, programomis bei įranga). 5 – Personalo skaitmeninio raštingumo lygis yra labai aukštas (81-100% darbuotojų geba savarankiškai naudotis skaitmeninėmis sistemomis, programomis bei įranga).	Digital literacy	
3	Kaip vertinate skaitmeninių technologijų prieinamumą personalui sveikatos priežiūros įstaigoje?	0 – Negaliu atsakyti. 1 – Skaitmeninės technologijos personalui beveik nėra prieinamos, poreikis mažas arba nepastebimas. 2 – Labai mažai skaitmeninių technologijų yra prieinamos personalui, nors poreikis tam yra. 3 – Mažai skaitmeninių technologijų yra prieinamos personalui, esant didėjančiam jų poreikiui. 4 – Skaitmeninių technologijų prieinamumas personalui yra vidutinis, esant stabiliam arba didėjančiam jų poreikiui. 5 – Daug skaitmeninių technologijų yra prieinamos personalui, o jų poreikis tik didėja.	Availability to digital technologies	
4	Ar organizacija skiria pakankamai resursų darbuotojų skaitmeniniam raštingumui skatinti?	0 – Negaliu atsakyti. 1 – Organizacija neskiria resursų darbuotojų skaitmeniniam raštingumui skatinti ir nenumato skirti ateityje. 2 – Organizacija neskiria resursų darbuotojų skaitmeniniam raštingumui skatinti, bet numato skirti ateityje. 3 – Organizacija skiria bet nepakankamai resursų darbuotojų skaitmeniniam raštingumui skatinti.	Resources in workforce skills	

		<p>4 – Organizacija skiria pakankamai resursų daugelio darbuotojų skaitmeniniam raštingumui skatinti.</p> <p>5 – Organizacija skiria pakankamai resursų visų darbuotojų skaitmeniniam raštingumui skatinti bei planuoja dar daugiau resursų skirti ateityje.</p>		
5	Ar klinikiniai sprendimai yra priimami, remiantis skaitmeniniais duomenimis (paciento ligos istorija, skaitmeniniai tyrimų rezultatai, kita)?	<p>0 – Negaliu atsakyti.</p> <p>1 – Klinikiniai sprendimai nėra priimami remiantis skaitmeniniais duomenimis.</p> <p>2 – Klinikiniai sprendimai nėra priimami, remiantis skaitmeniniais duomenimis, tačiau numatoma priimti ateityje.</p> <p>3 – Klinikiniai sprendimai retai priimami, remiantis skaitmeniniais duomenimis.</p> <p>4 – Klinikiniai sprendimai tam tikrais atvejais priimami, remiantis skaitmeniniais duomenimis.</p> <p>5 – Visi klinikiniai sprendimai dažniausiai priimami, remiantis skaitmeniniais duomenimis.</p>	Clinical decisions	
6	Kokia dalis pacientų registruojasi sveikatos priežiūros paslaugoms elektroniniu būdu (savarankiškai, ne registratūroje arba telefonu)?	<p>0 – Negaliu atsakyti.</p> <p>1 – Įstaiga nėra įdiegusi elektroninės pacientų registracijos.</p> <p>2 – Įstaiga nėra įdiegusi elektroninės pacientų registracijos, tačiau numato įdiegti ateityje.</p> <p>3 – Pacientų, kurie registruojasi elektroniniu būdu, dalis yra mažesnė (0-20%), palyginti su kitomis registravimosi formomis.</p> <p>4 – Pacientų, kurie registruojasi elektroniniu būdu, dalis yra vidutinė (21-40%), palyginti su kitomis registravimosi formomis.</p> <p>5 – Pacientų, kurie registruojasi elektroniniu būdu, dalis yra didesnė (nuo 41%), palyginti su kitomis registravimosi formomis.</p>	Patient communication	Interventions for clients
7	Ar pacientui suteikiama prieiga prie savo elektroninės sveikatos istorijos Jūsų SPI?	<p>0 – Negaliu atsakyti.</p> <p>1 – Pacientui nėra suteikiama prieiga prie el. sveikatos istorijos.</p> <p>2 – Pacientui kol kas nėra suteikiama prieiga prie el. sveikatos istorijos, tačiau numatoma suteikti ateityje.</p> <p>3 – Pacientui prieiga suteikiama, tačiau naudojimasis nėra stebimas, vertinamas</p> <p>4 – Pacientui prieiga suteikiama ir pastebimas fragmentiškas naudojimasis sistema.</p> <p>5 – Pacientui prieiga suteikiama ir pastebimas dažnas naudojimasis sistema.</p>	Health wearables	
8	Ar vykdomas paciento sveikatos/būklės duomenų rinkimas realiu laiku iš jų dėvimų medicinos prietaisų? Pavyzdžiui, nuotolinis gliukozės kiekio kraujyje matavimas, kraujospūdžio, širdies ritmo matavimas	<p>0 – Negaliu atsakyti.</p> <p>1 – Nevykdomas ir nenumatomas vykdyti.</p> <p>2 – Nevykdomas, tačiau numatomas vykdyti ateityje.</p> <p>3 – Vykdomas, tačiau labai retai.</p> <p>4 – Vykdomas tik tam tikrais atvejais.</p> <p>5 – Vykdomas labai dažnai.</p>	Telemedicine	
9	Ar yra nuotoliniu būdu teikiamų sveikatos priežiūros paslaugų? Pavyzdžiui, konsultacijos, gydymo planas, operacijos ir t.t.	<p>0 – Negaliu atsakyti.</p> <p>1 – Įstaiga neteikia jokių telemedicinos paslaugų.</p> <p>2 – Įstaiga neteikia telemedicinos paslaugų, tačiau numato teikti ateityje.</p> <p>3 – Įstaiga neteikia telemedicinos paslaugų, nors galėtų teikti.</p> <p>4 – Įstaiga teikia telemedicinos paslaugas tam tikrais atvejais.</p> <p>5 – Įstaiga teikia telemedicinos paslaugas dažnai ir greta tradiciškai teikiamų paslaugų.</p>	E-prescriptions	

