

TECHNOLOGICAL DEVELOPMENT MANAGEMENT UNDER GLOBALIZATION CONDITIONS

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ABSTRACT:

The research reveals a studying of scientific and technical development of enterprise in the context of globalization processes. The authors placed high emphasis on the specification of peculiarities and theoretical aspects of scientific and technical development of enterprise, the studying of impact of scientific and technical factors of economic development. The R&D financing in Ukraine and the strong and weak sides of application of model of technological development at international technology transfer are analyzed in the paper.

Key words: *globalization, multinationalization, national economy sustainable development model, technological development management, technological break model, information and communication technology*

1. Introduction

The knowledge appears by one of key factors of social and economic growth, and determined the scientific and technical development of enterprises. Globalization processes have ambiguous influence on scientific and technical progress – on occasion stimulating (for example, China), and in some cases – delay it (Ukraine and other countries of the CIS).

The contradiction of attitude for the scientific and technical development lately purchased a pronounced character. By the one side, it takes place confessedly of scientific and technical progress as inalienable and decision factor of economic growth but from other is an ignoring of it in the models of economic growth of the state, industry, and enterprise.

The investment flow level in science and scientific and technical works in Ukraine do not allow not only creating new knowledge but also saving inherited scientific and technical potential from soviet times. Meantime, the R&D expenditures of high-tech multinational companies amount to 10 % of revenue. Thus, the domestic enterprise competition on the world markets of high technologies is difficult.

The problems of scientific and technical development are reflected in researches of the well-known scientists' – J. Bhagwati, D. Held, S. F. Pokropyvnyi, B. A. Malyskyi, U. M. Bazhal, V. P. Solovyov, A. I. Yakovlev, B.

Twiss, A.R. Hiemer, A. Spithoven, C. Cooper, M.A. Bendikov, R.A. Fatkhutdinov, V. V. Glukhov, A. N. Mashayekhi, S. M. Masoumzadeh and other.

1.1. The research aim is consideration of theoretical aspects and features of scientific and technical development of enterprises in conditions of globalization; the role studying of scientific and technical factors of economic growth; analysis of R&D investment in Ukraine; analysis of strong and weak sides of application of model of technological development at international technology transfer.

1.2. Research methodology

The theoretical basis of research is makes by system approach at the analysis of scientific and technical development in the conditions of globalization. The methodological base of research is represented by the methods of comparison, logical generalization, system analysis, mathematical logic.

2. Research results

2.1. Globalization and enterprise management: theoretical questions

Globalization is the world association without the global state and global government. It is a Net in which concept of manager and guided lose the real sense. The real competitiveness of country in the framework of globalization is consists in its ability of maintenance of the originality to compete on equal in opened and liberal global economic space" [1].

Globalization is the process of acceleration of development of intercommunications in all spheres of human vital functions and transformation them in the planetary metasystem [2, p. 44]. In relation to separate countries the globalization shows up in including of countries in the system of global economic connections on of long duration basis, attended with gradual elimination of scopes of national economies as a result of permanent co-operation and growing interdependence of the states [3, 4, p. 310].

Briefly statement of globalization is characterized as the new stage of division of world [5]. Today the concept of globalization transformed at original cliché [6], by which describe the varied phenomena what is going on in society. However, it is possible to trace the display of globalization processes in the historical sources in the days of the Roman empire, European conquests of new continents and others.

The globalization processes began to show up the last two decades especially brightly due to the coincidence of the following factors: 1) predominance of activity of multinational corporations above the national economies of world countries; 2) transformation of world from bipolar to the unipolar; 3) elimination of information scopes by the information and communication technologies as the main instrument of globalization processes that make relative acceleration of the development of each other and gain the exponential character [7]. In particular, the founders of Intel corporation Andy Grove and Gordon Moore bind the development of world economy to the growth of industry of information and communication technologies as it motive forces [8].

