

Technological stratification of the large business enterprises' development (8)

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Abstract

Large business enterprises currently form the basis of both business in general and social development. The paper notes that the target existence of a large business enterprise is the ability to accumulate funds and create innovative products. Moreover, these products in the future will constitute an opportunity for infrastructure development. It is noted that on the whole such elements are consolidated and gradually implemented in the social and economic environment of the state. The work uses econometric methods that allow fully revealing the reasons for differentiation of large business enterprises and determining the index parameters of the demand for development for the subsequent infrastructural transformation. It is pointed out that the effect of such activity is achieved not only as the profit received, but also in the overall perception of the commodity market. The novelty of the research is the indicators that the largest technological and structural companies that implement the majority of innovations at the core level of their system were analyzed and

indices that evaluate in a comprehensive manner all possible types of innovations and the level of their implementation are provided. The direction of further research is the calculation of the possible institutional transformation of large business objects into state entities or objects with such characteristics.

Keywords: Large business, infrastructure, enterprise, development, competition, adaptability, classification, industry, economy sector.

Introduction

Enterprises can be classified on various grounds, the first and most visible among which are, firstly, their industry affiliation, and, secondly, their scale. The first criterion distinguishes enterprises (Empirical study, 2008):

- industrial (plants, factories, mines, etc.);
- agricultural (cooperatives, state farms, etc.);
- construction (construction and installation management, etc.);
- transport (railways, shipping companies, ports, airports, etc.);
- communication (communication nodes, post offices, etc.);
- shopping (department stores, gastronomes, various specialized stores);
- housing and utility (operational offices, repair and maintenance management, heat capacity, power grid, etc.).

According to the second parameter, enterprises are traditionally divided into large, medium and small. Criteria for classifying business entities into different size groups are constantly changing, but currently the main focus is on:

- 1) the volume of annual turnover (gross revenue);
- 2) the number of employees.

At the same time, these parameters are mainly determined for the subjects of micro-, small- and medium-sized businesses, as a result of which large scale enterprises are defined "on a residual principle", i.e. on them exceeding the bar established for the above-mentioned subjects.

According to the first criterion, in accordance with the decision of the Government of the Russian Federation, the following threshold values are established:

- up to 120 million rubles a year – for microbusiness;
- up to 800 million rubles a year – for small businesses;
- up to 2 billion rubles a year – for medium-sized businesses.

Thus, for today in Russia economic entities with an annual revenue of more than 2 billion rubles are considered as large business' enterprises. As for the number of employees, the Government of the Russian Federation set a bar for medium-sized enterprises at a level of no more than 250 people. Consequently, exceeding the value by this parameter means that the corresponding enterprise is included in the category of large ones.

Large enterprises as the leading sector of the domestic economy can be explored in various aspects: organizational, legal, economic, system and analytical, etc. From the point of view of *organizational and legal forms*, in accordance with Chapter 4 of the Civil Code of the Russian Federation there are: full partnerships; partnerships in commendam, limited liability companies, open joint-stock companies, closed joint-stock companies, unitary (state and municipal). The managing practice shows that the leading role here belongs to joint-stock companies. Article 96 of the Civil Code states that a joint-stock company is a business entity that has:

- 1) the authorized capital divided into a certain number of shares
- 2) the shareholders of the joint-stock company (shareholders) are not liable for its obligations and bear the risk of losses related to the activities of the company, within the value of their shares.

Literature review

Before analyzing the competitiveness of high-tech transnational corporations, we will consider methodological approaches to such analysis. After all, in the literature and business practice, there are many methods for assessing the competitiveness of enterprises that can contradict each other (Ioannou & Serafeim, 2012). As D.H. Cho & H.S. Shim rightly note: "The number of methods and methodologies for assessing the competitiveness of various objects from the enterprise to global entities is so significant that a very complex problem of choosing the optimal one arises before researchers and practicing managers" (Cho & Shim, 2011).