10	Koks įstaigos išduodamų elektroninių receptų kiekis, lyginant su tradiciniais (popieriniais) receptais?	0 – Negaliu atsakyti. 1 – Įstaiga šiuo metu neišduoda elektroninių receptų. 2 – Įstaigos išduodamų elektroninių receptų dalis lyginant su tradicinių receptų dalimi yra labai maža. 3 – Įstaiga išduoda palyginti vienodą kiekį elektroninių receptų ir tradicinių receptų (45% iki 55%). 4 – Įstaigos išduodamų elektroninių receptų dalis didesnė (iki 75%) už tradicinių receptų dalį. 5 – Įstaiga išduoda daugiausia elektroninių receptų (75-100%) ir mažai tradicinių (popierinių).	E-Bookings	Interventions for health system and resource managers
11	Ar įstaigos viešieji pirkimai vykdomi elektroniniu būdu?	0 – Negaliu atsakyti. 1 – Ne, viešieji pirkimai nėra vykdomi elektroniniu būdu. 2 – Ne, tačiau planuojama viešuosius pirkimus vykdyti elektroniniu būdu. 3 – Įstaigos viešieji pirkimai vykdomi elektroniniu būdu tam tikrais atvejais. 4 – Įstaigos viešieji pirkimai vykdomi elektroniniu būdu daugumoje atvejų. 5 – Įstaigos viešieji pirkimai vykdomi elektroniniu būdu visais atvejais.	E-procurement	
12	Ar įstaigoje sudaromi skaitmeniniai darbuotojų darbo grafikai?	0 – Negaliu atsakyti. 1 – Nesudaromi. 2 – Nesudaromi, tačiau numatoma sudarinėti ateityje. 3 – Sudarinėjami tik tam tikrais atvejais. 4 – Sudaromi daugumoje atvejų. 5 – Sudaromi visada.	Digital schedules	
13	Kokiu būdu registruojamas (jei registruojamas) operacinių (arba procedūrinių kabinetų) užimtumas?	0 – Negaliu atsakyti. 1 – Neregistruojamas. 2 – Neregistruojamas, tačiau numatoma įdiegti registravimo sistemą ateityje. 3 – Registruojama popierine forma (žurnale ar kituose dokumentuose). 4 – Registruojama elektroniniu būdu tam tikrais atvejais. 5 – Visada registruojama tik elektroniniu būdu.	Operating (or clinical procedures) room availability	
14	Ar organizacijos strategija įtraukia poreikį skaitmenizavimui bei su juo susijusioms inovacijoms?	0 – Negaliu atsakyti. 1 – Neįtraukia. 2 – Neįtraukia, tačiau numatoma atnaujinti skaitmenizavimo aspektu. 3 – Įtraukia tik užuomazgas (labiau susijusi su sąnaudų optimizavimu). 4 – Įtraukia dalinai, tačiau labiau susijusi su klientų patirtimi ir sprendimų priėmimu skaitmenizavimo atžvilgiu. 5 – Įtraukia esminę organizacijos procesų transformaciją dėl skaitmenizavimo.	Strategy	
15	Kaip vertinate vadovybės požiūrį į skaitmenines sistemas/technologijas, jų naudojimo skatinimą bei naujų diegimą?	0 – Negaliu atsakyti. 1 – Vadovybė neigiamai vertina turimas skaitmenines sistemas ir neskatina naujų diegimo. 2 – Vadovybė neigiamai vertina turimas skaitmenines sistemas, tačiau skatina jų tobulinimą bei naujų diegimą. 3 – Vadovybė neutraliai (nei teigiamai, nei neigiamai) vertina turimas skaitmenines sistemas, tačiau neskatina naujų diegimo.	Managers's standpoint	

