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IMPACT OF NEW TECHNOLOGIES AND INNOATIONS TO THE INCOME OF COMPANIES

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ABSTRACT

Purpose – The purpose of the study is to investigate the impact of innovation and new technologies on indicators of financial performance in a private medical center. For this, the study will analyze the current state of cardiac surgery and cardiology center LLP "Zhanuya" based on quantitative analysis.
Methodology –The statistical method, regression - correlation analysis, general scientific methods of analysis and synthesis are used to achieve study`s goal.
Originality/value – One of the most important factors in improving the competitiveness of an institution is the introduction of innovations, although the assessment of the impact of innovations is a problem due to the complexity of isolation and measurement. In addition, health care institutions are faced with a growing need for innovation in order to become competitive and offer new treatments for patients.
Conclusions – The article considers the data of the medical institution LLP "Zhanuya" which provides cardiological and cardiac surgical medical care to the population of the Republic of Kazakhstan and outside the republic.
According to the results of the study, it can be argued that the successful development of private medical centers requires the development of technological innovation and, therefore, intellectual capital - the knowledge, skills and production experience of employees that are interconnected.
The organization should also have long-term and short-term assets and close cooperation with the state, which makes it possible to expand the areas of profitable investment of its capital.
Keywords – innovation, new technologies, competitiveness, education, R§D.

INTRODUCTION

Relevance of the research topic. In today's society, innovations are an indispensable element of the functioning of the economy, where without the innovation component it is impossible to achieve effective development of the production and non-production areas of the economy. In the 21st century, the development and introduction of innovative technologies in the areas of production and circulation, new ways of organizing and managing enterprises have become key factors in market competition, a strong means of increasing efficiency and improving the quality of goods and services [1].

This requires the formation of a new mechanism of social development based on new requirements for human potential, consumed resources and provided services.

One of the important conditions for such transition is the development and formation of the economy of knowledge and high technologies, to which such spheres as education, high-tech medicine, research and development, which develop and implement innovations, are related. Without the introduction of innovations in these segments of the services market, it is impossible to achieve the main mission of the innovation policy - raising the quality of life of the population. At present, in global terms, the problems of interaction and interpenetration of the processes of innovative development in different sectors of the economy (including services) and the quality of life of the population of the state are important and widely discussed [2-4]. From a practical point of view, this work can help private medical centers make more effective decisions regarding the development of their innovation policies.

MAIN PART

The relationship between innovation and productivity and the extent to which the former determines the latter has been the subject of several studies over the past few years [5-7].

Innovation is the creation and adoption of new ideas or, generally speaking, something new. Innovation may be a direct result of managerial choices or may be imposed by external conditions. Organizational studies provide insights into the role of innovation in managing system-wide problems, such as adaptation to the environment, the ability to allocate resources for innovative (or operational) programs or activities, as well as overall organizational results and effectiveness [8].

Innovation in health care depends on the characteristics that flow from its unique nature, in addition to its status as a public organization (public health unit). This is a more complicated process due to the fact that innovative methods must be tested before their continuous implementation, and their adoption must be regulated by laws [9].

In our opinion, the strategic trends of the innovation development of the service sector institutions and its structural components are created in accordance with the types of innovations identified according to the areas of implementation. We believe that the following groups of innovations are peculiar to the services sector (Table 1).

Table 1. Definition of Innovation Groups

№	Innovation groups	Definition
1	Technological innovations	the provision of new services, the release of new related products due to innovations in technology services, the introduction of new equipment
2	Service innovations (service innovations)	increase in consumer value of services, differences in structure and set of services provided, improvement in quality characteristics of services
3	Organizational and managerial innovations	improvement of business processes, the introduction of new control methods, decision making, application new information and communication resources in service industries
4	Socio-economic innovations	correction of social, economic and legal the criterion for the functioning of service enterprises, contributing to improving working conditions and increasing quality of life of the population
5	Financial innovations	formation of new financial instruments and technologies of financing and attraction of investment in the service industry
Note - compiled by the authors based on the source [9]		

Oslo Manual says that for data collection purposes, it is important that innovations are clearly distinguished for one type of innovation, although this can sometimes be difficult because some innovations have characteristics that span more than one type. The impact of innovation on firm performance can range from sales growth to increased productivity and efficiency. It is important to identify innovations and the type of innovations that succeed in increasing the efficiency of a company, since they are central to the future development of a company's policy [10].

The models of P.Romer and R.Lukas are the beginning of the theory of endogenous growth, which included their own arguments and prerequisites for a non-decreasing return on capital [11].

The Romer model develops the The Romer model develops the Arrow model, in which a production function of the following form was formulated:

$$Y_i = A(K)\, F(K_i, L_i) \quad (1)$$

where i is the firm index [12].

In this model, the level of technological development depends on the total capital stock in the economy. The production function in the Romer model is written as follows:

$$Y_i = A(R)\, F(R_i, K_i, L_i) \quad (2)$$

where Ri is the research and development results of private company i [13].