Evaluation of the enterprise's competitiveness is the definition of its level, which gives some relative characteristic of the enterprise's ability to compete in a certain market. In general, the process of assessing the competitiveness of an enterprise's potential consists of the following stages (Carroll, 2014):

- definition of the purpose of the competitiveness' assessment (justification of claims for external investment resources, identification of economic growth's reserves, other goals of current management);
- selection of a group of competing enterprises, taking into account the possibility of obtaining the necessary primary information for the purpose of assessing competitiveness;
- definition of groups of competitiveness' key indicators, which are subject to evaluation;

- calculation of single, group, integral indicators of competitiveness for each enterprise;
- substantiation of the conclusion about the competitiveness' level of the evaluation object and development of measures aimed at improving or retaining competitive positions (Hawdon, 1986).

As indicators of the definition of the company's competitiveness, indicators and characteristics such as product competitiveness, quality and reliability of products (Bergsteiner & Avery, 2012), the distinctive properties of the goods, the company image (Bergsteiner et al., 2012), relative market share, cost level, sales methods (Zhao et al., 2013), sales profitability, revenue growth rate From realization, financial ratios (Pearce, 1997), efficiency of resource potential use (capital productivity, labor productivity, energy intensity, technology efficiency, information resources efficiency, efficiency of activities to enhance the staff creative activity), the pace and growth of the enterprise's value (He et al., 2011), the effectiveness of advertising and the ways and means of improving the information quality, sales promotion, personnel competence and experience, environmental performance indicators, service efficiency (Millstein & MacAvoy, 2003).

From the well-developed sources it follows that for today a single generally accepted methodology for assessing the competitiveness of an enterprise is not formed. In international practice, a number of methods proposed by international scientists are used (Crouch & Ritchie, 2012). In addition, each enterprise uses its own method when assessing competitiveness, and does not advertise the essence and effectiveness of its application (Shin, 2014a).

Most of the methods for assessing the company's competitiveness are based on applying different coefficients to analyze production activity, financial position, investment efficiency, and the like (Davis, 2016).

Summarizing the current literature, we can conclude that there are the following groups of methods for assessing the competitiveness of transnational corporations: matrix, graphic, index, analytical and complex.

Matrix methods. The essence of matrix methods is to determine the quantitative value of the integral rating indicator of the competitiveness of an individual enterprise or to graphically determine its competitive positions in the competitiveness matrix by certain parameters (Deavers, 1997). Matrix methods provide an opportunity to assess only the relative level of competitiveness of participants in the local market, which cannot serve as a sufficient basis for the development of specific activities, but allows us to determine the right direction for updating the production and development of the enterprise in the course of realizing the development potential (Pilinkienė et al., 2017). Among matrix methods, the most common are the Boston Consulting Group matrix, the Ansoff matrix (General Electric), the Mackinsey matrix, the M. Porter matrix of competitive

strategies, the A. Thompson and A. Strickland matrix, the SWOT analysis, the SPACE analysis, the STEP analysis, the STEEPV analysis.

Graphical evaluation methods basically have a low degree of mathematical formalization, they are characterized by laboriousness of implementation and discreteness of evaluation. They do not allow us to use the enterprise competitiveness assessment in the process of analyzing and determining priority directions for strengthening competitive positions in the market (Beranová et al., 2016).

Index methods are the most common in a market economy. The indicator system that underlies any index method is based on the areas of analysis (indicator of the resources' use, labor, market capacity) (Flohr et al., 2010). Each indicator is a ratio of absolute or relative indicators that reflect the most significant characteristics of the object or its activities (Ogrean & Herciu, 2015). The Deming method (Japan), the Baldrige method (USA), the European model of business excellence (European Union), the business improvement method (Great Britain), the rating of goods, the utility of products, the functional and value diagram can be used as specific index methods for assessing the competitiveness of high-tech TNCs.

