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Basics of researche of the technological environment of business

Podstawy badań technologicznego środowiska biznesu

Abstract: Continuous and progressive technological changes based on scientific-technical revolution have become common under modern globalization processes. They gradually destroy the traditional distinction between low and high-tech sectors and shift the general vector of development of the country from static, temporary comparative advantages to innovation-based dynamic competitive advantage. In other words, the technological environment is becoming a significant resource that determines competitive advantage and is essential for achieving efficient and rapid improvement of the welfare of a society. Almost all the aspects of the operations of international companies – introduction of new technologies, manufacturing operations, decision-making on marketing activities, productivity of human resources are significantly influenced by technological environment variables.

Keywords: technology, innovation, business environment, structure of variables, static and dynamic parameters

Abstrakt: We współczesnych procesach globalizacji zachodzą ciągle, progresywne i technologiczne zmiany oparte na naukowo-technicznej rewolucji. Stopniowo zaciera się podział na sektory niskich i wysokich technologii oraz zmienia się ogólny kierunek rozwoju ze statycznych, tymczasowych przewag konkurencyjnych w stronę przewag opartych na dynamiczności i innowacjach. Technologiczne środowisko jest niezbędne do osiągnięcia szybkiej poprawy stanu dobrobytu społeczeństwa. Prawie wszystkie aspekty działalności firm międzynarodowych - wdrażanie nowych technologii, procesów produkcyjnych, podejmowania decyzji w ramach działań marketingowych, produktywności zasobów ludzkich pozostają pod wpływem zmian w środowisku technologicznym.

Słowa kluczowe: technologia, innowacyjność, otoczenie biznesu, struktura zmiennych, parametry statyczne i dynamiczne

Importance of Studying the Technological Environment of the Country

The impact of technological variables on business processes and final outcomes of production is one of the pressing issues in international business. In modern global business management success can't be achieved without application and proper management of up-to-date technologies. As a result, in recent years, scientists pay special interest to the importance of technology and scientific and technological progress in business development. In our opinion, this is caused by the global e-commerce boom beginning in 1990s and the idea dominating in current economic thinking, that scientific and technological advancement based on

the increase in productivity is one of the key factors in improving the competitiveness of a company and welfare of a society.

Thorough analysis of variables of the technological environment and incorporating them in international business studies is an especially actual issue for Georgia as the country is trying to achieve full and competitive integration in global business. Orientation towards diversification of international business relations is one of the most important measures from this point. The EU-Georgia Association Agreement is one of the obvious examples of such diversification. The foreign aspect is considered to be the most important precondition of social and economic development of the country. From this point, it's very important to study, analyze and evaluate the technological environment in Georgia and to provide appropriate information to potential foreign partners - mostly large transnational companies with considerable experience.

Understanding the Concept of Business Technological Environment

A precise definition of the concept of the technological environment of business and the variables that affect it is an essential component of studying the environment. For this purpose, it's advisable first to analyze the opinions by different researchers and scientific centres regarding the interconnection between technological factors and business.

There are a number of definitions of the technological environment in scientific literature. According to the Oxford study laboratory, the technological environment includes inventions, changes in information and mobile technologies, innovations in internet and e-commerce, government expenditures on research¹.

The group of technological factors reflects the scientific-technical development level of a field or a society, which determine projection of a technical system of an enterprise and create new possibilities. Therefore, analysis of studies and new inventions as well as revealing progressive changes that enterprises get interested in is of special interest. All this, in turn, determines a company's ability to use new technologies and products faster than others, which, as a rule, leads to increasing the competitiveness of the organization².

According to the consulting internetportal PESTLE ANALYSIS, factors of the technological environment include innovations in technologies that may affect the operations of the industry and the market favourably or unfavourably. This refers to automation, research and development and the amount of technological awareness that a market possesses³.

As internetportal „wiseGEEK“ says, technological macro environment factors can influence the way an organization does business. A new type of machinery, computer chip, or product created through research and development can help a company stay modernized and ahead of the market curve. Owners must

¹ http://www.oxlearn.com/arg_Marketing-Resources-PESTLE---Macro-Environmental-Analysis_11_31

² *Управление Организацией*, под редакцией А.Г. Поршнева, З.П. Румянцевой, Н.А. Саломатина, „ИНФРА-М“, Москва 2009, с. 28.

