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INNOVATIVE DEVELOPMENT OF HEALTHCARE
IN LEBANON IN THE CONTEXT OF ECONOMY
DIGITALIZATION

Abstract of the dissertation
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The dissertation can be found in the library of the Belarusian State Technological University.

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INTRODUCTION

Development is a continuous process aimed at improving people's lives. Accompanied by increasing progress in innovation and the use of innovation management in work processes, it can bring positive changes in the lives of citizens, especially in a developing country like Lebanon.

Human development indicators show a negative trend in life expectancy in Lebanon. Achieving the highest level of health for citizens is an important goal of every society. Because health is one of the three pillars of human development (health, education, wealth), world leaders and national policymakers strive to create the best conditions for citizens to live healthy lives and access health services when they need them. These services must be inclusive and accessible to all citizens, regardless of discrimination. Digitalization of the economy as a result of the development of the information society improves the quality of life of the population. The success of the information society or digital economy lies in the rapid spread of innovation to all interconnected processes and entities. Currently, digitalization of the economy is a key direction of its innovative development. This is confirmed by studies by the UN Development Program, the World Economic Forum, Gupta et Al., dedicated to human and inclusive development.

Various aspects and criteria of the positive and negative impact of informatization of society, digitalization of the economy and the increase in its importance in the long term have been studied by foreign scientists. The works of D. Bell, H. Ciliers, H. Chivers, H. Martin, Y. Masuda, F. Machlup, H. Webster, H. Zelazny, and others made it possible to better understand and define the concept of the information society. Research primarily by D. Tuscott, as well as H. Brynjolfsson and H. Kahin, H. Lane, H. Margerio, H. Messenburg and others formed the basis for the emerging concept of the digital economy, followed by many scientific organizations and scientists who enriched this concept.

Numerous scientific works are also devoted to the problems of innovative development. J. Schumpeter first introduced the concept of innovation, and E. Rogers – the concept of diffusion of innovation. Other studies on the concept of innovation in management were presented in the works of H. Damanpour, H. Greenhalgh, H. Mele, H. Moore, H. Osborne, H. Tidd, H. Hartley, H. Walker and others.

Digitalization of healthcare and integration of ICT into healthcare processes have been of interest to many researchers, such as H. Anderson, H. Bradley, H. Bekkers, W. H. Briers, H. Chua, H. Eysenbach, Wu H. Kaplan, H. Korteland, H. Westbrook, H. Whetton, etc. Thanks to their works, the concepts of electronic health, health informatics, electronic records and others appeared in scientific circulation.

In general, both theoretical and practical issues of digitalization of the economy and its innovative development are widely covered in the literature. In this context, a

number of foreign and individual Lebanese studies in the field of health have been published, in particular the works of L. Abu Mrad, W. Van Lerberghe et Al. However, the problem of digitalization of Lebanese healthcare in the context of frequent changes in the leadership of the Ministry of Health and the emergence of new digital initiatives against the backdrop of not always completed and consistent previous ones deserves more attention from researchers and support from the Lebanese Ministry of Health.

Initiatives to digitalize the health sector as a prelude to the full digitalization of the economy must take into account the characteristics of the Lebanese environment, which must be carefully studied. In this regard, the works of Russian and Belarusian authors are useful, revealing a lot including the sectoral aspects of innovation in the national economy, for example, M. V. Bezzubtseva, T. N. Belyatskaya, A. V. Danilchenko, V. B. Krishtanov, K. A. Myzrovoy, I. V. Novikova, D. A. Pankova, P. A. Rukina, E. A. Tuganova, N. Shandora, and a joint Lebanese-Belarusian study by B. N. Zhelib and F. Hamadi.

At the same time, it should be noted that there are no systematic approaches in the literature to building a model of innovative development of healthcare in Lebanon in the context of digitalization of the economy, taking into account national characteristics and best global practices. This predetermined the choice of topic, the setting of goals and objectives, the structure of the dissertation research, which determines the path to the digital modernization of healthcare, which will ensure human development of the population and a more inclusive development of Lebanese society based on improving the management of this sector by expanding the introduction of information and communication technologies into its processes .

GENERAL DESCRIPTION OF WORK

Connection of work with major scientific programs (projects) and topics. The topic of the dissertation corresponds to the priority areas of scientific research approved by Decree of the President of the Republic of Belarus of May 7, 2020 No. 156 “On priority areas of scientific, technical and innovative activities for 2021–2025” (direction 1 “Digital information, communication and interdisciplinary technologies, production based on them” and direction 6 “Ensuring the safety of people, society and the state”).

The study was carried out in the context of the implementation of the “National e-Health Program”, approved by order of the Minister of Health of Lebanon dated March 4, 2012 N° 227/1. The research results obtained during the preparation of the dissertation were used by the Ministry of Health of South Lebanon and were assessed as an important solution to “improve the quality of services provided”, “facilitate procedures for working with patients” and “improve mechanisms for monitoring health care activities”, and also by medical institutions (Alaeddine Hospital , AlMashrek

Diagnostic Center), which implemented the results of the study in terms of human resource management and medical information integration.

Purpose and objectives of the study. The purpose of the study was to develop the theoretical, organizational and methodological foundations for the formation of a model of innovative development of healthcare in Lebanon in the context of digitalization of the economy.

The following tasks were set and solved in the dissertation:

- formulate a conceptual approach to the innovative development of healthcare in Lebanon in the context of digitalization of the economy;
- develop an algorithm for identifying the prerequisites and problems of innovative development of healthcare in Lebanon based on the digitalization of management processes;
- develop an organizational model for digitalization of healthcare in Lebanon;
- develop a roadmap for the digitalization of healthcare in Lebanon.

The object of the study is the innovative development of healthcare in Lebanon in the context of digitalization of the economy. **The subject of the study** is the organizational model of innovative development of healthcare in Lebanon in the context of digitalization of the economy.

The scientific novelty of the research lies in the development of theoretical, organizational and methodological foundations for the formation of a national model of innovative development of healthcare in the context of digitalization of the economy, which allows for human development and the inclusive development of society as a whole due to the provision of equal opportunities for access to the medical care system for all citizens, regardless of region, literacy levels, financial, political, social and other disparities and more efficient use of health resources.

Provisions submitted for defense.