Analytical methods are based on algorithms for calculating indicators, accommodate modeling with factors of production and products' sales. The scope of the analytical work and the complexity of the calculations depend on the number of factors considered in the model and whether this model is dynamic (Noh, 2016). It is customary to refer to such methods: the four-component concentration index CR4, the Herfindahl-Hirschman index, the difference method, the point method, the rank method, the ideal point method,

Among complex methods for assessing the competitiveness of high-tech TNCs, benchmarking is the most effective (Konzelmann & Birecree, 2000).

Taking into account the peculiarities and spheres of use of each of the above methods, the study uses a graphical method for constructing a competitiveness polygon and an analytical method for calculating the integral indicator of the high-tech TNCs of different industries' competitiveness level.

Results and discussion

Despite the fact that today all economic entities in high-tech industries face some common problems typical for these spheres of the economy, in particular rapid environmental variability, uncertainty in the prospects for market and industry development, rapid technological aging of products and the emergence of new technologies in the market, the importance of assessing the level of competitiveness in order to identify and implement the best methods of business organization is undeniable.

Since the conditions in the market have changed and the rate of change has increased, entrepreneurial situational approaches are now more important than in the past. Jack Welch, former CEO of General Electric, was an early supporter of this approach. He used an entrepreneurial approach (creating a crisis to create opportunities) to restore General Electric, which is now one of the largest and most recognized companies in the world. "What we persistently tried to build is a company that would combine the enterprise with the influence and resources of a large company – in the structure of our big company, but with a thirst for knowledge, an irresistible desire to share our own experience and passion for ongoing action – in the spirit of small company" (Walters et al., 1995).

In today's markets, such a powerful force as the Internet makes a huge contribution to changing the nature of today's business environment, thus, on one hand, creating huge opportunities for "hungry" companies that have a great desire to achieve results, and on the other, driving a lot of other companies that do not have a clear vision of the future into considerable confusion. Some of them are frightened by the Internet and see it as a threat, while others are trying to learn how to fully use its opportunities to achieve their own advanced results. As with other market changes and increasing opportunities, new strategies, tactics, actions, skills are important here, while entrepreneurial interests remain unchanged.

The provision on the relationship between the global competitiveness of high-tech corporations and the company's innovative activity is quite obvious, since it is itself a key factor in creating high-tech products and services, which are the subject of export contracts. However, the question arises about determining the volumes of companies' innovative potential. There are different views on this problem, which can be divided into three groups.

Some researchers associate the innovation potential with the human factor, since the company's employees, of research and marketing services, primarily, create and market high-tech products (National Competition Policy and International Competitiveness, 2013). However, in the absence of a single universally recognized method for assessing the human factor, it is impossible to relate it quantitatively to the innovative, and, consequently, to the export potential of the company.

The second group of concepts is based on the definition of the corporation's patent potential as the most important component of intellectual property. Interesting publications of both foreign and domestic specialists in this regard, have been published recently (Cortenraad, 2000). However, so far, attempts to determine the patent potential of leading corporations have not been successful, and patents themselves do not protect intellectual property rights and do not guarantee them from the pirated products production.

The third group of concepts connects the corporate innovation potential with the costs of R&D, which are contained in the financial statements of corporations and determine the amount of

resources for various types of innovation (Li, 2013). The advantages of this concept are related to the following features. First, it is based on a logical connection between innovation activity as a base factor and high-tech exports as a result of this factor. Secondly, the cost of R&D can be quantified in dynamics, can be compared between different TNCs. These costs are shown in Table 1.

However, the question arises: to what extent the costs of R&D and the effectiveness of high-tech companies' innovative activities are associated. In 2014-2016 Booz&Co carried out a survey of more than 450 innovative leaders from more than 400 companies and 10 industries to determine the most innovative company in the world and concluded that those companies that invest more in research and development are not always the most innovative, which again proves the need for effective innovation management.