³ <http://pestleanalysis.com/what-is-pestle-analysis/>

be able to accurately identify which new developments will be truly useful, and which are just fads⁴.

According to *Business Environment*, a textbook published by Elsevier, a leader in providing scientific information, the technological environment includes the following variables:

- Information technologies – intranet, extranet and internet;
- Digital electronics – digital television, mobile phones (WAP da 3G);
- New synthetic materials – synthetic medicines, celluloid, polymers;
- Renewable energy resources – wind, solar, tidal energy;
- Biotechnologies – cloning, genetically modified foods, human genetic maps⁵.

As can be observed, the above sources agree that the technological environment has innovative nature. The technological environment is associated with the introduction of innovations in business, focus is mainly made on digital and internet technologies, which significantly limit a full understanding of the technological factors affecting business. When studying the technological environment of business, we should go beyond innovative processes and thoroughly understand the nature of the technology. From the economic point of view, technology is the way to transform production factors into products and refers to the methods of processing materials, changing their shapes and characteristics used in the production process. Thus, here we deal with the ways and methods of transforming something into something else. These methods and ways which include not only new knowledge and innovations, but also a set of skills and means to implement the task. Consequently, when speaking about the technological environment, along with innovations the following categories are highlighted: accessibility to raw materials, human skills, physical assets, technology, equipment, which is used to ensure the operational function of business.

This is the way R. Ebert and R. Griffin develop their ideas. They explain that the technological environment includes all the ways, which firms use to make production components worthy. Technology holds a central place in this definition and it includes human knowledge, working methods, physical assets, electronic, communication and other equipment, which is used to do business⁶.

According to *BusinessDictionary.com*, one of the leading internet business dictionaries, external factors in technology impact business operations. Changes in technology affect how a company will do business. A business may have to dramatically change their operating strategy as a result of changes in the technological environment⁷.

Consulting internetportal "Businessballs" explains that the technological environment of business includes the following variables: development of competing technologies; research funding; associated/dependent technologies; replacement technology/solutions; maturity of technology; manufacturing maturity and capacity; information and communications; consumer buying mechanisms;

⁴ <http://www.wisegeek.org/what-are-macro-environment-factors.htm>

⁵ *Business Environment*, Published by Elsevier Ltd., 2005, pp. 90.

⁶ Ronald J. Ebert, Ricky W. Griffin, *Business Essentials*, Pearson Education Limited, England 2013, pp. 28.

⁷ <http://www.businessdictionary.com/definition/technological-environment.html>

technology legislation; innovation potential; technology access, licenses, patents; intellectual property issues; global communications⁸.

S. Wall and B. Rees consider that analysis of technological environment variables gains decisive importance under modern technoglobalism, as a macro environment phenomenon. These variables include the level of technology, the country's technical needs, technology transfer and infrastructure⁹.

R. Griffin and M. Pustay go even further when speaking about technological environment variables. They quite rightly point out that the basis of the technological environment is the resources at its disposal¹⁰. Availability or lack of resources determines which goods are produced in this or that country. The countries with fertile agricultural lands are food exporters. The countries with cheap labour produce and provide the world market with labour-intensive products. Thus, existence of resources directly determines which production technologies can be used in a given country and naturally, is the most important factor of the country's technological environment. Classical theories of trade can be used to support this opinion. According to these theories, the foreign trade structure of a country is directly determined by the level of resources.

Although R. Griffin and M. Pustay consider natural resources to be the basis of the technological environment of a country, they also identify other significant variables:

- Infrastructure – highways, transport communications, communication systems, water supply, etc;
- Human capital – the level of knowledge or qualification, which allows the country to increase its workforce productivity and efficiency.
- The level of intellectual property protection, which is determined by the country's legislation. It refers to copyrights, trademarks and other intangible assets, which determine the company's key competencies on the world market. Countries that can't ensure protection of intellectual property reduce their opportunities for forming the intellectual assets of local companies, as well as attracting high-tech foreign investment opportunities¹¹.

