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H. M. Younis
Belarusian State Technological University

AN INNOVATION MODEL FOR THE DEVELOPMENT OF THE LEBANESE HEALTH SECTOR: A ROADMAP FOR THE CREATION AND IMPLEMENTATION

The article presents the prerequisites for the development of an innovative integrated model for the digital integration of healthcare services by the electronic health record, trying to benefit from the previous initiatives of the experts and the ministry of public health. The author will study the related opinions to create an applicable model which takes the Lebanese peculiarities. The results of a sociological study conducted according to the author's methodology, which was qualitative using direct interview method at the top level management, and quantitative using questionnaire method at the middle and low levels, are presented to assess the readiness to implement such model, and identify associated problems and risks of not applying. The author presents a scheme reflecting stakeholders' requirements needed in the formation of an integrated model, taking into account the level and functional approaches. The stages of creation and implementation of an integrated model are also considered.

Key words: integrated model, healthcare, development, readiness, digital, electronic health record, stakeholder, level approach, functional approach.

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Х. М. Юнис
Белорусский государственный технологический университет

ИННОВАЦИОННАЯ МОДЕЛЬ РАЗВИТИЯ ЛИВАНСКОГО СЕКТОРА ЗДРАВООХРАНЕНИЯ: ДОРОЖНАЯ КАРТА СОЗДАНИЯ И ВНЕДРЕНИЯ

В статье представлены предпосылки разработки инновационной модели цифровой интеграции медицинских услуг на основе электронной медицинской карты, учитывающей все предыдущие инициативы. Автор с целью создания полезной модели, принимающей во внимание особенности Ливана, изучил мнения различных экспертов и представителей Министерства здравоохранения. Приведены результаты социологического исследования оценки готовности к внедрению такой модели и выявления связанных с ней проблем и рисков неприменения, проведенного по авторской методологии, предполагающей обращение к качественному анализу с использованием метода прямого интервью на высшем уровне управления и количественному анализу с использованием метода анкетирования на среднем и низшем уровнях. Разработана схема, отражающая требования заинтересованных сторон, которые должны быть учтены при формировании интегрированной модели и систематизированы на основе уровневого и функционального подходов. Также рассмотрены этапы создания и внедрения интегрированной модели.

Ключевые слова: интегрированная модель, здравоохранение, развитие, готовность, цифровой, электронная медицинская карта, заинтересованная сторона, уровневый подход, функциональный подход.

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Introduction. The Lebanese health sector has been a pioneer in providing excellent healthcare for the Lebanese and their neighbors, as Lebanon was once called as "The hospital of the middle east". Lebanon has the qualified human resources, and the healthcare institutes are up-to-date in providing the latest technologies. Yet these development initiatives were decentralized leaving each facility to determine the need, use, and budget to acquire them. This results into duplication of services and inefficient use of resources, and fraud. Nowadays, all managements need information and communication technologies (ICT) in their route towards digital improvement, which is now considered the shortest way towards a productive economy in the whole information society. The issue is to assess the readiness of the Lebanese society for digital integration of health management system, and the development of an integrating innovation model for the health sector.

Assessing the readiness of the Lebanese stakeholders for a digital platform. Digitization is entering effectively the economic sectors in all societies. The level of implementation differs from one nation to another according to its peculiarities. Some nations are moving faster towards crossing the digital divide into becoming digital economies, while others are hindered by many obstacles that are slowing them down from coping with the new era. Lebanon as a developing country is struggling to follow up with progress in many domains, given its specific case that has its advantages and many disadvantages. The Lebanese health sector is one of the leading domains internally and among its peers, with the availability of qualified human resources and medical technologies. The weak linkage between the ministry of public health, public and private healthcare institutes, and the population [1, p. 35] makes it necessary to find newer and more progressed solutions to integrate the healthcare data in a way that provides unique, fast, secure, efficient and productive use of health records, which will reflect positively on the management of this sector at all levels: leadership, managements and beneficiaries.