The sources of growth in the model are knowledge and learning by personal experience; these factors underlie the increasing return on capital. An enterprise, increasing its capital, is learning to produce most efficiently. Training on your own experience is accomplished through the investment of the company. The model also implies that the knowledge of each company is represented by a public good, access to which any company is able to have at no cost.

The models described earlier provide a convincing explanation of endogenous growth based on an investment in capital in a broad sense. Nevertheless, according to the view of D. Grossman and E. Helpman, pointing to the sources of growth, they cannot explain the mechanism, which are innovations. The Grossman and Helpman model was the first endogenous growth model to link technological progress with innovation activity and innovation. The model of Grossman and Helpman goes back to the work of J. Schumpeter, in which he introduced the concept of "innovation", and also laid down the basic principles of the theory of creative destruction, based on the innovative activities of entrepreneurs [14, 15].

METHODS AND STRUCTURE OF THE STUDY

Statistical method and regression-correlation analysis are used. Using the GRETL data analysis toolkit using the ARIMA model and the maximum likelihood method, correlation and determination coefficients are identified based on secondary data (40 observations) for the years 2008-2017.

RESEARCH RESULTS

Income of the company was used as a dependent variable, and key indicators affecting income were used such variables as: *Innovation in medical services, Organizational innovation, Technological innovation, Education, R§D, Dollar exchange rate, Inflation index , Operations, Cash-in-flow budget, Long-term assets, Short-term assets.*

Before conducting a correlation-regression analysis, we conducted statistical tests for the presence of autocorrelation and for the normal distribution of errors in Table 2.

Table 2. The results of diagnostic testing

Test	Statistics test	*p*-value
Model I		
LM test for autocorrelation presence Null hypothesis: autocorrelation is missing	$X^{2(2)}$ 0,597	
Test for normal error distribution Null hypothesis: errors are distributed according to the normal law	$X^{2(2)}$ 3,885	0,143
Model II		
LM test for autocorrelation presence Null hypothesis: autocorrelation is missing	$X^{2(2)}$ 1,020	
Test for normal error distribution Null hypothesis: errors are distributed according to the normal law	$X^{2(2)}$ 1,998	0,368
Model III		
LM test for autocorrelation presence Null hypothesis: autocorrelation is missing	$X^{2(2)}$ 3,206	
Test for normal error distribution Null hypothesis: errors are distributed according to the normal law	$X^{2(2)}$ 10,580	0,005
Note - the table is compiled by the authors on the basis of data of enterprises		

As can be seen from Table 2 for the LM test, there is no autocorrelation in the three models, which means that the errors of the regression model will not lead to a deterioration in the quality of the estimates of the regression parameters, as well as to an overestimation of the test statistics by which the quality of the model is checked.

Checking the variables for a test for the normal distribution of errors showed that in all models the distribution according to the exponential law with intensity μ is performed.

As can be seen from Table 2 in our model, all the coefficients are significant and therefore can be proceeded to the evaluation of the model.

In a normal normal distribution, a simple dependence and a rather rigid form a linear form, i.e. dependency type:

$$y = a0 + a1x1 + a2x2 + ... + apxp \quad (3)$$

It is important to determine whether all variables should be added to the equation or whether there are variables that do not have a significant effect on Y, and that they should not be added to equation (3).

To solve this, a table was created consisting of pairs of correlation coefficients for all factors.

Table 3. Correlation Matrix

	Income_of_the_company	Innovationinmedicalservices	Introductionnewtechnology	Organizational innovation	Technological innovation	Education	RD	Dollar_exchange rate	Inflation_index	Operations	Cashinflowbudget	Longtermasset	Shorttermassets
Income of the company	1												
Innovation in medical services	0,6719	1											
Introduction new technology	0,6508	0,9572	1										
Organizational innovation	0,7685	0,5859	0,6000	1									
Technological innovation	0,7689	0,4747	0,4776	0,9385	1								
Education	0,6503	0,5391	0,5335	0,6047	0,4984	1							
R§D	0,5056	0,3053	0,3144	0,4383	0,4984	0,3372	1						
Dollar exchange rate	0,7161	0,9375	0,9099	0,6526	0,5425	0,5347	0,3890	1					
Inflation index	-0,2454	-0,0931	-0,0659	-0,2152	-0,2091	-0,1335	-0,0634	0,0549	1				
Operations	0,6788	0,6382	0.6427	0,5614	0,5586	0,3655	0,4095	0,6894	-0.0940	1			
Cash-in- flow budget	0,6866	0,3063	0,2892	0,2892	0,8913	0,4287	0,3775	0,3826	-0,2283	0,4697	1		
Long-term assets	0,8204	0,7260	0,7050	0,8074	07496	0,7914	0,4477	0,7275	-0,2292	0,4175	0,5770	1	
Short-term assets	0,3408	0,2372	0,2233	0,4602	0,4298	0,3793	0,3355	0,2774	-0,0325	0,1687	0,1082	0,4231	1
Note - the table is compiled by the authors on the basis of data of enterprises													

According to Table 3, the coefficients are closely related to the income of the company coefficient, (the correlation coefficients, respectively, from 0.82 to 0.34, respectively) and the negative effect (-0.24).