1. *Conceptual approach to the innovative development of healthcare in Lebanon* in the context of digitalization of the economy, including:

- *clarification of the conceptual apparatus*, in particular, definitions of the concepts “information” society and “digital economy” are proposed: *the information society* is a society that widely uses information and communication technologies (ICT) to achieve progress and human development, which creates a favorable environment that has economic, spatial-technological, political, social, cultural and infrastructural characteristics for the formation of a digital economy that ensures better use of all types of resources and obtaining higher economic and social results, the natural criterion of which is the preservation of public health; *The digital economy* is an economic activity based on the use of ICT, network and electronic means that provide people with digital access (high-speed, accurate, borderless and distance-free way of creating, transforming, transmitting, using and storing information) to various sectors economy (health care, trade, education, communications, industry, etc.), which makes it possible to improve the

management of processes and thereby increase their efficiency. Clarified definitions, in contrast to those proposed in the literature, focus on the role of healthcare in the development of society, the characteristics and criteria for the development of society, as well as the digitalization of management processes as the main direction of innovative development of the economy and healthcare as its sector;

– *to the concept of innovative development of healthcare in Lebanon*, in which the intensification of digitalization of management processes in healthcare is considered as a key direction *for the integration of information about the health and medical care of citizens/patients (medical information) and more efficient use of the resources of medical institutions of various types and forms of ownership in the interests of all stakeholders*, carried out taking into account the development of Lebanon, the state of the healthcare sector and the ICT sector of Lebanon, and global experience in the functioning of national healthcare systems. The implementation of this concept will contribute to *human development in Lebanon and the inclusive development of Lebanese society* by providing equal opportunities in access to the health care system for all citizens regardless of region, religion, level of education, financial, political, social and other differences, which will allow achieving better socio-economic results.

2. *Algorithm for identifying the prerequisites and problems of innovative development of healthcare in Lebanon based on the digitalization of management processes*, which includes four stages. The first stage involves *an analysis of human development based on indicators of the United Nations Development Program (UNDP) and the development of the information society in Lebanon based on the author's system of development indicators*, based on Webster's information society criteria (economic, spatial-technological, political, social, cultural, infrastructural). The second stage involves *an analysis of the state of the health sector and the ICT sector in Lebanon* based on international rankings, statistical data and documentary observation. At the third stage, based on the triangulation method (a combination of documentary observation, interviews, questionnaires), *the readiness of specialists from healthcare institutions to digitalize management processes and the associated risks is analyzed*. The fourth stage involves analyzing global experience in implementing healthcare digitalization projects. Testing of the algorithm made it possible to identify the prerequisites and systematize the problems of digitalization of healthcare in Lebanon, which were taken into account when developing an organizational model for digitalization of healthcare in Lebanon.

3. *Organizational model of digitalization of healthcare in Lebanon*, including:

a) *characteristics of the institutional structure of healthcare*, where institutional units, depending on their role, are represented by three enlarged groups of stakeholders: 1) government and external organizations, as well as the population (patients and their relatives, whether Lebanese, refugees or foreigners); 2) *guarantors* that finance medical and health procedures for patients (national social insurance fund, cooperative of government employees, military

programs, insurance companies, etc.); 3) *medical institutions of various types* (hospitals, outpatient clinics, primary health care centers, diagnostic centers, pharmacies, etc.) *and forms of ownership* (public and private), providing medical and health services to patients and receiving payment for their services from guarantors;

b) *e-health framework design* as a set of basic components of digitalization of the healthcare sector (strategy and implementation; leadership and management; applications; technological infrastructure; legislation and standards; qualified workforce; technical support), based on the synthesis of best practices;

c) *a conceptual scheme for creating a unified medical information database* under the Lebanese Ministry of Health (MoPH), providing integration, storage, and use of data, to which all stakeholders will be connected to exchange medical information and ensure control over medical and financial procedures. Its operation is based on *a citizen/patient's electronic health record* (EHR), containing all historical and current information about his health, providing unique personal identification and providing stakeholders with differentiated digital access to information;

d) *a roadmap for digitalization of healthcare* in Lebanon, formed taking into account previously implemented digital initiatives, identified prerequisites and problems of digitalization of management processes in healthcare.

The implementation of this model will solve a number of problems in Lebanese healthcare and provide it with a number of advantages by covering all stakeholders with an electronic healthcare system, which will improve the quality of medical care and the efficiency of using the resources of medical institutions.

4. *Lebanon Healthcare Digitalization Roadmap*, including:

a) *the sequence of stages of digitalization of healthcare* (gap analysis; analysis of financing options; ensuring the technological readiness of the MoPH data center ; assessing and ensuring the technological readiness of stakeholders and communication methods; determining the mechanism for transmitting data from hospitals and medical centers and related ones institutions; determining the mechanism for generating a unique citizen/patient identifier; making legislative decisions; unifying EHR components by creating a template; collecting data on citizens/patients from guarantors; designing a unified medical information database in the MoPH data center; studying safety measures; creating a portal for each type of stakeholder; training of instructors (IT managers); stakeholder training; testing the availability and use of a digital solution; implementation of a digital solution) and *characteristics of the stages* (resources, duration, estimated cost, performers and their coordination); b) *calendar schedule* for digitalization of healthcare; c) *a system of indicators* for monitoring digitalization of healthcare; d) *a formula for accreditation of medical institutions* , taking into account the conditions associated with the implementation of the stages of digitalization of healthcare, which will encourage medical institutions to comply with them.

Personal contribution of the applicant. The dissertation was prepared by the author in accordance with the postgraduate study plan approved by the academic council of the Belarusian State Technological University (2018–2023). The dissertation research is an independent scientific work, carried out taking into account the achievements of Lebanese, Belarusian and foreign economic science on this issue. All scientific results reflected in the main provisions submitted for defense have scientific novelty, practical significance and were developed by the applicant personally. The co-authors of the publications considered aspects not related to the research results being presented for defense.

Approbation of the dissertation results. The key ideas of the dissertation work and its conceptual provisions were presented in reports at 82–87 scientific and technical conferences of teaching staff, researchers and graduate students of the Belarusian State Technological University (2018–2023), as well as at international scientific and practical conferences, including: “Human resource management is the basis for the development of an innovative economy” (Krasnoyarsk, Siberian State University of Science and Technology named after M. F. Reshetnev, 2021, 2022, 2023), “Current problems of management: features of management in crisis situations in a pandemic” within the framework of the Fifth International Economic Symposium – 2022 (St. Petersburg, St. Petersburg State University, 2022).