The main peculiarities of enterprise management in the context of globalization come forward: 1) business multinationalization (overrun the state boundaries, boundary of country group); 2) decentralization of management; 3) transition of organizational structures to the flat forms. The reasons of the noted processes are four groups of globalization stimuli: markets stimuli, decreasing expenses, stimuli given by the governments of other countries, stimuli of competition.

On the principle that is the main tendency of world globalization comes forward the multinationalization. So, the problem of successful competition of large, middle and small national enterprises with multinational companies is appearances not only in high tech industries but also in such industries as a food industry and agriculture [9, 10].

2.2. Multinational corporations

The multinationalization comes forward a main counterbalance for the national economies of developing countries. The analysis of the territorial distributing of belonging of multinational corporations testifies that 34 % of top 500 companies in the world are American (table 1, table 2).

2.3. The model of sustainable development of national economy

The balanced development of national business (large, middle and small) and multinational corporations is one of tasks of sustainable development of countries.

A model of the balanced development in the conditions of globalization is based on supposition about sustainable development of global economy as system of national economies [13, p. 122] and supposes diminishing of contradictions arising up between multinational corporations and representatives of national business that corresponds to approach of Hiemer [14].

The mathematical model of the balanced development in the conditions of globalization with participation of all levels of national business is presented by the sum of components of national economies and multinational corporations in the proper proportions:

$$\eta \sum_{i=1}^{233} (\alpha_i LB_i + \beta_i MB_i + \chi_i SB_i) + \mu \sum_{j=1}^{78000} MNC_j \rightarrow \text{Globalization} \quad (1)$$

where *LB* is large national business; *MB* is middle business; *SB* is small business; *MNC* are multinational corporations; α , β , χ are weighting coefficients which determine the share of the proper business in the structure of national economy; η , μ - weighting coefficients determining the balanced development of constituents of national economies and transnational companies in the world; i - amount of countries (233); j is amount multinational corporations of in the world [15].

2.4. The scientific and technical factors of economic growth

The well-known economists' – L. V. Kantorovich, Golosovskiy [16] and other get a conclusion that the factor of scientific and technical innovations carries out influence on growth of GDP of the developed countries about 67 - 87 %. If to trace the researches about the influence of factors on economy growth of the well-known scientists which basis on the USA economy data mainly, the getting results also confirm the considerable share of scientific and technical factors of economic growth (table 3). The analysis of influence of scientific and technological changes on the economy growth that studied by Solow can be generalized for other states (table 4).

The R. Solow study of the economy growth was made on the basis of two approaches – empiric and model [18]. The first uses the aggregated production function of GDP (Y) relatively of three factors of production – capital (K), labour (L) and technological changes (T):

$$Y = F(K, L, T) \quad (2)$$

The accounting of evolution of influence factors (staining of information factor) on the economic growth (2) can be adapted taking into account the factor of knowledge – useful information that is necessary pre-condition of appearance of technological changes:

$$Y' = F(K, L, T, I) \quad (3)$$

where Y' is production function of gross national product taking into account four main factors; I – factor of knowledge.

Domestic researcher V.P. Solovyov estimate influence by the following way: from increasing of man-hours is 32 %, from labour productivity increasing – 68% (including: by the innovations – 28%, by the education – 14%, by the capital – 10%, by the changing of manufacturing scope – 9%, by the resource allocation – 7%) [21].

2.5. Investment distribution by technological modes

The information and communication technologies belong to 6th technological mode among the technological modes (table 5) that is tied-up above all things, with their considerable science intensity. The level of science intensity defines as relation of expenditures on R&D at development of technology for revenue that got from the sale

of technology or services [22, 23]. At the same time concordantly to information of Institute of economic forecasting of NAS of Ukraine of financing of scientific and technical developments in Ukraine on 70 % there is the 4th technological mode (table 5 [24]). In particular, expenditures on R&D by telecommunications companies in the world from 0,1 to 4 % of revenue. The comparative analysis of some telecommunications companies of world is resulted at table 6 (by the data of Google Finance [25]) testifies to the considerable differences in financing of R&D to the amount of R&D personnel.