		<p>4 – Vadovybė teigiamai vertina turimas skaitmenines sistemas, tačiau nepakankamai skatina naujų diegimą.</p> <p>5 – Vadovybė teigiamai vertina skaitmenines sistemas, skatina jų tobulinimą, naudojimą ir yra aktyviai įsitraukusi į naujų sistemų diegimą.</p>		
16	Kaip vertinate elektroninės pacientų sveikatos istorijos pildymą Jūsų atstovaujamoje organizacijoje?	<p>0 – Negaliu atsakyti.</p> <p>1 – Nepildoma.</p> <p>2 – Nepildoma, bet numatyta pildyti ateityje.</p> <p>3 – Pildoma tik tam tikrais atvejais.</p> <p>4 – Pildoma daugumoje atvejų.</p> <p>5 – Pildoma visada.</p>	Electronic health records	Interventions for data services
17	Kaip vertinate skaitmeninių duomenų prieinamumą organizacijos naudojamose informacinėse sistemose?	<p>0 – Negaliu atsakyti.</p> <p>1 – Galima teigti, kad duomenys nėra prieinami.</p> <p>2 – Galima teigti, kad duomenys nėra prieinami, tačiau prieigos problemos numatomos spręsti ateityje.</p> <p>3 – Galima teigti, kad tik maža dalis duomenų yra lengvai prieinami, turint tam teisę.</p> <p>4 – Galima teigti, kad vidutinė dalis duomenų yra lengvai prieinami, turint tam teisę.</p> <p>5 – Galima teigti, kad visi (arba beveik visi) duomenys yra lengvai prieinami, turint tam teisę.</p>	Data accessibility	
18	Kaip vertinate skaitmeninių duomenų saugumą organizacijoje?	<p>0 – Negaliu atsakyti.</p> <p>1 – Šiuo metu duomenys nėra saugūs.</p> <p>2 – Šiuo metu duomenys nėra saugūs, tačiau keliami duomenų saugumo tikslai ateityje.</p> <p>3 – Duomenys yra dalinai saugūs, tačiau siekama tobulinti jų saugumą.</p> <p>4 – Duomenys yra laikomi saugūs organizacijai laikantis nustatytų teisinių reikalavimų.</p> <p>5 – Duomenų saugumas yra itin aukštas, organizacijai laikantis ne tik nustatytų teisinių reikalavimų, tačiau įgyvendinant ir papildomas duomenų apsaugos priemones.</p>	Data security	
19	Kaip vertinate skaitmeninių duomenų valdymą organizacijoje?	<p>0 – Negaliu atsakyti.</p> <p>1 – Duomenys organizacijoje visai nėra valdomi.</p> <p>2 – Duomenys nėra valdomi, tačiau planuojama valdyti ateityje.</p> <p>3 – Duomenys yra valdomi dalinai, tačiau nepakankamai gerai.</p> <p>4 – Duomenys organizacijoje valdomi pakankamai gerai, tačiau matoma tobulintinių krypčių.</p> <p>5 – Duomenys organizacijoje valdomi aukščiausiu lygiu.</p>	Data management	
20	Kaip vertinate skaitmeninių duomenų panaudojimą organizacijoje?	<p>0 – Negaliu atsakyti.</p> <p>1 – Duomenys organizacijoje nėra panaudojami.</p> <p>2 – Duomenys organizacijoje nėra panaudojami, tačiau numatyta panaudoti ateityje.</p> <p>3 – Duomenys yra panaudojami tik tam tikrais atvejais, fragmentiškai.</p> <p>4 – Duomenys organizacijoje panaudojami daugumoje atvejų, periodiškai.</p> <p>5 – Duomenys organizacijoje naudojami labai plačiai ir nuolat.</p>	Data use	

Closed-ended questions – digitalisation application in performance measurement				
No.	Question (provided in Lithuanian language)	Answer (provided in Lithuanian language)	Indicator	Per- spec- tive
1	Ar vertinant darbuotojų pasitenkinimą yra įtrauktas skaitmenizavimas?	0 – Negaliu atsakyti/Darbuotojų pasitenkinimas nėra vertinamas. 1 – Darbuotojų pasitenkinimas nėra vertinamas, tačiau planuojamas vertinti ateityje, įtraukiant skaitmenizavimą. 2 – Darbuotojų pasitenkinimas yra vertinamas, tačiau tinkamai skaitmenizavimo neįtraukia. 3 – Darbuotojų pasitenkinimas yra vertinamas, tačiau tik iš dalies įtraukia skaitmenizavimą. 4 – Darbuotojų pasitenkinimas yra vertinamas, įtraukus daugelio tipų skaitmenizavimą. 5 – Darbuotojų pasitenkinimas yra vertinamas įvairiapusiškai, įtraukus visų jiems aktualių tipų skaitmenizavimą.	Employee satisfaction	Learning and Growth
2	Ar galite teigti, kad organizacijos skaitmeninėmis priemonėmis (būdu) registruojama darbuotojų kaita, o skaitmeninė informacija panaudojama veiklai vertinimui?	0 – Negaliu atsakyti/Darbuotojų kaita nėra registruojama. 1 – Registruojama, bet ne skaitmeniniu būdu. 2 – Registruojama skaitmeninėmis priemonėmis (neapibrėžtu periodiškumu), tačiau informacija nėra panaudojama veiklai vertinti. 3 – Registruojama skaitmeninėmis priemonėmis, tačiau informacija tik fragmentiškai yra panaudojama veiklai vertinti. 4 – Registruojama skaitmeninėmis priemonėmis, o informacija daugumoje atvejų yra panaudojama veiklai vertinti. 5 – Registruojama skaitmeninėmis priemonėmis ir informacija nuolat yra naudojama veiklai vertinti.	Employee turnover	
3	Ar galite teigti, kad organizacijos skaitmeninėmis priemonėmis (būdu) registruojamas darbuotojų skaičius, o skaitmeninė informacija panaudojama veiklai vertinimui?	0 – Negaliu atsakyti/Darbuotojų skaičius nėra registruojamas. 1 – Registruojamas, bet ne skaitmeniniu būdu. 2 – Registruojamas skaitmeninėmis priemonėmis (neapibrėžtu periodiškumu), tačiau informacija nėra panaudojama veiklai vertinti. 3 – Registruojamas skaitmeninėmis priemonėmis, tačiau informacija tik fragmentiškai yra panaudojama veiklai vertinti. 4 – Registruojamas skaitmeninėmis priemonėmis, o informacija daugumoje atvejų yra panaudojama veiklai vertinti. 5 – Registruojamas skaitmeninėmis priemonėmis ir informacija nuolat yra naudojama veiklai vertinti.	Number of employees	
4	Ar, vertinant organizacijos veiklą, įvertinamas e-receptų, bei e-epikrizių skaičiaus santykis atitinkamai su visų receptų, bei epikrizių skaičiumi, naudojant skaitmeninę informaciją?	0 – Negaliu atsakyti/ Nėra skaičiuojama ir ateityje vertinti neplanuojama. 1 – Nėra skaičiuojama, tačiau planuojama ateityje. 2 – Skaičiuojama e-receptų arba e-epikrizių dalis tenkanti visam išrašytų receptų arba visam epikrizių skaičiui, tačiau rezultatai nėra tinkamai panaudojami veiklos vertinimui. 3 – Skaičiuojama e-receptų ir/arba e-epikrizių dalis tenkanti visam išrašytų receptų ir/arba visam epikrizių skaičiui, tačiau rezultatai tik tam tikrais atvejais yra panaudojami veiklos vertinimui.	Technological growth, Implementation and development of IT level	