Table 1. The most innovative high-tech companies in the world in 2014-2016

Company	2014			2015			2016		
	R&D costs, million dollars	R&D costs, income %	Rating position	R&D costs, million dollars	R&D costs, income %	Rating position	R&D costs, million dollars	R&D costs, income %	Rating position
Apple	1,333 (81)	3,1%	1	1,782 (70)	2,7%	1	2,4 (53)	2,2%	1
Google	2,843 (44)	12%	2	3,762 (34)	12,8%	2	5,2 (26)	13,6%	2
Samsung	3,300 (35)	2,1%	9	3,939 (32)	2,6%	7	9,0 (6)	6,0%	4
GE	9,010 (2)	15,4 %	4	8,714 (4)	14,0%	4	4,6 (30)	3,2%	5
Microsoft	5,820 (12)	6,1%	6	6,026 (15)	6,0%	5	9,0 (5)	12,9%	6
Toyota	6,002 (10)	5,5%	5	7,873 (7)	5,9%	9	9,9 (1)	4,2%	7
P&G	2,044 (58)	2,6%	7	1,950 (61)	2,5%	8	2,0 (72)	2,4%	8
IBM	7,822 (4)	3,8%	8	8,546 (6)	3,9%	6	6,3 (17)	5,9%	8
Amazon	-	-	-	-	-	-	2,9 (48)	6,1%	10

The results of the survey are confirmed by the fact that a dozen of the largest export-oriented innovators have significantly outperformed the top ten companies spending the most funds for research and development for the main financial indicators (Figure 1). Only three companies – Samsung, Microsoft and Toyota are included in both top-10 ratings, which once again proves that

the success in implementing innovation activities of export-oriented companies depends not on how *much* the company spends, but on *how* it spends money. At the same time, the leader of the expenses' rating is R&D, Toyota took the 7th place according to the survey results.

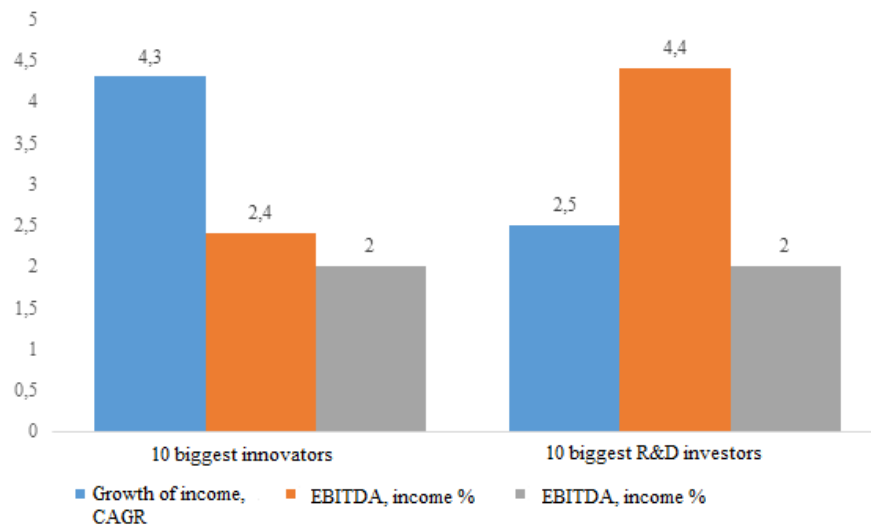


Figure 1. Comparison of financial indicators of the 10 largest high-tech innovators and 10 largest investors in R&D in 2016.

The analysis conducted above allows us to conclude that the size of R&D financing is not directly related to innovation, and therefore to high-tech potential, as evidenced by the divergence of the companies' ratings in Tables 1 and 2. According to many experts, the indicators of Table 2 are more objective, since they are closely related to the market capitalization of TNCs, which is shown in Table 3. It would seem that the decision regarding the connection of innovation potential with the level of competitiveness is reduced to the identification of correlation coefficients. Unfortunately, the lack of statistical data on the structure of competitive TNC operations in the context of the level of manufacturability does not allow this.