Analysis of table 6 enables to come to conclusion about ineffectiveness (or absence) of R&D management that took place on enterprise Ukrtelecom comparatively with FT and BT Group. In particular, Ukrtelecom have in organizational structure a scientific and technical center that do not held a development of new technologies in a sufficient measure but specialized on probation of finished existent technologies. The noted enterprise co-operate with domestic and foreign research institutes, universities and laboratories which make out developments at industry of information and communication technologies.

The level of science intensity of information and communication technologies grows in all regions of world. In particular, the change of structure of the USA employers in telecommunication sector testifies to growth of role of R&D in economic activity of information and communication enterprises (table 7 [29]).

Development status of industry of high technologies in the world testifies to lag of Ukraine in area of microelectronics, computing engineering, telecommunications. For renewal of competitiveness of technologies appears by a necessity of sustainable development of fundamental science and considerable volumes of investments which in 2005 in education take 0,21 % of GDP, in R&D – 0,04 % of GDP. While the volumes of financing of the fundamental and applied science are insufficient (fig. 1 [30]) for implementation its economic function that foresees expenditures at level no less than 2 % of GDP.

That is why for the domestic enterprises of software and hardware production, telecommunication equipment by the advantageous form of production stays an using of SKD and MKD charts that are not characterized by the assistance of development of element base, introduction of high-tech technologies, development of scientific and technical personnel.

2.6. International technology transfer by the technological break model

Distributing of technologies between countries is not characterized by evenness. In particular, on the share of new knowledge which are incarnated in technology, equipment, organization of production, in the developed countries is from 70 to 85 % increase of GDP. On the share of seven high developed countries there is the issue 80-90 % to the high tech products and practically all its export. The countries of G7 possess 46 from by 50 macrotechnologies. 22 technologies are controlled by the USA, 10 - by Germany, 7 - by Japan, 3-5 by Great Britain and France; one is on Sweden, Norway, Italy, and Switzerland control [31, p. 8-9].

The management model of technological development in the conditions of globalization aimed on decreasing expenses of the technological and skilled providing a resource [32, p. 100; 33, p. 9]. One of the models of international technology transfer is the use of model of technological break. We will bring applications over of model of technological break on the example of telecommunication industry. The term of technological break between telecommunications technologies in Ukraine and technologies of the Western European countries on the average makes 8-10 years (fig. 2).

The beginning of the phases of decline of life cycle of information and communication technology is an optimum period for the sale of this technology to the countries with the lower level of technological development (like in Ukraine). From one side the use of model of technological break allows to multiply the life cycles of technologies and attain afore-mentioned aims for countries-developers and accelerate technological development in industry for countries mastering the imported technologies. But from other side, investing of the collected

facilities from the sale of technology, equipment, services in exploitation and repair of the used equipment in development and mastering of new technology in developed country only multiplies technological lag of country with low technological development. In fact, while the out-of-date technological equipment in Ukraine will cover their costs, a country-supplier will use principally new telecommunication technology.

Thus, reinvestment in development and mastering of new technology only inwardly the technologically developed country only is multiplies technological lag of countries with low technological development.

3. Conclusions

1. The inevitability of globalization, absence of counterbalances of it negative consequences, and also impossibility to avoid these consequences in general are result in the necessity of smoothing out of negative consequences of this phenomenon with the purpose of maintenance of control above a situation in economy, industry, on enterprise and etc.

2. The multinationalization is the main economic component of globalization processes. Therefore the task of providing of high level of sustainable development of the state will be attained for many domestic companies operating at transnational level. The disproportion of distribution of technologies between countries is results in conclusion about equal rights of all nations for technological progress achievement, knowledge and about some negative impact of intellectual property protection for global technological progress.

3. The support on the balanced development of all constituents of national economies (large, middle and small business) and multinational companies activity of which did not counteract to the strategic aims of the state, is desirable, above all things, for the developing states and states with transitional economies. Thus the following of strategy of protectionism in high tech industries of economy is necessary.