Thus, in our opinion, in the broad sense the technological environment of business, along with innovations, includes a combination of production factors, as well as infrastructure components, tangible and intangible assets, which enable achieving the operational efficiency of business, production of competitive products and services and market penetration. For a more reasoned understanding of the above category, we have to discuss the structural composition of its variables.

Key Components of Business Technological Environment Structure

As noted previously, the technological environment of business includes quite a wide range of factors, which impacts operational effectiveness of an enterprise and determines its competitiveness on the world market. In addition,

⁸ <http://www.businessballs.com/pestanalysisfreetemplate.htm>

⁹ S. Wall, B. Rees, *International Business*, Second edition, Pearson Education Limited, England 2004, pp. 164-168.

¹⁰ Р. Гриффин, М. Пастей, *Международный бизнес*, 4-е изд. Пер. с англ., Питер 2006, с. 139.

¹¹ *Ibidem*, с. 139-141.

different opinions regarding the factors that determine the technological environment of business often cross or complement, but in some cases exclude each other. Therefore, for an in-depth study of the technological environment of business it's necessary to separate and group the basic variable components, the analysis of which will enable an assessment of the strengths and weaknesses of the country's technological environment and to reveal ways to improve it.

As mentioned above, identification of the technological environment parameters requires a clear understanding of the nature of technology. In the most general form, the technology can be understood as a process, in which production factors are transformed into intermediate or completed goods through definite ways or methods. Therefore, when assessing the technological environment of business, on the one hand we deal with the production factors, their quantitative and qualitative indicators, which can be called static parameters and on the other hand, with the effectiveness of ways and methods of their usage, which is determined by the innovative potential of the country and is reflected in the technological dynamism (dynamic parameters).

As a result, two basic groups of parameters can be identified when assessing the technological environment of business:

1) Static parameters:

- **Advantage of the country's geopolitical location:** this refers to close location with intercontinental hubs, international trade routes, sales markets and ports, which makes the country attractive for domestic and foreign companies.
- **Access to natural resources:** existence of fertile agricultural land and favourable natural and climatic conditions is especially important.
- **Labour resources:** number of workable population, level of education and vocational training, structure of employment, unemployment rate, social conditions and other demographic indicators.
- **Access to local financial resources:** the level of financial infrastructure development, sustainability and flexibility of the banking system, stability of the national currency, capital market conditions, availability of insurance products.
- **Infrastructural development:** areas for production capacities, buildings, energy and water supply systems, roads, transportation and communication facilities, warehousing and logistics services, personnel housing, recreational, healthcare and educational institutions and other social conditions.

2) Dynamic parameters:

- **Research and development:** innovation processes are characterized by a significant increase in the role of science. Currently, research and development represent, not only a source of new ideas, but also a resource that covers all stages of the innovation process. Naturally, a starting point for assessing this variable is expenditures on R&D, which can be divided according to sources of funding, branches of science, types of business activities and socio-economic objectives;
- **Innovations in enterprises:** introduction of technological innovations is actively applied by modern enterprises to achieve and maintain competitiveness; therefore, this variable includes expenditures of enterprises on innovations

throughout the country, as well as the technological aspects of the enterprise culture, such as: innovation priorities; experience in introducing innovations; competitive position in domestic and international markets; level of interest in strategic partnership with innovators, etc¹².

- **High-tech manufacturing and knowledge-based service sector:** the technological environment of a country depends on the development of high-tech and knowledge-based industries in the country and their role in the sectoral composition of economy, which can be evaluated in the context of economic, employment and scientific research indicators.

- **Intellectual property:** patents, copyrights, trademarks, professional secrets are the most common methods of intellectual property protection. Countries that cannot ensure to protect the property rights on intangible assets lose the possibility of the formation of intellectual assets. In addition, patents reflect the outcomes of activities in the field of inventions in the country. The number of patents in the country also shows its possibility of application and commercialization of scientific innovations. In this context, the patent statistics directly reflects the country's innovative potential.