Selected scientific results of the dissertation research were used by the Ministry of Health of South Lebanon (unique patient identifier, 2023), Alaeddine Hospital (in the field of human resource management of medical institutions, 2019), AlMashrek Medical Diagnostic Center (in parts of the mechanism for integrating medical information and sharing information, 2023).

The results of the dissertation research were introduced into the educational process of the Ipnec College of the Ministry of Education of Lebanon (2023) and the Belarusian State Technological University (2023).

Publication of the dissertation results. 13 works have been published on the topic of the dissertation research, including 5 articles in scientific publications listed by the Higher Attestation Commission of Belarus, 8 publications in conference proceedings. The volume of publications corresponding to clause 18 of the Regulations on the awarding of academic degrees and the assignment of scientists exceeds 5.2 author sheets.

Structure and scope of the dissertation. The dissertation is presented in one volume, which contains a list of abbreviations and symbols, an introduction, a general description of the work, three chapters, a conclusion, a bibliographic list of 192 titles, a list of the applicant's publications and appendices, set out on 180 pages. The volume occupied by 20 figures, 23 tables, list of used sources, appendices is 61 pages.

MAIN CONTENT

The first chapter, “**Conceptual foundations for forming a model for innovative development of healthcare in Lebanon in the context of digitalization of the economy,**” shows the role of innovative development of healthcare in human and inclusive development. The search for prospects for the development of healthcare based on reference to the theory of the information society, the concept of the digital economy and world experience made it possible to highlight digitalization as its key direction and formulate the concept of innovative development of healthcare in Lebanon.

The chapter opens with a consideration of innovative development as a productive direction for improving healthcare and promising areas of innovation management in this sector of the economy. These issues are presented in the context of the evolution of the concepts of human and inclusive development, reflecting modern scientific ideas about social progress. According to *the concept of human development*, for human development and achieving a high quality of life, not only increased well-being is important, but also *good health* and education. *The concept of inclusive development* states that *development should not exclude any person*, regardless of his religion, place of residence, level of education and other characteristics. The author substantiates the expediency of their use as the initial components of the research paradigm of this work.

The world experience and prospects for the development of healthcare in the context of digitalization of the economy are studied. An appeal to *the theories of the information society*, as well as *Tapscott’s concept of the digital economy*, revealed the feasibility of their use in the research paradigm of this work. They allow us to consider the information society as an environment that ensures human development based on the digitalization of the economy, creating conditions for facilitating access to goods and services and improving the quality of life of the population. Both theoretical concepts are based on the recognition of the importance of ICT for achieving economic and social progress. The study allowed us to conclude that the digital economy is the result of the formation and functioning of the information society, which seeks to automate all processes, and the digital economy is based on the automation of economic processes.

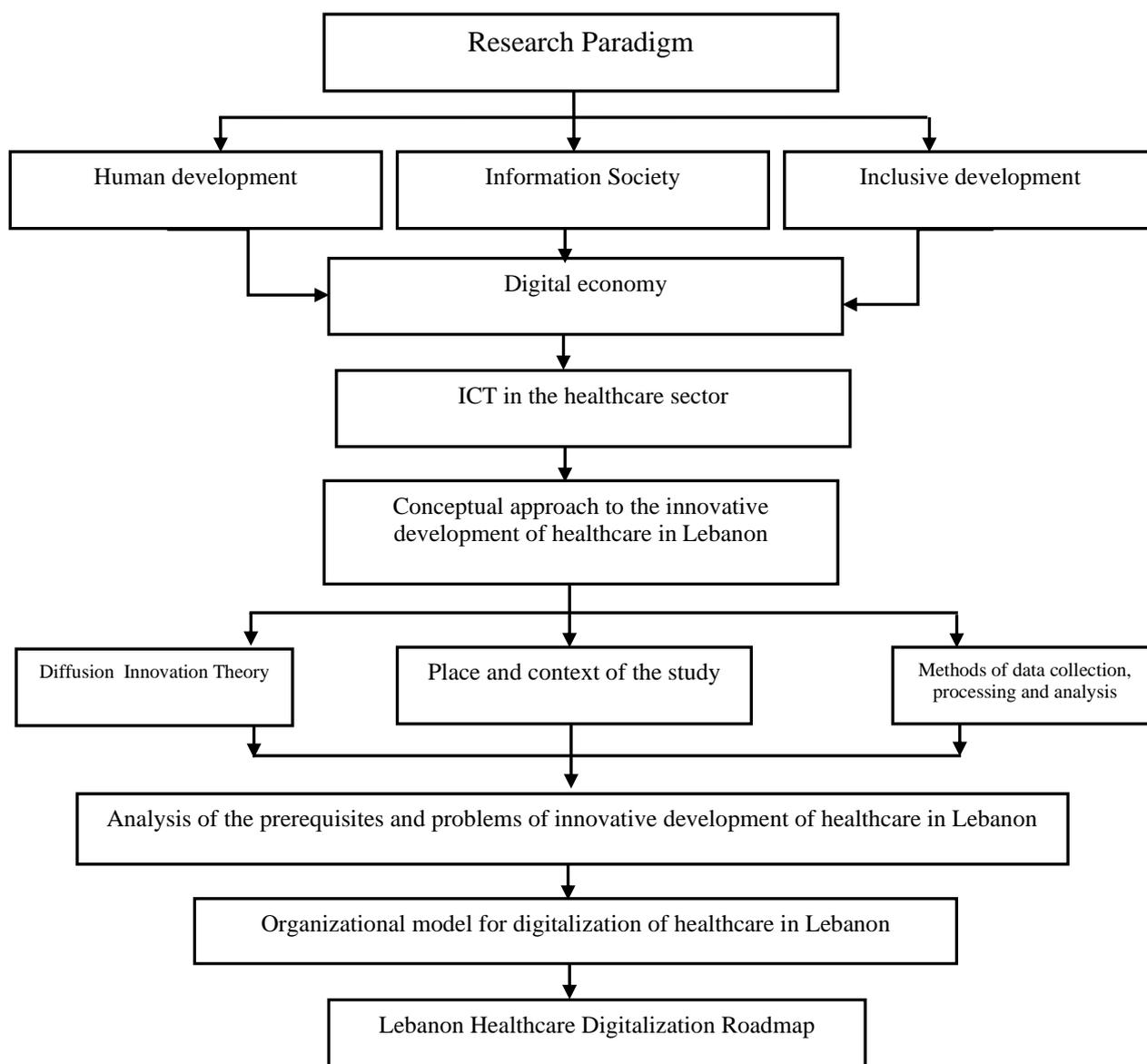
As a result, the author clarified the concepts of “information society” and “digital economy” in the context of the research being carried out. *An information society* is understood as *a society* that widely uses ICT to achieve social progress and human development, which creates a favorable environment that has certain economic, spatial-technological, political, cultural, social and infrastructural characteristics (according to Webster’s theory) for the formation of a digital economy that ensures better use of all types of resources and obtaining higher economic and social results, the natural criterion of which is the preservation of public health; *The digital economy* is an economic activity based on the use of ICT, network and electronic means that provide people with