		<p>4 – Skaičiuojama e-receptų ir/arba e-epikrizių dalis tenkanti visam išrašytų receptų ir/arba visam epikrizių skaičiui, o rezultatai daugumoje atvejų panaudojami veiklos vertinimui.</p> <p>5 – Skaičiuojama e-receptų bei e-epikrizių dalys, tenkančios visam receptų bei epikrizių skaičiui, ir vertinimo rezultatai yra nuolat naudojami veiklai vertinti.</p>		
5	Ar darbuotojų mokymai registruojami organizacijos elektroninėje IS ir skaitmeniniai duomenys panaudojami veiklos vertinimui?	<p>0 – Negaliu atsakyti/Nėra registruojami.</p> <p>1 – Registruojami, bet ne skaitmeniniu būdu.</p> <p>2 – Registruojami skaitmeninėmis priemonėmis (neapibrėžtu periodiškumu), tačiau informacija nėra panaudojama veiklai vertinti.</p> <p>3 – Registruojami skaitmeninėmis priemonėmis, tačiau informacija tik fragmentiškai yra panaudojama veiklai vertinti.</p> <p>4 – Registruojami skaitmeninėmis priemonėmis, o informacija daugumoje atvejų yra panaudojama veiklai vertinti.</p> <p>5 – Registruojami skaitmeninėmis priemonėmis ir informacija nuolat yra naudojama veiklai vertinti.</p>	Training	
6	Ar organizacijoje naudojamomis skaitmeninėmis priemonėmis (duomenimis) nustatomas sveikatos priežiūros įstaigos infekcijų lygis (dažnis)?	<p>0 – Negaliu atsakyti./Nėra nustatomas</p> <p>1 – Nėra nustatomas, tačiau numatoma nustatyti ateityje.</p> <p>2 – Nėra nustatomas, nors organizacijos naudojamomis skaitmeninėmis priemonėmis jis galėtų būti nustatomas.</p> <p>3 – Yra nustatomas tik tam tikrais atvejais bei su tam tikromis sąlygomis.</p> <p>4 – Yra nustatomas dažnai.</p> <p>5 – Yra nustatomas nuolatos.</p>	Infection	
7	Ar lovos užimtumo rodiklis skaičiuojamas, remiantis skaitmeniniais duomenimis, o informacija naudojama veiklos vertinimui?	<p>0 – Negaliu atsakyti./Nėra skaičiuojamas</p> <p>1 – Nėra skaičiuojamas, tačiau numatoma skaičiuoti ateityje.</p> <p>2 – Yra skaičiuojamas (neapibrėžtu periodiškumu), tačiau informacija nėra panaudojama veiklai vertinti.</p> <p>3 – Yra skaičiuojamas tam tikrais atvejais, o informacija fragmentiškai panaudojama veiklai vertinti.</p> <p>4 – Yra skaičiuojamas daugumoje atvejų ir informacija daugumoje atvejų yra panaudojama veiklai vertinti.</p> <p>5 – Visada skaičiuojamas remiantis skaitmeniniais duomenimis, o informacija nuolat panaudojama veiklai vertinti.</p>	Bed occupancy	Internal business
8	Kaip skaičiuojama vidutinė hospitalizuotų (jeigu taikoma) pacientų gydymo trukmė įstaigoje?	<p>0 – Negaliu atsakyti./Nėra skaičiuojama</p> <p>1 – Skaičiuojama naudojantis tik popieriniais paciento ligos istorijos formatais (ar kitais dokumentais).</p> <p>2 – Skaičiuojama naudojantis tik popieriniais paciento ligos istorijos formatais (ar kitais dokumentais), tačiau planuojama skaitmenizuoti.</p> <p>3 – Skaičiuojama naudojantis skaitmenine paciento ligos istorija (arba kita skaitmenine informacija) rečiau, lyginant su popierine paciento ligos istorija (ar kitu dokumentu).</p> <p>4 – Skaičiuojama dažniau naudojantis skaitmeninėmis pacientų ligos istorijomis (arba kita skaitmenine informacija) nei popierinėmis</p>	Length of stay	