- **Human resources in science and technology:** the innovative potential of a country is essentially determined by the number of the people employed in the scientific and technological fields at a certain period. In assessing these variables the following aspects can be observed: human resources in science and technology by gender, age, education, business area. Human resources with the third level of education in science and technology and their international mobility are essential components for this field.

- **Information society indicators:** frequency of usage of innovations and communication technologies in households and enterprises directly indicate the level of the technological environment development. As a rule, indicators of the information society include usage of information and telecommunication technologies, the internet and other electronic networks; the level of e-commerce and business development; investments in and expenditures on information and communication technologies; security of information and communication technologies¹³.

- **Cooperation between entrepreneurial and scientific sectors:** under global competition, the technological dynamism of a country is closely connected to the development of different forms of partnership between the private and scientific sectors. Forms of such cooperation include development of scientific and technological parks, innovation centres, joint research projects, university research and technology centres, agreements on industrial and university research, scientific and research consortia, etc. As a rule, powerful scientific and industrial complexes are university-based. Silicon Valley in US, based at Stanford University is one of the best examples of the global technological revolution and such complexes.

¹² Sh. Shaburishvili, *Prospects For The Development Of Innovative Entrepreneurship In Georgia*, Problems and prospects of cooperation between countries of South-Eastern Europe within context of the BSEC and GUAM, 2011, pp. 842.

¹³ I. Gogodze, *Assessment and Monitoring of Innovative Processes in Europe*. <http://www.inovdev.ge/uploads/files/51073S.Gogodze.pdf>

• **The stimulating role of the state:** in the modern world, the innovative development of the country depends not only on the above factors, but on the effectiveness of the state policy from the point of supporting innovative activities. The more active and effective measures that are taken by the government, the more attractive is the technological environment of the country. In this context, the following areas are very interesting: **structural policy**, which includes government initiatives in various areas – technological and competition policy, deregulation, reduction of tax burdens, encouraging hi-tech foreign investments, participation in major research projects, preferential loans to innovative business, free or preferential transfer of land or state property to innovative enterprises and scientific infrastructure organizations, etc.; **Intermediary policy** – the state takes the responsibility to organize meetings of scientific and business representatives with governmental structures, such meetings should encourage development of partnership and strategic cooperation between the parties; **The policy of a demanding consumer** – the state sets high standards on the quality of goods and service, the technology and manufacturing process, thus making companies design and implement innovations¹⁴.

• **Internationalization of research:** the generation of scientific knowledge and technological “know-how” depends more and more on the research carried out in the frames of joint projects implemented in several countries. The participation of a country in the internationalization processes is affected by the following factors: the size of a country (as a rule, the scientific and technological area of small countries is more internationalized); geographical proximity to the regions, which are actively involved in research activities; industrial specialization; the nature of business activities of branches and subsidiaries of foreign firms, etc.¹⁵

Summary

The technological environment of business determines the global competitive advantage of a country and is essential for improving the welfare of society. Analysis of different studies shows that the technological environment of business includes a wide range of variables, which have a direct or indirect impact on the operational efficiency of the enterprise.

When we assess the technological environment of business, on the one hand we deal with the production factors, their quantitative and qualitative indicators, which can be called static parameters and on the other hand, with the effectiveness of ways and methods of their usage, which is determined by innovative potential of the country and is reflected in a technological dynamism. The static parameters include all the natural and static advantages, which make the organization of production in the country attractive. These are a favourable geographic location, access to natural, labour and financial resources, and the infrastructure development level. Dynamic parameters include the variables that describe the innovative potential of the country, such as R&D, innovations in enterprises, hi-

¹⁴ Sh. Shaburishvili, *Prospects of Innovative Development of Georgia under Globalization*, “Economy of Georgia” No 4 (125), Tbilisi 2008, p. 76-80.

¹⁵ *Внешнеэкономическая деятельность предприятия*. Под редакцией Л.Е. Стровского. М.: ЮНИТИ 2007, с. 697.

tech production and a knowledge based service sector, intellectual property, human resources in science and technologies, indicators of the information society, partnership between entrepreneurial and scientific sectors, the stimulating role of the state and research internationalization.

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