Proposing a solution for digital improvement, is the electronic health record (EHR), that was implemented in most developed and developing countries.

Some peculiarities of Lebanese health sector is that it is mostly owned by the private sector (82.4% private) [2], as the ministry of public health in Lebanon (MoPH) supervises this sector, and also interacts with hospitals as being one of their multiple guarantors (MoPH in Lebanon covers 1,629,015 beneficiaries [3, p. 74], about 40% of Lebanese patients not covered by other guarantors. Other patients are covered by guarantors: the national security fund 1,077,683 beneficiaries [3, p. 64], the civil servants' cooperative 193,860 beneficiaries [3, p. 69], military schemes of army 263,100 citizens, interior security forces 126,677 beneficiaries, general security forces 16,285 beneficiaries and national security forces 5,645 beneficiaries [3, p. 69–70].

Some attempts of digitization are made since 2014 [4] with the "National E-Health program" which drew a roadmap for digitization but didn't reach the proposed goals, till now especially to use the Covid-19 (vaccination, traceability, testing, results, and quarantine) which are included in the "Lebanon National Deployment and Vaccination Plan for Covid-19 Vaccines" [5, p. 14, 29, 55], and economic crisis (support of needy people, social studies and assistance, financial evaluation), as opportunities to increase the use of digitally integrated data, using many platforms, but this still needs a lot in order to become a whole integrated solution, that combines information to be more useful.

Another promising attempt, was also made through a conference held at the American University Beirut named "Building consensus on the readiness for EHR in Lebanon or E-Health Roadmap" [6] which focused on discussing with stakeholders about initiating such solution. Extensive explanation about the implementation of EHR in Lebanon, included the Lebanese experience and those of other nations was also studied as a basis for such solution [7].

In order to increase the success factors of such solution, the study was holistic to cover the social and economic aspects reflecting directly and indirectly on the quality of life of the normal citizen.

A socioeconomic study based on statistical and analytical approaches will be made to assess the readiness of the Lebanese health sector for digitization and implementation of the electronic health records, in addition to integrating the healthcare processes of the public and private sectors into a central and unique database supervised by the official authority which is the Lebanese ministry of public health (MoPH), with a primary foundation is to be secure to preserve the privacy of personal data, and at the same time to allow the proper disclosure of information that will allow to reduce the errors and frauds that happens because of lack of surveillance and duplication of health data.

The socioeconomic approach will divide the stakeholders of the health sector into functional levels, to be a complete and systematic evaluation of the stakeholders' readiness for improvement, using suitable tools and methods for each level. The level division was carried out according to their authority, job, and capabilities:

Top level: the ministry of public health (MoPH), which will provide the official opinion and the participation of the official authorities and related ministries. A qualitative approach was used to analyze the results that used the direct interview which showed enthusiasm and readiness.

Management level: the guarantors, health facility managers, and syndicates. Another qualitative method was used which was the interview of differrent manners (direct, by phone or conferencing) all yielded great feedback.

Mid-level: doctors, nurses, non-clinical employees, pharmacies, centers. Results of the survey are shown in table 1 below.

Lower level: citizens, patients and their relatives. Results are shown in table 2.

After surveying the Lebanese society regarding the digital implementation of unified health records, an analytical evaluation of the answers was performed to draw the obstacles that could hinder such solution.

In general, most developing nations suffer from some obstacles related to *bad infrastructure* [8] (especially electricity and communication) whose availability is enforced in health sector, *illiteracy* which is not high in Lebanon, as literacy rate in Lebanon was reported by UNESCO at 95.07% in 2018 [9].

Table 1

Stakeholder readiness percentage for EHR in Lebanon

Question	Private hospitals	Public hospitals	Diagnostic centers	Primary health care centers	Clinics	Ambulatory services	Pharmacies
Sample size	32	8	50*	5	64	3	120
Are you willing to work within an integrated EHR?	62.5%	100%	75%	90%	56.25%	66.67%	87.5%
Do you have the qualified human resources?	62.5%	65%	62.5%	37.5%	60%	66.67%	85%
Do you have the necessary ICT?	75.5%	25%	62.5%	25%	25%	33.33%	90%

*Sample consists of 35 laboratories and 15 x-ray centers.