		(ar kitais dokumentais ne skaitmeniniu formatu). 5 – Skaičiuojama visada naudojantis skaitmeninėmis pacientų ligos istorijomis (arba kita skaitmenine informacija).		
9	Ar skaitmenizavimo duomenys panaudojami nustatant sveikatos priežiūros paslaugos vidutinį laukimo laiką?	0 – Negaliu atsakyti./Laukimo laikas nėra nustatomas. 1 – Laukimo laikas nėra nustatomas, tačiau numatomas nustatyti ateityje skaitmenizuotai. 2 – Nėra panaudojami, nors laukimo laikas yra nustatomas. 3 – Gali būti panaudojami tam tikrais atvejais. 4 – Yra panaudojami daugumoje atvejų. 5 – Yra naudojami visada.	Waiting time	
10	Ar galite teigti, kad organizacijos skaitmeninėmis priemonėmis bei duomenimis nustatomas suteiktų sveikatos paslaugų kiekis per atskaitinį laikotarpį, o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti. /Nėra nustatomas. 1 – Nėra nustatomas, tačiau numatoma nustatyti ateityje. 2 – Nustatomas (neapibrėžtu periodiškumu), informacija nėra toliau panaudojama. 3 – Nustatomas tam tikrais atvejais, informacija tam tikrais atvejais yra panaudojama veiklos vertinimui. 4 – Nustatomas daugumoje atvejų ir informacija daugumoje atvejų yra panaudojama veiklos vertinimui. 5 – Nustatomas visada (arba nuolat) ir informacija panaudojama veiklos vertinimui.	Amount of provided healthcare services	
11	Ar į pacientų pasitenkinimo vertinimo kriterijus yra įtraukiamos skaitmeninės technologijos (pavyzdžiui, e-receptas, e-registracija, elektroninė sveikatos istorija), o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Nėra vertinamas. 1 – Nėra įtrauktos, nors pacientų pasitenkinimas yra vertinamas. 2 – Yra įtrauktos, tačiau gauta informacija nėra panaudojama. 3 – Yra įtrauktos, tačiau gauta informacija yra panaudojama tik tam tikrais atvejais. 4 – Yra įtrauktos visos (arba dauguma) įstaigos naudojamos skaitmeninės technologijos, susijusios su pacientais, gauta informacija panaudojama daugumoje atvejų. 5 – Yra įtrauktos visos įstaigos naudojamos skaitmeninės technologijos, susijusios su pacientais ir gauta informacija yra nuolat naudojama veiklos vertinimui.	Patients' satisfaction	
12	Ar, vertinant pacientų skundus, yra įtraukiami skaitmeniniai skundai, gauti per organizacijos informacinę sistemą, o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Jokie pacientų skundai nėra vertinami. 1 – Organizacija negauna/nevertina skaitmeninių skundų. 2 – Skaitmeniniai skundai yra gaunami, tačiau neįtraukiami, vertinant veiklą. 3 – Skaitmeniniai skundai yra gaunami ir tam tikrais atvejais įtraukiami, vertinant veiklą. 4 – Skaitmeniniai skundai yra gaunami ir daugumoje atvejų yra įtraukiami, vertinant veiklą. 5 – Skaitmeniniai skundai yra gaunami ir visada yra įtraukiami, vertinant veiklą.	Patients' complaints	Customer
13	Ar pacientų mirštamumas nustatomas, naudojant skaitmeninę informaciją?	0 – Negaliu atsakyti./Nėra nustatomas. 1 – Nustatomas, bet ne skaitmeniniu būdu. 2 – Nustatomas skaitmeninėmis priemonėmis (neapibrėžtu periodiškumu), tačiau informacija nėra panaudojama veiklai vertinti. 3 – Nustatomas skaitmeninėmis priemonėmis, tačiau informacija tik fragmentiškai yra panaudojama veiklai vertinti.	Mortality	

		4 – Nustatomas skaitmeninėmis priemonėmis, o informacija daugumoje atvejų yra panaudojama veiklai vertinti. 5 – Nustatomas skaitmeninėmis priemonėmis ir informacija nuolat yra naudojama veiklai vertinti.		
14	Ar aptarnaujamų pacientų skaičius yra nustatomas (sekamas) skaitmeniniais duomenimis (pvz., pacientų per dieną, pacientų skaičius per mėnesį), o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Aptarnaujamų pacientų skaičius nėra nustatomas. 1 – Aptarnaujamų pacientų skaičius nustatomas ne skaitmenizuotai. 2 – Aptarnaujamų pacientų skaičius nustatomas (neapibrėžtu periodiškumu) skaitmenizuotai, bet informacija nėra panaudojama veiklos vertinimui. 3 – Aptarnaujamų pacientų skaičius nustatomas skaitmenizuotai, o informacija tam tikrais atvejais yra panaudojama veiklos vertinimui. 4 – Aptarnaujamų pacientų skaičius nustatomas skaitmenizuotai ir informacija daugumoje atvejų yra panaudojama veiklos vertinimui. 5 – Aptarnaujamų pacientų skaičius nustatomas skaitmenizuotai ir informacija nuolat naudojama veiklos vertinimui.	Customer acquisition	
15	Ar pacientų readmisijos dažnis nustatomas naudojantis organizacijoje adaptuotomis skaitmeninėmis priemonėmis bei duomenimis, o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Nėra nustatomas. 1 – Nėra nustatomas, tačiau numatoma nustatyti ateityje. 2 – Nustatomas (neapibrėžtu periodiškumu), informacija nėra toliau panaudojama. 3 – Nustatomas tam tikrais atvejais, informacija tam tikrais atvejais yra panaudojama veiklos vertinimui. 4 – Nustatomas daugumoje atvejų ir informacija daugumoje atvejų yra panaudojama veiklos vertinimui. 5 – Nustatomas visada (arba nuolat) ir informacija panaudojama veiklos vertinimui.	Readmission	
16	Ar įstaigos praėjusių metų grynasis pelnas (nuostolis) nustatomas naudojantis skaitmenine informacija (duomenimis), o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Nėra nustatomas. 1 – Nėra nustatomas, tačiau numatoma nustatyti ateityje. 2 – Nustatomas (neapibrėžtu periodiškumu), informacija nėra toliau panaudojama. 3 – Nustatomas tam tikrais atvejais, informacija tam tikrais atvejais yra panaudojama veiklos vertinimui. 4 – Nustatomas daugumoje atvejų ir informacija daugumoje atvejų yra panaudojama veiklos vertinimui. 5 – Nustatomas visada (arba nuolat) ir informacija panaudojama veiklos vertinimui.	Net profit or net profit margin	
17	Ar įstaigos sąnaudų darbo užmokesčiui dalis nustatoma, naudojantis skaitmenine informacija (duomenimis), o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Nėra nustatoma. 1 – Nėra nustatoma skaitmeninėmis priemonėmis, tačiau numatoma nustatyti ateityje. 2 – Nustatoma (neapibrėžtu periodiškumu), informacija nėra toliau panaudojama. 3 – Nustatoma tam tikrais atvejais, informacija tam tikrais atvejais yra panaudojama veiklos vertinimui. 4 – Nustatoma daugumoje atvejų ir informacija daugumoje atvejų yra panaudojama veiklos vertinimui. 5 – Nustatoma visada (arba nuolat) ir informacija panaudojama veiklos vertinimui.	Personnel cost of total costs	Financial