4. The absence of the effective operating national program of innovative development and considerable increasing of financing of primary links is traced in a chain let:

«developed state – developed economy – powerful industry – front-rank technologies – developed science and education».

5. The scientific and technical development of domestic enterprises must be based not only on the so-called modernization – an acquisition of front-rank in Ukraine, but everywhere in-use or out-of-date in the technologically developed countries technologies, but by the development of domestic analogues from the improvement in beginning and concluding by unique know-how also.

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Table 1: Distribution of top 500 multinational corporations by countries in 2006 (by the Fortune data [11])

Country	USA	Japan	UK	France	Germany	China	Netherlands	Canada	Switzerland	South Korea	Italy	Spain	Australia	Sweden	India	Russia	Mexico
Amount of companies	170	70	39	38	35	20	14	14	12	12	10	9	8	6	6	5	5
Country	Belgium	Brazil	Taiwan	Norway	Finland	Denmark	Venezuela	Turkey	Thailand	Singapore	Saudi Arabia	Malaysia	Luxemburg	Ireland	Austria	Romania	Ukraine
Amount of companies	5	4	3	2	2	2	1	1	1	1	1	1	1	1	1	?	?

Table 2: 25 Top MNC grouping by revenue, profits and employers in 2006 (by the Fortune data [11])

Rank 2006	Company	Revenues (USD millions)	Profits (USD millions)	Employees (thsd., people)
1	Exxon Mobil	339,938.0	36,130.0	83.7
2	Wal-Mart Stores	315,654.0	11,231.0	1900.0*
3	Royal Dutch Shell	306,731.0	25,311.0	109.0
4	BP	267,600.0	22,341.0	96.2
5	General Motors	192,604.0	-10,567.0	335.0
6	Chevron	189,481.0	14,099.0	59.0
7	DaimlerChrysler	186,106.3	3,536.3	382.7
8	Toyota Motor	185,805.0	12,119.6	285.98
9	Ford Motor	177,210.0	2,024.0	300.0
10	ConocoPhillips	166,683.0	13,529.0	35.6
11	General Electric	157,153.0	16,353.0	316.0
12	Total	152,360.7	15,250.0	112.9
13	ING Group	138,235.3	8,958.9	115.3
14	Citigroup	131,045.0	24,589.0	303.0
15	AXA	129,839.2	5,186.5	78.8
16	Allianz	121,406.0	5,442.4	177.6
17	Volkswagen	118,376.6	1,391.7	344.9
18	Fortis	112,351.4	4,896.3	54.2
19	Credit Agricole	110,764.6	7,434.3	136.8
20	American Intl. Group	108,905.0	10,477.0	97.0
21	Assicurazioni Generali	101,403.8	2,384.0	61.5
22	Siemens	100,098.7	2,854.9	461.0
23	Sinopec	98,784.9	2,668.4	730.8
24	Nippon Telegraph & Telephone	94,869.3	4,404.6	199.1
25	Carrefour	94,454.5	1,784.3	440.5

* More than 1.9 million employees worldwide [12]

Table- 3: The influence of main economic factors on the economy growth [17]

Author	Period of research, years	Influence of capital, %	Influence of labour, %	Influence of scientific and technical progress, %
Abramovitz M. (1956)	1869-1953	22	48	33
Kuznets S. (1971)	1929-1957	8	14	78
Kendrick J. (1973)	1948-1966	21	24	56
Denison E. (1962)	1929-1957	15	16	58
Denison E. (1985)	1929-1982	19	26	46
Solow R. (1957)	1909-1949	21	24	51

Table- 4: The factors of influence on GDP growth: capital, labour intensiveness, general factor of the productivity that represented the effect of technological changes for regions and selection of countries, % [19]