Source. Table prepared by researcher based on his national survey of year 2021.

Table 2

People readiness percentage for EHR in Lebanon

Question	Doctor	Nurse	Technician	Non-medical employee	Patient	Relative
Sample size	50	100	50	50	100	50
Are you willing to access and work on an integrated EHR?	25%	88%	85%	90%	71.5%	87.5%
Do you have the necessary ICT qualifications?	60%	62%	75%	55%	51%	60%
Do you have the necessary ICT tools?	55%	81%	80%	70%	65%	70%

Source. Table prepared by researcher based on his national survey of year 2021.

Yet there are some problems that have large influence in Lebanon more than other countries which are related to.

First we should mention the *political instability* in Lebanon, which makes any proposition a matter of conflict of interests among the conflicting political parties, in addition to the short range of planning due to the constant change in relevant ministers. Second the most important is the lack of *Unique national identifier* (national ID number, passport number, and register number at least). Another important problem noticed is *Doctors resistance*, those who work in Lebanon as a free partner and not as employees and they influence is big. At the same time *private sector domination*, which makes their opinion decisive, and they showed many notes and concerns regarding their participation in any new solution [10]. *Funding* is a bigger problem now since the financing parties are making conditions of reform before releasing funds especially the reform related to digitization as happened in the "Cedre" conference, resulted a promise of funding parties of providing $11,6 billion, $10,8 billion as soft loans, and $0,8 billion as grants [11, p. 2] aiming to develop the Lebanese economy. *Legislations*: The issuance of the suitable decrees and laws and their implementation in the Lebanese society could show the impact of Freedom of Information on society [12, p. 7] and the social impact of ICT; especially the influence of internet on communities [13, p. 93]. So far Lebanon has not defined "medical jurisdiction, liability or reimbursement of E-Health services" [14, p. 204].

Innovative integrated model to develop the healthcare system using EHR. After taking the Lebanese peculiarities into account, a customized model is proposed to reach a Lebanese EHR that addresses most of the concerns, and creates a unique medical record for each citizen. The cooperation and coordination of different stakeholders whether they are public or private, high or low, direct or indirect influence, ready or unready, should be existent in order to get the productive implementation. To demonstrate the requirements of stakeholders, a diagram is created that draws the links between each of them, defining their input, responsibility, and feedback (fig. 1).

After defining the roles/requirements of each stakeholder it is easy to interconnect them within one model that will result the core which is a unified, digital, national and unique electronic health record. The model to construct this EHR is by connecting all the related entities to ensure its success and integrity. Such approach was also coincides with previous studies, which are taking into consideration the requirements, coordination and facilitation of the process from all stakeholders. This was summarized and presented in an introductory manner by D. Ghassan Hamadeh, in his presentation "E-health roadmap for Lebanon", in the conference held at the American University of Beirut in 2019 [11].