digital access (a high-speed, accurate, borderless and distance-free way of creating, transforming, transmitting, using and storing information) to various sectors of the economy (health care, trade, education, communications, industry, etc.), which makes it possible to improve process management and increase their efficiency. The success of the digital economy relies on the rapid spread of innovation to all interconnected processes and entities. Clarified definitions, in contrast to those proposed in the literature, highlight the role of healthcare in the development of society, the characteristics and criteria of this development, as well as *digitalization as a key direction in the innovative development of the economy and healthcare as its sector*.

Within the outlined theoretical paradigm, the concept of innovative development of healthcare in Lebanon is formulated, in which *the intensification of digitalization of management processes in healthcare* is considered as a key direction for the integration of information about the health and medical care of citizens/patients (medical information) and more efficient use of medical resources institutions of various types and forms of ownership in the interests of all stakeholders, carried out taking into account the development of Lebanon, the state of the healthcare sector and the ICT sector of Lebanon, and global experience in the functioning of national healthcare systems. The implementation of this concept will contribute to human development in Lebanon and the inclusive development of Lebanese society by providing equal opportunities in access to the health care system for all citizens regardless of region, religion, level of education, financial, political, social and other differences, which will allow achieving better social-economic results.

To reflect the logic of the formation and implementation of the concept of innovative development of healthcare in Lebanon, a comprehensive *methodological research scheme* has been developed (Fig. 1).

It involves supplementing the theoretical foundation of the study *with the theory of diffusion of innovations by E. Rogers*, which reveals ways to ensure that digitalization reaches all citizens equally and sufficiently. The research methodology involves taking into account world experience and *national context*, the use of various sources of information (scientific publications; regulations of the Lebanese government, its ministries and other documents reflecting state policy in the field of healthcare; statistical databases and publications of international organizations; materials of economic and sociological research, etc.), as well as various *methods of collecting, processing and analyzing data* (general scientific, economic-statistical, monographic and comparative analysis, sociological research, triangulation, modeling, road mapping) for -development of an organizational model for the digitalization of healthcare in Lebanon and a roadmap for its implementation. The use of various sources of information and scientific methods made it possible to create a sufficient information array to understand the current situation and substantiate the model of innovative development of healthcare in Lebanon in the context of digitalization of the economy.



Note – Developed by the author

Figure 1 – Methodological scheme of the study

The second chapter, “**Prerequisites and problems of innovative development of healthcare in Lebanon based on the digitalization of management processes,**” is devoted to identifying these prerequisites and problems. For this purpose, the author proposed a four-stage analytical algorithm, the testing of which made it possible to determine the prerequisites and systematize the problems of digitalization of healthcare in Lebanon, which were taken into account when developing the organizational model of digitalization of healthcare in Lebanon.

The first stage of the analysis included *an analysis of human development and the development of the information society in Lebanon* based on UNDP human development indicators and the author’s system of indicators based on Webster’s information society criteria (Table 1). To test the proposed approach, statistical data presented on the websites of UNDP, ILO, IMF, WHO, World Bank, etc. were used.

Table 1 – Indicators of the development of the information society in the context of Webster’s theory

Webster's criterion	Indicator
Economic	Unemployment rate. Lack of medical care. Poverty level. Extreme poverty.
Spatial	ICT Development Index. Public access to personal computers. Public access to the Internet.
Political	Democracy Index. Participation in political life.
Social	Literacy level of the population. Quality of primary education.
Cultural	Cultural diversity: A diverse society that includes many ethnicities, cultures, and social levels.
Physical infrastructure	General infrastructure. Quality of infrastructure. Air infrastructure. Quality of energy supply.

Note – Developed by the author.

An analysis of the dynamics of human development indicators has shown a decrease in life expectancy in recent years, with stability in the duration of education and a sharp drop in per capita gross domestic product (GDP) due to the action of a number of factors that are likely to have an adverse impact on human development in subsequent years. This will update the implementation of programs and projects to restore and improve human development indicators and the quality of life of the population in order to prevent major risks.

Analysis of the development of the information society in Lebanon gave contradictory results. Economic indicators showed high levels of unemployment and a large proportion of patients without health insurance, whose costs are partially covered by the MoPH, draining its budget. Spatial and technological indicators indicate the readiness of the ICT infrastructure to implement innovations. The political situation in the country is unstable, while in the cultural aspect the situation is favorable, the society allows cultural diversity and freedom. Physical infrastructure has problems, the main one being the inability to provide a stable electricity supply, but healthcare has a stable supply of electricity, which is a prerequisite for the rapid digitalization of this sector.

The second stage involved an analysis of the health and ICT sector in Lebanon based on international rankings, comparative analysis and documentary observation.

The ranking analysis showed Lebanon's high position in ratings reflecting the effectiveness of national healthcare systems: according to the Healthcare Effectiveness Index (The Economist Intelligence, 2014) – 31st place out of 166 countries, ahead of the United States; according to the Healthiest Countries Index (Bloomberg, 2017) – 32nd out of 168; on the Health Index (World Economic Forum, 2016) – 34th out of 137; according to the Healthcare Access and Quality Index (2016) – 31st out of 196.

A comparative study of the healthcare development of Lebanon and Belarus in terms of human development and healthcare development indicators (Table 2) showed,

along with a higher life expectancy in Lebanon (81.2 versus 74.5 years), a higher level of infant and maternal mortality, as well as positive dynamics of the Lebanese population compared to negative ones in Belarus, fewer beds per person (35 versus 111), higher *healthcare* costs in GDP (7.1% versus 6.1%).