Region or country	Capital	Labour	General factor of the productivity
Region of the world, 1960-1987			
Africa	73	28	0
East Asia	57	16	28
South Asia	67	20	14
EMEA region	58	14	28
Latin America	67	30	0
Total	65	23	14
Industrial developed countries, 1960-1985			
France	27	-5	78
BRD	23	-10	87
Japan	36	5	59
UK	27	-5	78
USA	23	27	50
USSR (1928-1987) [20]	50	15	35

Table- 5: Division of financing after the technological modes in Ukraine, 2005

Indexes	Technological modes			
	3d	4th	5 th	6 th
Goods production volume	57,9%	38%	4%	0,1%
Financing of researches works	6%	69,7%	23%	0,3%
Expenditures on innovations	30%	60%	8,6%	0,4%
Investment	75%	20%	4,5%	0,5%
Investment in technical re-equipment and modernization	83%	10%	6,1%	0,9%

Table- 6: Financial performance indicators, expenditures on R&D and quantity of R&D personnel in 2006

Company	Revenue, mln. USD	Expenditures on R&D, mln. USD	R&D personnel	Expenditures on R&D per R&D personnel amount, thsd. USD
France Telecom	60316,02	2413,0	3780 [26]	638,360
British Telecom Group	38637,72	390,0	1695 [26]	230,090
Ukrtelecom [27]	1541,00	2,1	2124	0,989
Rostelecom [28]	2317,90	3,47	1531	2,266

Table- 7: Comparison of change of structure of employment in the telecommunication sector of the USA and JSC „Ukrtelecom”

Employer category	% of personnel in 1997	% of personnel in 2006	change of structure of employment during 1997-2007, % of growth (the 2007's data are estimated)	% of personnel in 2006 at JSC „Ukrtelecom” [27]
Telecommunication sector of the USA				
Top managers	34	29,3	+8%	6
Technicians	25	23,8	+23%	41
Managers	16	17,9	+37%	19
Marketing	11	12,2	+37%	
Engineers and technical staff	9	10,6	+46%	16
Programmers and technical support	5	4,9	+13%	18*

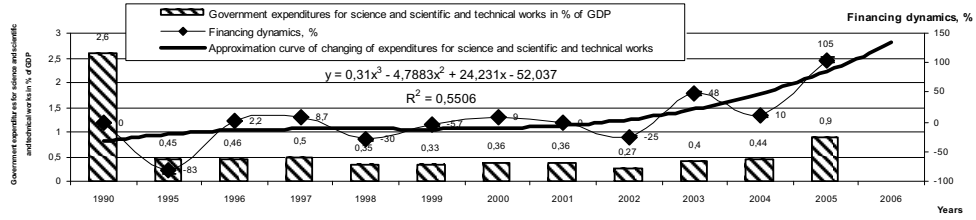


Figure 1. Government expenditures for science and scientific and technical works in % of GDP in Ukraine

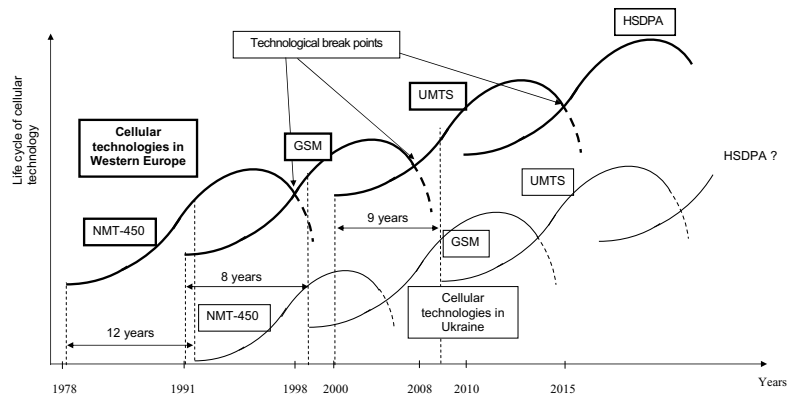


Figure 2. Life cycles of cellular technologies in Western Europe and Ukraine