18	Ar vykdytų konsoliduotų viešųjų pirkimų skaičius nustatomas naudojantis skaitmenine informacija (duomenimis), o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Nėra nustatomas. 1 – Nėra nustatomas skaitmeninėmis priemonėmis, tačiau numatoma nustatyti ateityje. 2 – Nustatomas (neapibrėžtu periodiškumu), informacija nėra toliau panaudojama. 3 – Nustatomas tam tikrais atvejais, informacija tam tikrais atvejais yra panaudojama veiklos vertinimui. 4 – Nustatomas daugumoje atvejų ir informacija daugumoje atvejų yra panaudojama veiklos vertinimui. 5 – Nustatomas visada (arba nuolat) ir informacija panaudojama veiklos vertinimui.	Consolidated procurements
19	Ar vaistų, kurie įsigyti per CPO elektroninį katalogą vertės dalis su visų vaistų verte nustatoma naudojantis skaitmenine informacija (duomenimis), o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Nėra nustatoma. 1 – Nėra nustatoma skaitmeninėmis priemonėmis, tačiau numatoma nustatyti ateityje. 2 – Nustatoma (neapibrėžtu periodiškumu), informacija nėra toliau panaudojama. 3 – Nustatoma tam tikrais atvejais, informacija tam tikrais atvejais yra panaudojama veiklos vertinimui. 4 – Nustatoma daugumoje atvejų ir informacija daugumoje atvejų yra panaudojama veiklos vertinimui. 5 – Nustatoma visada (arba nuolat) ir informacija panaudojama veiklos vertinimui.	Value of medicines acquired via CPO of total value
20	Ar įstaigos papildomų finansavimo šaltinių įtraukimas nustatomas naudojantis skaitmenine informacija (duomenimis), o informacija naudojama veiklos vertinimui?	0 – Negaliu atsakyti./Nėra nustatomas. 1 – Nėra nustatomas skaitmeninėmis priemonėmis, tačiau numatoma nustatyti ateityje. 2 – Nustatomas (neapibrėžtu periodiškumu), informacija nėra toliau panaudojama. 3 – Nustatomas tam tikrais atvejais, informacija tam tikrais atvejais yra panaudojama veiklos vertinimui. 4 – Nustatomas daugumoje atvejų ir informacija daugumoje atvejų yra panaudojama veiklos vertinimui. 5 – Nustatomas visada (arba nuolat) ir informacija panaudojama veiklos vertinimui.	Additional financial resources