Table 2 – Health-related human development indicators in Belarus and Lebanon (2017)

Index	Lebanon	Belarus	Note
Population density, people/km ²	4 822 000/10 452	9 357 000/207 600	–
Doctor density	3,2	3,93	Per 10,000 people
Life expectancy at birth, years	81,2	74,5	–
Number of births, people	90.647 (2.05%)	94.042 (0.99%)	Growth: Lebanon (+1.5%) Belarus (–2.8%)
Number of deaths, people	25.847 (0.59%)	120.053 (1.27%)	
Infant mortality rate	6.7 per 1000	1.1 in 1000	–
Maternal mortality rate	16.9 per 100,000	3.0 per 100,000	–
Total health care expenditures, % of GDP	7,1	6,1	–
Number of hospital beds	35	111	Per 10,000 people

Note – Developed by the author based on data of MoPH Lebanon, and national statistics of Belarus (Belstat)

A comparison of Lebanon's healthcare status with Arab countries in the MENA region showed that Lebanon was ranked 3rd in the Arab Healthcare Competitiveness Index (2017), after Saudi Arabia and the United Arab Emirates.

A study of the structure of the Lebanese healthcare sector (including the distribution of hospitals by type of ownership) and the investment of this sector in medical technologies showed the predominance of the private sector (136 private hospitals versus 29 public ones), which contributed to the high level of medical technology in healthcare by world standards.

Thus, the rating and comparative analysis showed a high level of healthcare in Lebanon, despite the presence of certain problems (maternal and infant mortality). However, the complication of the political and socio-economic situation in the country may lead to the loss of existing positions.

A retrospective analysis of ICT adoption in Lebanese healthcare was carried out based on documentary observation. Legislative acts since 2002 were analyzed, as well as hospital accreditation standards containing requirements for the digitalization of management processes and the policies of medical institutions in this regard. Documents related to the implementation of 17 initiatives for the digitalization of management processes undertaken by the MoPH, but not fully implemented due to the lack of integration and coordination of the actions of the MoPH with other stakeholders, were studied.

The study also analyzed the state of the ICT sector in Lebanon. Lebanon does not produce ICT hardware, but has a large share of software development in the country and abroad. The contribution of ICT to Lebanon's GDP, Lebanon's readiness to

increase the use of ICT compared to neighboring countries, and the country's high ranking in the MENA Innovation Index have led to the appreciation of the results achieved by this sector.

At the third stage, to obtain an idea of the readiness of specialists in healthcare institutions for the digitalization of management processes and the associated risks, an analysis was performed using the triangulation method. Initially, documents and paper records containing patient records were analyzed. Then interviews were conducted with those responsible for managing the healthcare sector and the management of guarantor institutions to clarify their attitude towards the digitalization of medical records. After this, a survey of specialists was carried out on their readiness to interact and use EHR using 8 closed questionnaires developed for specialists at various levels (managers, including ICT, personnel, quality, doctors, nurses, technicians, pharmacists), as well as citizens/patients. The results of the study were encouraging, however, some experts expressed their concerns regarding the computer literacy of specialists and patients, and the confidentiality of information.

At the fourth stage, the experience of implementing projects on digitalization of management processes in healthcare in developed countries (USA, EU countries), as well as in developing countries (India, African countries, etc.) was analyzed. The analysis showed the possibility of digitalization of healthcare in Lebanon, given the necessary commitment, resources and funding, and helped to determine the contours of the national healthcare system

At the end of the chapter, it is concluded that the Lebanese healthcare sector is ready for the digitalization of management processes, and the ICT sector, with high availability of equipment on the Lebanese market, is able to provide the necessary software, and a systematized presentation of the prerequisites and problems of digitalization of Lebanese healthcare is provided.

Based on the results of a multi-stage analysis, it was revealed that with a low level of infrastructure development in Lebanon, healthcare is in a better position than other sectors of the economy, and medical institutions are able to provide the necessary conditions for further digitalization of management processes. *Prerequisites for expanding the use of ICT* include continuous power supply (24 hours a day), the availability of ICT equipment at medical institutions, a constant connection to the Internet, the functioning of an internal network connecting all computers, the ability for entities that do not have software to access a special portal for data entry, availability of trained ICT staff.

The challenges hindering the digitalization of healthcare in Lebanon are political instability, lack of continuity of plans in the sector, insufficient funding, immaturity of some organizations, dominance of the private sector, weakness of automation directly in the MoPH, poor infrastructure for the application of ICT, bureaucracy and conflict of interests, resistance to change, weakness legal and regulatory environment. With this in mind, *the main problem is multiple personal identification in Lebanon (lack of a unique*

citizen/patient identifier). Some of the problems are typical for Belarus, others are absent or have been successfully resolved (Table 3), which indicates the benefit of mutual exchange of experience, including during the development of a model for innovative development of healthcare in Lebanon.

Table 3 – Health development in Lebanon and Belarus

Problems	Lebanon	Belarus
No unique identity identifier	Multiple Identification	Unique National Identification Number (2005), national EHR
Financing problems	Private sector and conditional foreign loans (Cedars 2015)	Government financing and World Bank loan (2016)
Political instability	Internal and external conflicts, economic crisis, frequent changes of ministers	Relatively stable politics, frequent changes of ministers and plans
Inequalities in knowledge and awareness in ICT	ICT Development Index : 52/125	ICT Development Index : 41/125
Imperfect infrastructure	117/137 (in the WEF ranking) (electricity : 134/137)	Old, but sufficient and updated available as needed
Resistance to change	High resistance (private sector, doctors, financiers)	Less resistance (state dominance)
Weakness of the legal and regulatory framework	No definition of medical jurisdiction, liability or reimbursement for eHealth services	

Note – Developed by the author based on research results.

In the third chapter, “**Organizational model of digitalization of healthcare in Lebanon,**” based on the results of the studies presented in the first and second chapters, a model of innovative development of healthcare in Lebanon has been developed, focused on the formation and functioning of a unified medical information database at MoPH based on EHR.

The developed conceptual approach to the innovative development of healthcare in Lebanon made it possible to formulate the principles of forming an organizational model for the digitalization of healthcare in Lebanon: focus; inclusiveness of citizens' access to health care; progressiveness; continuity; adequacy; integration of medical information; differentiated access of stakeholders to medical information; confidentiality of medical information, analytics. Based on these principles, the general configuration of the model was determined, the main elements of which are the institutional structure of healthcare, the framework design of e-health, the concept of creating a unified medical information database, and the roadmap for the digitalization of healthcare.