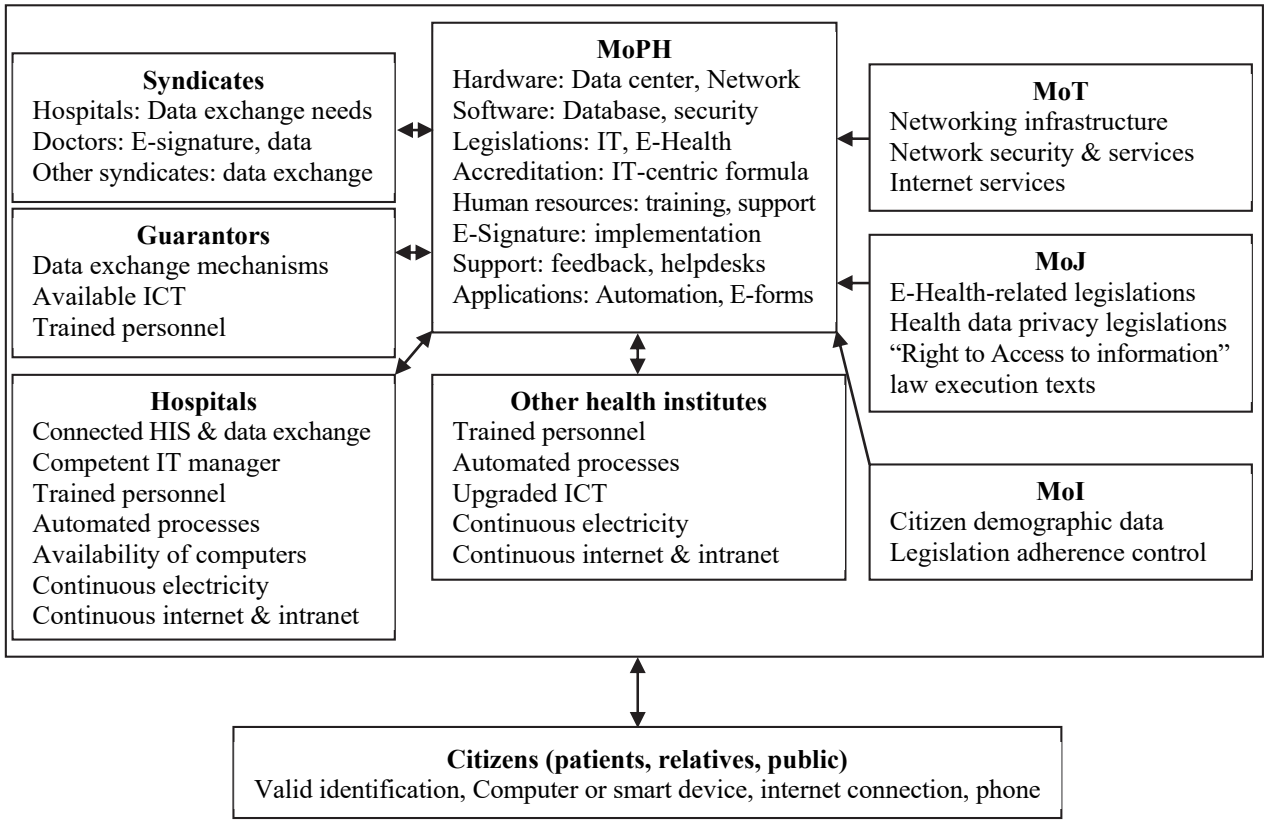


Fig. 1. Stakeholder requirements

A multi-level model that takes the vertical functional levels into account regarding their responsebilities and areas of authority (ministries, guarantors, health facilities managers, employees, citizens), and horizontal management and working functions, of different job descriptions at the same level (nurses, accountants, human resources, IT), with a requirements scheme of requirements needed at each level in order to integrate all efforts, and synchronize the inputs into one system, to generate secure and efficient outputs.

The stages of creation and implementation of the model will pass into a preparatory stage by providing the infrastructure, funding, legislations, human resources, ICT and others. The second stage is to create a demo model that can be tested on selected experts and institutes. Then the implementation stage will come to overcome all difficulties and obstacles faced in the testing period. Then comes the surveillance stage which will keep this solution up-to-date regarding maintenance, functioning, commitment of stakeholders, transparency and continuity.

This formation of the model, and its right implementation will help increase the competitiveness of the health sector as part of the economic system as a whole. It will be autonomous regarding health related topics, and should be flexible to updates, growth, and development.