In accordance with the above, let us compose the regression statistics in Figure 1.

Regression Statistics	
Plural R	0,959946751
R-sqare	0,921497765
Normalized R-squared	0,885265964
Standard error	0,128807553
Observations	40

Figure 1 - Regression Analysis

As can be seen from the figure, the coefficient R2 = 0.92 i. means strong correlation. When evaluating regression models, this is interpreted as matching the model with the data.

We can check the importance of these factors through the GRETL program. For this, we have divided the factors into three models shown in Table 4.

Table 4. Model ARIMA (exact MP method)

Variables	ARIMA models, used observations of 2008:1-2017:4 (T = 40)		
	I	II	III
Const	0,0000 *** (0,167)	1,65e-061 *** (0,384)	0,1913 (1,299)
Innovationinmedicalservices	0,7834 (0,025)	0,4527 (0,020)	
Introductionnewtechnology	0,9332 (0,014)	0,5012 (0,012)	
Organizational innovation	0,4965 (0,092)	0,7687 (0,093)	
Technological innovation	0,0184 ** (0,046)	0,1519 (0,049)	0,0029 *** (0,048)
Education	0,0238 ** (0,012)	0,0056 *** (0,014)	0,4605 (0,013)
RD	0,6777 (0,014)	0,9447 (0,16)	
Dollar_exchange rate	0,0399 ** (0,001)	0,4524 (0,0009)	
Inflation_index	0,0881 * (0,133)	0,1277 (0,127)	
Operations		0,0592 * (0,233)	1,15e-06 *** (0,231)
Cashinflowbudget			6,58e-05 *** (0,034)
Longtermasset			2,41e-05 *** (0,158)
Shorttermassets			0,0134 ** (0,011)
Note - the table is compiled by the authors on the basis of data of enterprises			

As can be seen from the calculations in the first model, we see that companies' income is influenced by such factors as Technological innovation, Education and Dollar exchange rate at the level of 0.01% and Inflation index at the level of 0.5%. This is explained by the fact that technological innovations and knowledge in medicine today are connected with the latest technologies of the diagnostic and treatment process, with the creation of more advanced medical equipment and the provision of completely new medical services to the population [16]. Significance of factors such as Dollar exchange rate and Inflation index is determined by the fact that 100% of medical equipment and 90% purchased medicines and medical products of LLP “Zhanuya” are foreign-made.

In the transition from one model to another, Operations variable and such variables as Technological innovation, Dollar exchange rate, Inflation index lose their significance, and the significance of the influence of the Education variable increases on the final estimate of the estimated parameter at the level of 0.001%.

In the third model, we remove some factors from the study and add others, such as Cash-in-flow budget, Long-term assets, Short-term assets. It was determined that these variables significantly affect the final assessment of the estimated parameter at a significance level of 0.001% and 0.01% with a positive effect. However, with the inclusion of these interaction variables, Education loses its significance, and the variables Technological innovation and Operations become significant at the 0.001% significance level also with a positive effect on the parameter being assessed.

CONCLUSION

Medical organizations need a developed infrastructure - these are equipment, availability of qualified medical personnel and the creation of conditions for the introduction of innovations, which are also priority aspects of the development of new technologies.

The costs of medical institutions for education and staff development have an important impact on the introduction of innovation in the company. So, as is the development of medical technology, scientific advances related to obtaining high-quality treatment, optimal management of processes in the medical industry, with the creation of new medical products, technologies or services that have competitive advantages.

As indicated in the Romer model, the level of technological development depends on the total capital stock. That is to say that in order to increase the profitability of companies we require long-term and short-term assets, as well as close interaction with the state, which is confirmed by empirical research.

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РЕЗЮМЕ

Согласно результатам исследования можно утверждать о том, что для успешного развития частных медицинских центров необходимо развитие технологических инновации и соответственно интеллектуальный капитал — знания, навыки и производственный опыт сотрудников которое взаимосвязаны между собой. Также иметь долгосрочные и краткосрочные активы и тесное сотрудничество с государством, что дает возможность расширить сферы выгодного приложения своего капитала.

ТҮЙІН

Зерттеу нәтижелеріне сәйкес, жеке медициналық орталықтардың табысты дамуы үшін технологиялық инновацияны және сәйкесінше зияткерлік капитал — қызметкерлердің білімі, дағдылары мен өндірістік тәжірибесі өзара байланысты болуы қажет деп айтуға болады. Сондай-ақ ұзақ мерзімді және қысқа мерзімді активтерге ие болу және мемлекетпен тығыз ынтымақтастық жасау, бұл өз капиталын тиімді қолдану аясын кеңейтуге мүмкіндік береді.