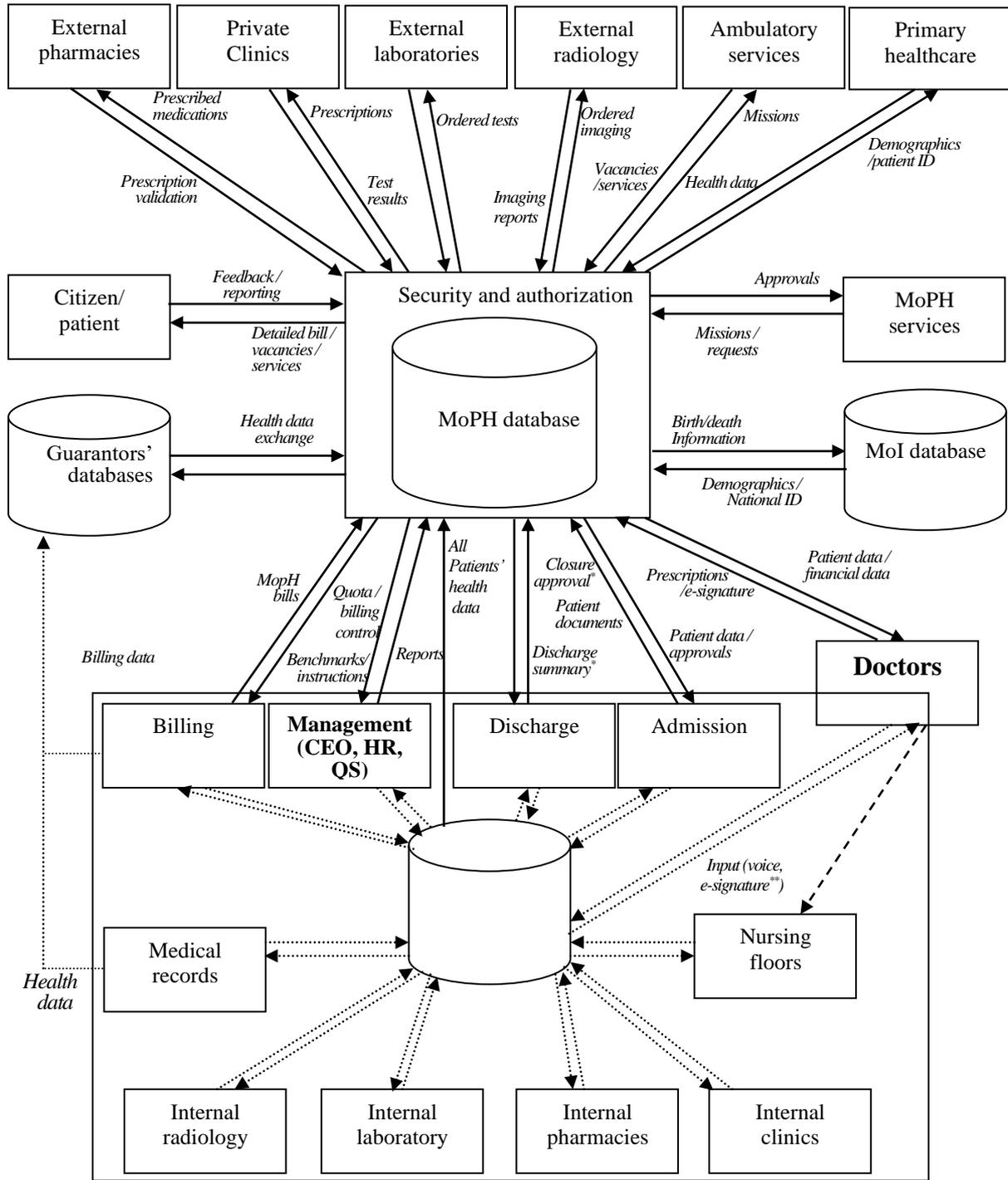
The model is based on the existing *institutional structure of Lebanese health care*, the units of which are divided into three groups depending on their role. The first is represented by *stakeholders*: authorities and management in the healthcare sector, local authorities, medical institutions and healthcare-related organizations, patients and their relatives, and the public. The second includes *guarantors* that finance medical and health procedures for their patients: the national social insurance fund, a cooperative of government employees, military programs, insurance

companies, etc. They will provide data about their beneficiaries and are interested in receiving medical information from a single center. The third group consists of *medical institutions of various types and forms of ownership*, providing medical and health services to patients and receiving payment for their services from guarantors (hospitals, outpatient clinics, diagnostic centers, pharmacies, etc.). They will ensure that medical data is sent to the information processing center using special portals in accordance with position, privileges and responsibilities. Trained personnel (doctors, nurses, pharmacists, technicians, etc.) will receive authorized access to enter, transmit and receive data.

The e-health framework design, formed on the basis of a synthesis of best practices in the digitalization of healthcare, is a set of basic components (strategy and implementation; leadership and management; applications; technological infrastructure; legislation and standards; qualified workforce; technical support), defining the stages of digitalization of healthcare in Lebanon, reflected in the road map.

A fundamental diagram of the formation and functioning of a unified medical information database at MoPH, reflecting the interaction between all participants in medical care and other stakeholders (Fig. 2). The database will ensure the integration, storage, use of medical data, as well as the exchange of information of all stakeholders and direct control of MoPH over medical and financial procedures. The functioning of this base is based on the use of an EHR, which will contain all historical and current information about his health, providing unique identification of the individual and providing stakeholders with differentiated digital access to medical information, maintaining its confidentiality, but allowing specialists to access vital authorized information for the provision of medical care. Fig. 2 reflects the exchange of information both within medical institutions and with external organizations, as well as the passage of information through a single data processing center for storage and monitoring.

The roadmap for digitalization of healthcare in Lebanon was developed taking into account 17 initiatives already undertaken, identified prerequisites and problems, and global experience developed in the implementation of similar projects. Includes 16 stages: gap analysis; analysis of financing options; ensuring the technological readiness of the MoPH data processing center; assessing and ensuring the technological readiness of stakeholders and communication methods; determining the mechanism for transmitting data from hospitals and medical centers and related institutions; determination of the mechanism for forming a unique identity formed with citizen/patient identifier; adoption of legislative decisions; unification of EHR components by creating a template; collection of data on citizens/patients from guarantors; designing a unified database in the MoPH data center to store all medical information; study of safety measures; creation of a portal for each type of stakeholder; training of instructors (IT managers); stakeholder training; testing the availability and use of the digital solution; implementation of a digital solution.