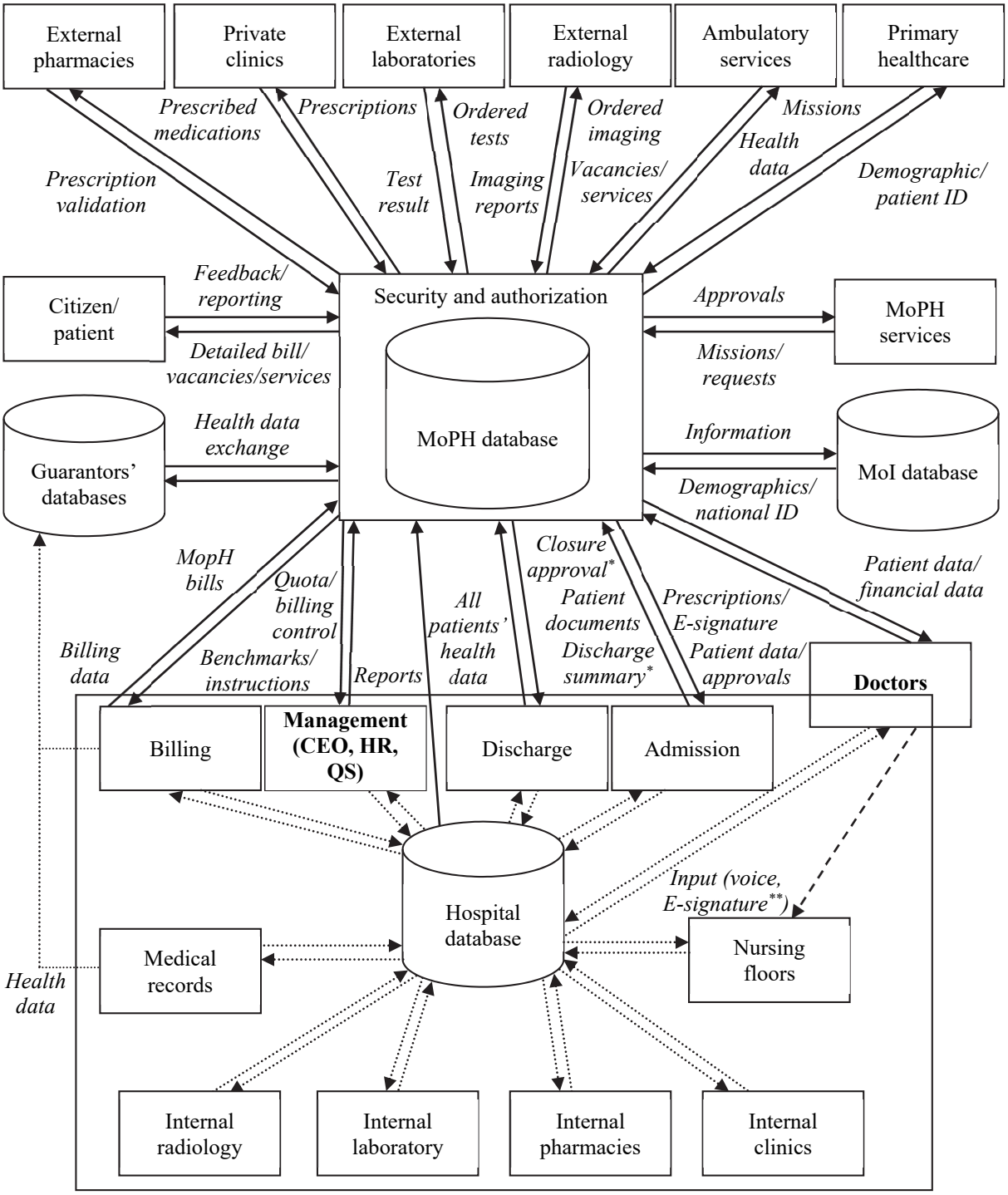
In order to provide the centralized control, one database will be accessible by internet using dedicated portals and proper authorization for each stakeholder.