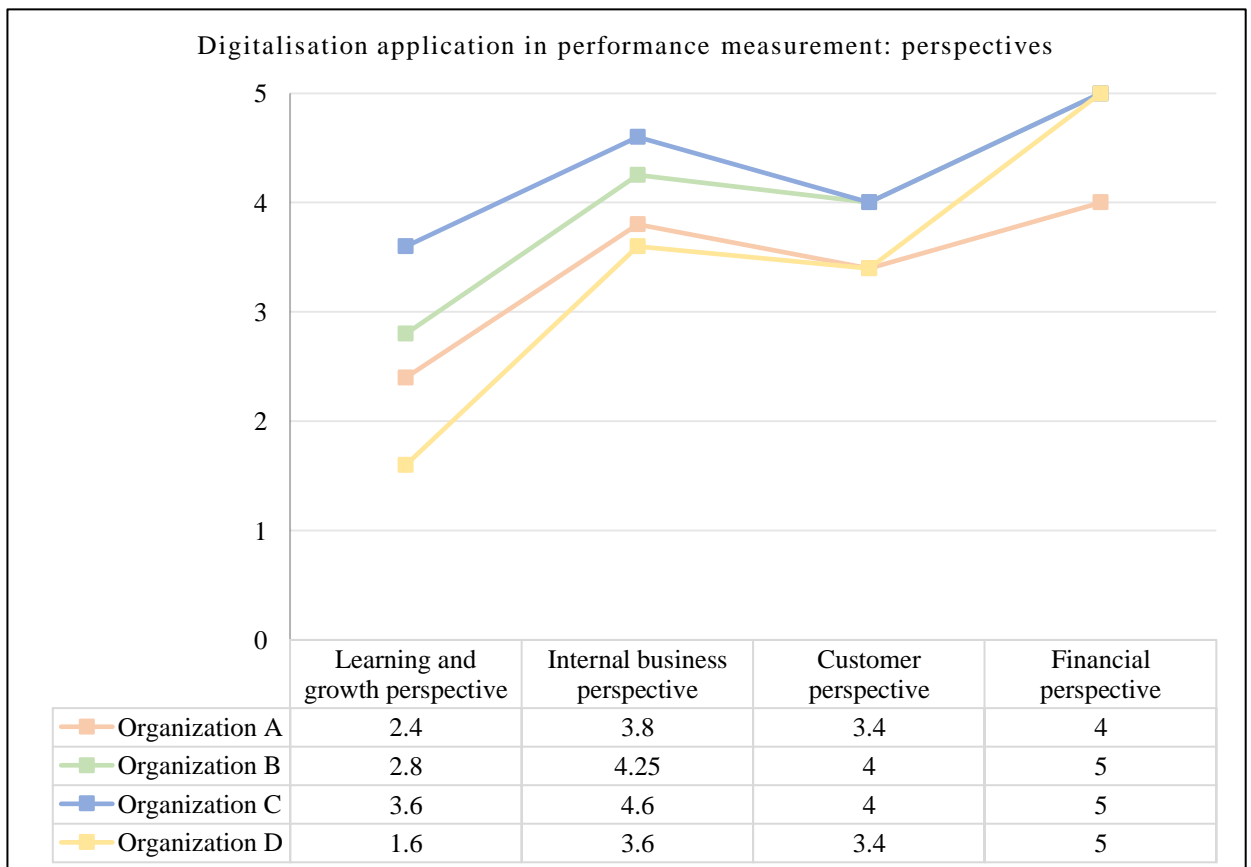
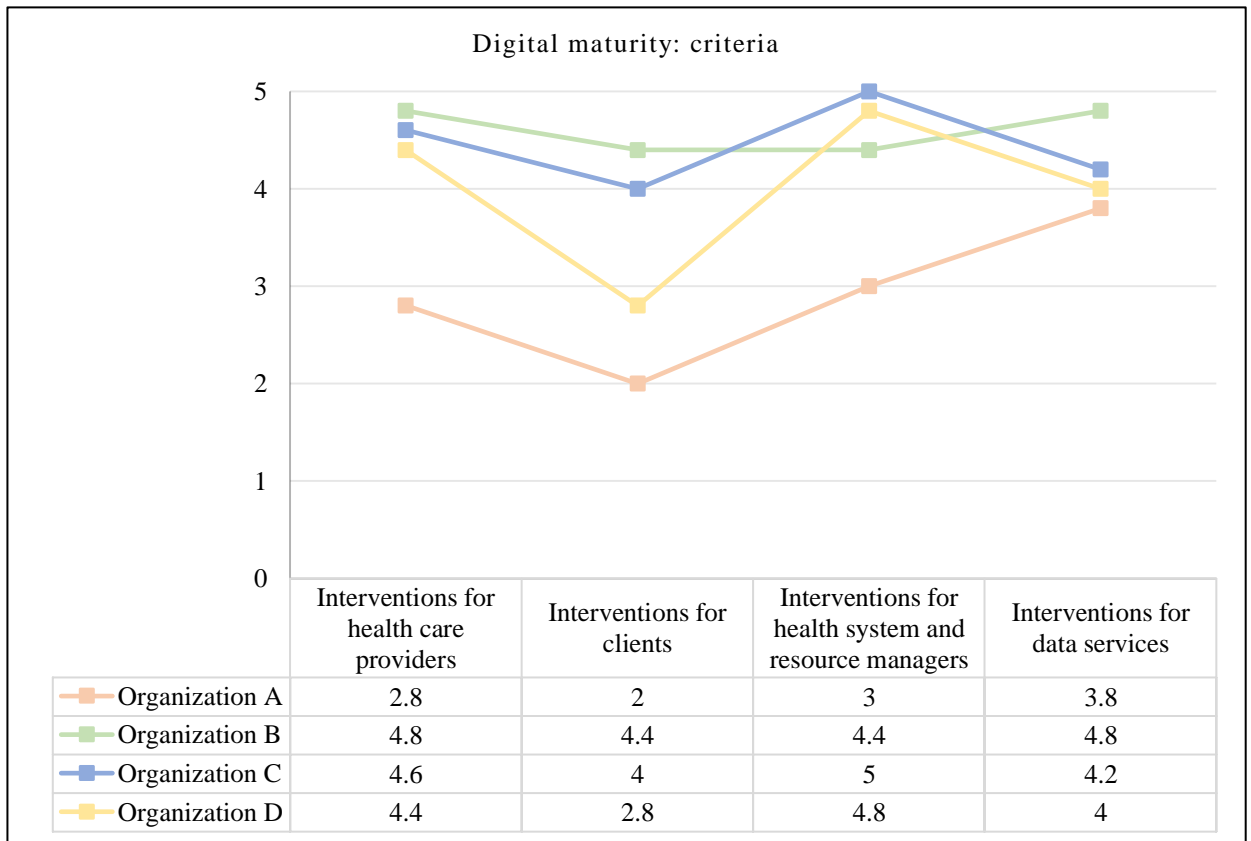
Open-ended questions (provided in Lithuanian language)

Kokias įstaigos naudojamas skaitmenines sistemas galėtumėte išvardinti?
Kur įstaiga naudoja skaitmenines technologijas (vertę kuriančios veiklos ir vertės nekuriančios veiklos)? Ar daugiau skaitmenizavimo atsispindi pagrindinėse veiklose ar administracinėse?
Kokie pagrindiniai iššūkiai naudojantis skaitmeninėmis technologijomis?
Kas skatintų daugiau naudotis skaitmeninėmis technologijomis?
Kaip manote kokia galėtų būti tinkama veiklos vertinimo sistema tokio tipo įstaigose, kaip Jūsų?
Ar matote kokių nors skaitmeniniu būdu gaunamų duomenų visai nepanaudojamų
Kokios organizacijoje egzistuoja priemonės informacijos apsaugai?
Ar ligonių kasų gaunamas finansavimas registruojamas skaitmeniniu būdu ir duomenys vėliau panaudojami?
Koks yra informacinių technologijų vystymo lygis Jūsų įstaigoje?
Ar organizacija mato veiklos rezultatų pagerėjimą dėl skaitmeninių technologijų pritaikymo veikloje?
Ar kovai su korupcija pasitarnauja naudojamos skaitmeninės priemonės?

Appendix 4. Themes and codes of coding analysis (created by the author)

Theme	Code	Code description
Digitalisation application	Encouragement	The factors that encourage digitalisation application in performance and performance measurement in healthcare organizations
	Challenges	Challenges of digitalisation application in performance and performance measurement in healthcare organizations
	Activities	Digitalisation is applied more in non-added value activities or value-added activities
	Performance improvement	Performance improvements caused by digitalisation application
	IS Features	The main features contained by digital systems within healthcare organization
Performance measurement	Indicators	Indicators of performance measurement
	Improvements	Directions of performance measurement improvement identification
	Digital data	Digital data application in performance measurement

Appendix 5. Results of model implementation: digital maturity criteria and digitalisation application in performance measurement perspectives (created by the author)



Appendix 6. Recommendations for research participants (created by the author)