Dotted lines are operations done external to the proposed system.

* Operations specific for MoPH patients only.

** Is an internal operation but needs to be automated within each hospital.

Figure 2 – The fundamental diagram of the formation and functioning of a national unified health information database under the MoPH

To reflect the sequence of these stages, a calendar schedule for the digitalization of healthcare has been developed. A brief description of each stage is given: required resources, duration, estimated cost, performers and their coordination, system of indicators for monitoring the digitalization of healthcare (Table 4).

Table 4 – System of indicators for monitoring digitalization of healthcare

Stage	Indicator (formula)
ICT capability of the organization	$(\text{Number of organizations capable of providing the necessary ICT} / \text{total number of organizations (by type)}) \cdot 100$
Human Resources (ICT Readiness)	$(\text{Number of organizations with required ICT skills} / \text{total number of organizations}) \cdot 100$
Sources of financing	Available financial resources = $(\text{Amount of available funds} / \text{Planned amount (total and for each fund)}) \cdot 100$
Data Center Readiness	$(\text{Available ICT} / \text{required ICT}) \cdot 100$
ICT readiness	$(\text{Number of organizations ready to use ICT} / \text{total number of organizations}) \cdot 100$
Data transmission mechanism	Data exchange readiness ratio = $(\text{number of guarantors with mechanism} / \text{total number of guarantors}) \cdot 100$
Unique patient identifier	$(\text{Number of citizens with national ID} / \text{Number of citizens}) \cdot 100$
Legislation	Readiness of legislation = $(\text{number of laws issued} / \text{number of necessary laws}) \cdot 100$
EHR Forms	Readiness for EHR automation = $(\text{Number of automated forms} / \text{number of planned forms for EHR}) \cdot 100$
Participation in the transfer of old data	$(\text{Number of organizations that provided correct data} / \text{total number of organizations (by type and guarantor)}) \cdot 100$
Software development	Software creation rate = $(\text{procedures achieved} / \text{procedures planned}) \cdot 100$
Training	Training coefficient = $(\text{number of related employees trained} / \text{number of related employees needing training}) \cdot 100$
Testing	Correctness rate = $(\text{Number of errors corrected} / \text{number of errors reported}) \cdot 100$ Success rate = $(\text{Number of functioning modules} / \text{total number of modules}) \cdot 100$

Note – Developed by the author.

Since the MoPH should stimulate the digitalization of management processes, *a new formula for accreditation of medical institutions* has been proposed, characterized by the introduction of a variable reflecting the use of ICT and the participation of medical institutions in the formation and operation of a single medical data center. This formula will facilitate MoPH to monitor the digitalization of management processes and determine its relationship with medical institutions in accordance with their obligations (level of funding (quota), support and cooperation, etc.).

The implementation of the model of innovative development of Lebanese healthcare based on the digitalization of management processes will allow it to solve a number of problems and provide a number of *social and economic benefits* (unique identification of citizens/patients, timeliness of medical care, transparency of accounts, reduction of bureaucratic and paper procedures, centralized control by the MoPH, overcoming the immaturity of organizations and resistance to change on the part of personnel) by covering all stakeholders with the electronic health system, on this basis, improving the quality of medical care and the efficiency of using the resources of medical institutions, which will help preserve the health of the population and how consequence to *human development and inclusive development of Lebanese society*.

CONCLUSION

Main scientific results of the dissertation

1. The dissertation develops a conceptual approach to the innovative development of healthcare in Lebanon in the context of digitalization of the economy, including: clarification of the conceptual apparatus, in particular, definitions of the concepts “information society” and “digital economy” are proposed, as well as the concept of innovative development of healthcare in Lebanon, in which swarm, the intensification of digitalization of management processes in healthcare is considered as a key direction for the integration of medical information and more efficient use of the resources of medical institutions of various types and forms of ownership, based on the interests of all stakeholders, carried out taking into account the development of Lebanon, the state of healthcare and the ICT sector of Lebanon, and global experience functioning of national health systems. The implementation of this approach will help improve the quality (including speed) of medical care, preserve the health of the population and, ultimately, human and inclusive development [2, 7, 9, 10, 11, 13].

2. An algorithm has been developed for identifying the prerequisites and problems of innovative development of healthcare in Lebanon based on the digitalization of management processes, which includes four stages: analysis of human development based on UNDP indicators and indicators of the development of the information society in Lebanon based on the author’s system of development indicators based on Webster’s criteria; analysis of the health and ICT sector in Lebanon based on international rankings, statistics and documentary observation; analysis of the readiness of specialists from healthcare institutions to digitalize management processes and related problems based on the triangulation method; analysis of global experience in healthcare digitalization. Approbation of the algorithm made it possible to identify the prerequisites and systematize the problems of digitalization of healthcare in Lebanon, which were taken into account when developing an organizational model of digitalization of healthcare in Lebanon [1, 4, 5, 6, 9, 11, 12, 13]. The algorithm can be used in the development of other national models of innovative development based on the digitalization of management processes

3. An organizational model of digitalization of healthcare in Lebanon has been developed, including: a) characteristics of the institutional structure of the healthcare sector, the units of which, depending on their role, are represented by three groups: 1) government and external organizations, the population; 2) guarantors who finance medical and health procedures for patients; 3) medical institutions of various types and forms of ownership, providing medical and health services to patients and receiving payment for their services from guarantors; b) framework design of e-health as a set of basic components of digitalization of the healthcare sector; c) a schematic diagram for creating a unified medical information database at the MoPH, ensuring integration,

storage, use of data, to which all stakeholders will be connected to exchange medical information and ensure control over medical and financial procedures based on the introduction of an electronic medical record of a citizen/patient (EHR), containing all historical and current information about his health, providing unique identification of the individual and providing stakeholders with differentiated digital access to information; d) a roadmap for the implementation of the digitalization project of Lebanese healthcare, formed taking into account previously implemented digital initiatives, in particular, compiled in coordination with the Lebanese MoPH, taking into account the identified prerequisites and problems of management processes in healthcare [3, 10, 11, 13]. The implementation of the model will solve a number of problems existing in Lebanese healthcare and provide it with a number of advantages through integration, more complete and rapid use of information, which will make it possible to improve the quality of medical care and the efficiency of using the resources of medical institutions in the interests of human and inclusive development.