Related to a unique national identifier, each citizen's EHR will contain the sections: *demographics* (full name, mother's name, date of birth, place of birth, blood group, and all other information existent on national ID card), *contact information*, *health history* (previous history of patient including hospitalization, prescribed treatments, doctor and clinic prescriptions, immunization, tests, images, medications, allergies, admission and discharge reports, doctors and nursing progress notes, test results, nutrition diets, treatments, surgeries and medications), *guarantor information* (defining the party that supports the hospitalization of the patient, in which percentage, and what type of coverage, with continuous update and validation of such status).

To enter and retrieve these data of citizens, the database needs to be accessed according to predefined privileges and authorization. This access needs to secure, available, easy to use, and interoperable.

All these data contained will allow different querying from different types of participants, starting from normal citizen with no access credentials, reaching the top management of health in Lebanon, passing through all health-related institutes. This model summarizes the data interaction among all stakeholders and management levels, acquiring and providing all health data and supporting data from its sources.

The flow of information among each stakeholder and user is shown in fig. 2.



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.

Fig. 2. Integrated E-Health data model

The roles of participants and stakeholders in the following expected manner. Hospitals and other long stay institutes: the whole file is sent to MoPH at discharge time of the patient, or at the end of each day (if there were no direct connection between MoPH database and the institute's database), after files are completed in the medical records department of each hospital, they are sent daily to MoPH database. The doctor will enter the prescription for tests, imaging, medications, or treatments directly using a dedicated portal into the MoPH database. This prescription will be saved with a serial unique prescription number that is held by the patient and handled to the next destination (health institute). Then the doctor can use the number to access the prescription's results after it is executed by the destination services. Primary

healthcare centers and other one day procedures (like clinics, pharmacies, laboratories, radiology centers) data are entered directly using the portal assigned by MoPH solution. They will use the prescription number held by the patient or the doctor to access, execute and validate the prescription. Guarantors receive continuous update about their subscribers into the MoPH database, including their status, health records, and coverage. MoPH provides approvals, consultancies, and reports.

The integrated health data solution promises to improve the management of the health sector in Lebanon reaching to providing a better quality of life for the Lebanese. Integrating the health data and all related numbers, and forms into one centralized database will have its benefits and advantages that will affect directly the health sector as a whole and will allow better management from the top authorities down under.

Conclusion. Many challenges are waiting on the road of integrating the healthcare information using ICT in developing countries. The Lebanese scores are well regarding readiness criteria, and thus has an opportunity of integrating the health data using ICT, but it still suffers from many weaknesses to reach feasible implementation. This is affecting not only the health sector but also other domains as well. Yet the first steps towards implementation are already taken, especially with the conference for "EHR readiness" and the following meetings in Lebanon, and the digital integration of management of Covid-19 epidemic. Plans and roadmaps and expected funding seem to be in place.

The development of and integrated model for electronic health record in the Lebanese health sector takes all related opinions into account, in addition to the technical issues that could affect the implementation of the solution. The lack of unique identifier for Lebanese citizens can be overcome by using the national identity number as a unique identifier, and create a health identifier for those who don't have an ID. As for the resistance of change raised by some stakeholders, all parties will be committed if enough seriousness and transparency was available. On the other hand, the delay in implementing such solutions is separating citizens from health services more and more especially with the scarcity of hospital beds, the high cost of hospitalization these days, and the multiple health records that could lead to different medical histories of one patient, and eventually to treatment conflict, and medical errors, and worse health results. Such solution is only a step towards joining all the loose circles into one chain that will improve the connectivity, and decrease the size of expenditure. Given the current and forecasted social and economic situations, the implementation of such solution is just a matter of time, and time is not on the Lebanese side any more.

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Information about the author

Younis Hassan Mohammad – external doctorate student, the Department of Enterprise Economy and Management. Belarusian State Technological University (13a, Sverdlova str., 220006, Minsk, Republic of Belarus). E-mail: hssnyougm@gmail.com

Информация об авторе

Юнис Хассан Мохаммед – соискатель кафедры экономики и управления на предприятиях. Белорусский государственный технологический университет (220006, г. Минск, ул. Свердлова, 13а, Республика Беларусь). E-mail: hssnyougm@gmail.com

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