	Recommendation	Description
Organization A	Employee skills enhancement	Insufficient employee skills and stagnancy are one of the challenges found in this research that are faced by research participants. The good practice from Organization B could be taken regarding employees' skills enhancement. Digital competence trainings from external institutions and organized internally. Internal trainings could be performed inside organization among employees. As there are employees who are more digitally skilled and could share their experience with the organization's community. As finances is one of the obstacles Organization A faces regarding digitalisation, internal trainings could be good solution for employee's digital literacy improvements, as a result, more digitalisation could be applied in performance measurement in Organization A.
	Digital strategy development	Digitally strong strategy is important for organization's digital maturity (Bellman, 2015; Frach et al., 2017). As organization's A strategy does not involve digitalisation, it should be improved and updated regarding the following aspects (Frach et al., 2017): involve digitalisation as a transformative process; set strategic goals to drive that process, implement digital roadmap; set performance indicators to measure the progress towards transformation.
	Digitalisation orientation to non-value-added activities	It was found that there is a need to improve personnel management and control. Digital tools, as digital schedules, employee training schedules help to manage employees working hours and to maintain employees' qualification.
	Digital data management system	As amount of digital data in healthcare is rapidly increasing (Reddy and Sharma, 2016), organizations shall ensure digital data is managed well. Management of digital data in organization A is insufficient, therefore, Organization A should consider digital data system acquisition. It was noticed that research participants, which have implemented document management systems, have higher scores regarding digital data management.
Organization B	Future-looking metrics	It is recommended to involve future-looking metrics in Organization's B performance measurement. Future looking metrics are associated to organization's intangible assets and could provide information regarding organization's abilities to excel in the future. In addition to Organization's B performance indicators, several additional, future-looking indicators could be implemented (Emami and Doolen, 2015, p.432): "total training hours provided to the staff in the past year"; "number of physicians using electronic clinical IS"; "percentage of revenue from new medical services developed in the past two years". As it could be noticed, future-oriented metrics are associated to digitalisation.
	Digital employee management and performance measurement	Employee related performance indicators, such as, number of employees or employee turnover should be retrieved from digital data. Moreover, digital schedules would be useful for Organization B as it has more than 100 employees, therefore employees' management would be enhanced. In addition, the data of digital schedules could be used in performance measurement to determine employee utilization rate, employee absenteeism rate.
	Future-oriented digital trends	The implementation of health wearables (for example, in cardiology) and expansion of telemedicine possibilities (for example, teleradiology, telecardiology services) should be involved in Organization's B strategic objectives.

Organization C	Increase costs and investments related to digitalisation	Consistent manager's standpoint among research participants was found regarding digitalisation – the improvements in administrative/managerial and patients-related activities. In addition, there was found that digitalisation is supported by digitally skilled employees, however, Organization B does not allocate sufficient resources to employees digital literacy promotion (according to Table 7, Organization C allocates 0,02% of its operating costs for employee qualification, this value is 10 times lower than Organization's A and five times lower than Organization's B and Organization's D). Therefore, resources allocated to employee digital literacy improvement should be increased by Organization C. The value of employee costs could be taken as a reference 0,1-0,2%. Additionally, literature (Wang et al., 2018), found that digitalisation expenditures showed positive effect on hospitals ROA. As it was determined, the demand of digital technologies is increasing in Organization C, therefore, the investments in digital technologies are reasoned and promising.
	Employees motivation	Based on research results it was found there is a lack of employees' ideas regarding digitalisation, therefore, it is considered as one of the challenges. To address this, Organization C should motivate employees regarding innovations, provide employees the abilities to control their work and experiment regarding innovations. Results found in literature (Demircioglu and Audretsh, 2017) show that employee motivation and improvements in innovations are strongly related.
	Increasing the frequency of digitalisation application	Number of employees, training, waiting time, amount of provided services are the indicators which should be retrieved from digital data and used in performance measurement in all of the cases.
Organization D	Application of digitalisation in employee-oriented metrics	Employee satisfaction, employee turnover, number of employees should be obtained from digital data using personnel management system and involved in Organization's D performance measurement. Additional metrics should be involved to address the gap that employee individual progress related indicators are missing in performance measurement. Number of EHR per employee (Rahimi et al., 2017), number of e-prescriptions or e-epicrisis per employee per month, intensity of operating room use (Veillard et al., 2005) could be applied in performance measurement in order get more comprehensive view about efficiency of employees' work.
	Paper-based records elimination	Despite the fact that EHR is still on development stage and organizations, implementing EHR face various challenges, the benefits EHR provide, exceed the drawbacks (Atasoy et al., 2019; Scott et al., 2016). In addition, according to Reddy and Sharma (2016), EHR will replace paper-based records. Taking a look to Organization's B experience, the elimination of paper-based records led to increased digital data generation. It was found out, that sense of inevitability encourages the application of digitalisation in organization's activities. Therefore, as Organization D has 70% of employees who are able work independently, it is recommended to start planning the elimination of paper-based records: there is sufficient number of employees to support EHR implementation and the remaining ones will be encouraged to put personal efforts regarding digital skills improvement due to unavoidability.
	Enhancement of IS internal integration	After the code "IS features" was analyzed, it was found that research participants which have implemented their individual IS, mentioned integration as an important feature of IS which increase efficiency and improve the use of digital data. As integration could be internal (which enhances more efficient digitalisation application in various processes including performance measurement) and external (stakeholders, such as, EHSCI IS or customers.). Organization D should improve its internal integration within different systems. For example, organization's IS, intranet, documents management system, personnel management system. Data from personnel management system could be integrated to accounting system. If organization has several systems, which are not interconnected, continuously generated data is more likely to be misused. According to Respondent D, there is data which is not informative, thus, it is not used properly. Organization D shall investigate the reasons digital data is non-informative: there is a need for further analytics or there is a need for data elimination. If the data is uninformative, there is possibility that it is unnecessary. Following the example of Organization B, the research regarding digital data could be done and determined the sources which could be eliminated.