4. A roadmap for the digitalization of healthcare has been developed, including: a) the sequence of 16 stages of project implementation, their characteristics (resources, duration, estimated cost, performers and their coordination); b) project implementation schedule; c) a system of indicators for the implementation of project stages; d) the formula for accreditation of medical organizations, taking into account the fulfillment of conditions related to the implementation of project stages, which allows stimulating medical organizations to implement them [3, 6, 10, 11, 12, 13]. The implementation of the healthcare digitalization project in accordance with the roadmap will ensure the dynamism of this process by anticipating scenarios for the development of individual subprocesses at various stages, monitoring their implementation and timely adoption of management decisions.

Recommendations for the practical use of the results

The results of the dissertation work have practical significance for building a model of innovative development of healthcare in Lebanon based on the digitalization of management processes. The implementation of the fundamental idea of the formation and operation of a unified bank of medical information under the Lebanese Ministry of Health will create the necessary conditions for improving the quality of medical care for the population and more efficient use of the resources of medical institutions.

The results of the study were used in the services of the Ministry of Health of South Lebanon and were assessed as an important solution that would “improve the quality of services provided”, “facilitate the procedures for working with patients” in the Ministry of Health and “improve mechanisms for monitoring health activities” (certificate of the head of the health service -opinions of South Lebanon dated 05/18/2023). Some of the results of the study were implemented in the Alaeddine

Hospital in the field of human resource management, where their testing confirmed that the digitalization of processes in medical institutions can be implemented with the presence of computer-literate employees, and this can make a great contribution to the formation of a unified database (certificate from the director of the Alaeddine hospital dated 02/10/2019). The healthcare digitalization model at the technical level was tested at the AlMashrek medical diagnostic center, and the IT manager confirmed that the results were productive and that the structure of the model does not contradict the data structure of the center, and can be integrated with it to transfer information to the data center (certificate from IT -manager dated 05/10/2023). The results of the dissertation research were approved and used not only in these institutions, but also in many other medical institutions, which recommended the innovative Lebanese healthcare digitalization project for speedy implementation.

Some of the research results were introduced into the educational process of IPNET Maarak College (certificate dated 05/19/2023, N° 115/2023), as well as in the educational process of the Belarusian State Technological University (certificate dated 05/05/2023).

Thus, the results of the study have already been used and can further be applied in the field of healthcare and in the educational process of higher education institutions. The results obtained can be used in scientific research, as well as in the educational process of institutions to improve the qualifications of healthcare professionals.

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SUMMARY

Younis Hassan Mohammed

Innovative development of healthcare in Lebanon in the context of economy digitalization

Key words: innovative development, human development, inclusive development, information society, digital economy, information and communication technologies, diffusion of innovations, algorithm, electronic medical record, medical information, base, institutional infrastructure, framework design, organizational model, road map, indicator, methodology, accreditation formula.

The purpose of the study is to develop theoretical and organizational and methodological foundations for the formation of a model for the innovative development of healthcare in Lebanon in the context of the digitalization of the economy.

Research methods: general scientific, concept analysis, economic and statistical analysis, monographic analysis, comparative analysis, methods, sociological research, triangulation, modeling, road mapping.

The results obtained and their novelty. For the first time developed: a conceptual approach to the innovative development of healthcare in Lebanon in the context of the digitalization of the economy; algorithm for identifying the prerequisites and problems of the innovative development of healthcare in Lebanon based on the digitalization of management processes; Lebanese healthcare digitalization organizational model; roadmap for the implementation of the healthcare digitalization project.

Degree of use: the results of the dissertation research were used by the Ministry of public health – Health service of South Lebanon (unique patient identifier, 2023), Alaeddine Hospital (in the field of human resource management of medical institutions, 2019), AlMashrek Medical Diagnostic Center (in terms of the mechanism for integrating medical information and sharing information, 2023); implemented in the educational process of the Ipnnet College of the Lebanese Ministry of Education (2023) and Belarusian State Technological University (2023).

Scope of application: practical activities of public health authorities and medical institutions in Lebanon and other countries, the educational process of higher education institutions and institutions for advanced training of health professionals, scientific research.

РЕЗЮМЕ

Юнис Хассан Мохаммед

Инновационное развития здравоохранения Ливана в условиях цифровизации экономики

Ключевые слова: инновационное развитие, человеческое развитие, инклюзивное развитие, информационное общество, цифровая экономика, информационно-коммуникационных технологии, диффузия инноваций, алгоритм, электронная медицинская карта, медицинская информация, база, институциональная инфраструктура, фрэймворк-дизайн, организационная модель, дорожная карта, индикатор, методика, формула аккредитации.

Цель исследования – разработка теоретических и организационно-методических основ формирования модели инновационного развития здравоохранения Ливана в условиях цифровизации экономики.

Методы исследования: общенаучные, концепт-анализ, экономико-статистический анализ, монографический анализ, сравнительный анализ, методы социологического исследования, триангуляция, моделирование, дорожное картирование.

Полученные результаты и их новизна. Впервые разработаны: концептуальный подход к инновационному развитию здравоохранения Ливана в условиях цифровизации экономики; алгоритм выявления предпосылок и проблем инновационного развития здравоохранения Ливана на основе цифровизации управленческих процессов; организационная модель цифровизации здравоохранения Ливана; дорожная карта реализации проекта цифровизации здравоохранения.

Степень использования: результаты диссертационного исследования использованы Министерством здравоохранения Южного Ливана (уникальный идентификатор пациента, 2023), больницей «Alaeddine» (в области управление человеческими ресурсами медицинских учреждений, 2019), медицинским диагностическим центром «AlMashrek» (в части механизма интеграции медицинской информации и обмена информацией, 2023); внедрены в учебном процессе колледжа Irnet Министерства образования Ливана (2023) и Белорусского государственного технологического университета (2023).

Область применения: практическая деятельность органов государственного управления здравоохранением и медицинских учреждений Ливана и других стран, учебный процесс учреждений высшего образования и учреждений по повышению квалификации специалистов здравоохранения, научные исследования.

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YOUNIS Hassan Mohammed

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IN LEBANON IN THE CONTEXT OF ECONOMY DIGITALIZATION**

Abstract of the dissertation
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