Table 2. The world's largest companies for research and development costs in the period from 2009 to 2016

Rating position								Company	R&D costs, million US dollars								Headquarters location	Field
09	10	11	12	13	14	15	16		16	15	14	13	12	11	10	09		
5	3	1	1	1	4	6	1	Toyota	9,985	46	7,822	8,994	8,386	7,691	7,178	7,025	Asia	Automobile industry
18	16	14	11	9	6	3	2	Novartis	9,690	70	7,469	7,217	6,430	5,349	4,846	4,207	Europe	Health care
19	19	16	8	3	1	1	3	Roche Holding	9,496	46	9,120	8,168	6,985	5,262	4,578	4,067	Europe	Health care
2	2	2	3	6	5	2	4	Pfizer	9,194	13	7,739	7,945	8,089	7,599	7,442	7,684	North America	Health care

1	8	7	7	4	2	45	Microsoft	9	8,714	9,010	8,164	7,121	6,584	6,184	7,779	North America	Software and Internet	
17	11	11	9	12	10	76	Samsung	9	7,873	6,002	6,413	6,536	5,924	5,428	4,320	Asia	Computers and electronics	
20	22	19	17	23	14	57	Merck	8,58	8,591	5,613	4,806	4,883	4,783	3,848	4,010	North America	Health care	
12	12	12	14	14	13	11	8	Intel	8,46	5,576	5,653	5,722	5,755	5,873	5,145	4,778	North America	Computers and electronics
6	5	6	2	5	11	99	General Motors	8,16	9,62	6,000	8,000	8,100	6,600	6,700	6,500	North America	Automobile industry	
15	17	18	4	2	3	8	10	Nokia	7,87	7,778	8,240	8,733	7,727	4,892	4,753	4,640	Europe	Computers and electronics
13	13	15	19	17	15	14	11	Volkswagen	7,76	6,089	5,359	5,429	4,757	5,312	5,071	4,719	Europe	Automobile industry
10	7	4	5	7	7	10	12	Johnson & Johnson	7,56	6,844	6,986	7,577	7,680	7,125	6,312	5,203	North America	Health care
-	14	13	12	10	8	16	13	Sanofi	6,75	5,838	6,391	6,695	6,208	5,571	5,025	-	Europe	Health care
-	15	17	18	20	18	12	14	Panasonic	6,66	6,176	5,143	5,152	4,850	4,992	4,989	5,726	Asia	Computers and electronics
16	20	20	16	16	19	17	15	Honda	6,65	7,04	4,996	5,603	5,142	4,765	4,508	4,352	Asia	Automobile industry
11	10	8	10	11	9	13	16	Glaxo SmithKline	6,36	6,127	6,187	6,425	6,476	6,351	5,700	5,200	Europe	Health care
9	9	10	13	13	12	15	17	IBM	6,36	6,026	5,820	6,337	6,153	6,107	5,842	5,673	North America	Computers and electronics
-	-	-	22	19	17	19	18	Cisco Systems	5,85	5,273	5,208	5,153	4,500	-	-	-	North America	Computers and electronics
4	4	5	-	-	-	26	19	Daimler	5,84	4,286	-	-	-	6,678	7,019	7,032	Europe	Automobile industry
-	-	25	15	18	22	18	20	AstraZeneca	5,55	5,318	4,432	5,179	5,162	3,902	-	-	Europe	Health care

The official international list of high-tech industries for international research was compiled by the Organization for Economic Cooperation and Development for the first time in 1997, based on the data analysis from 10 countries around the world for the period of 1973-1992. Over time, in 2012, the data was reanalyzed, but in the context of the analysis of 12 countries (USA, Canada,

Japan, Denmark, Finland, France, Germany, Ireland, Italy, Spain, Sweden, United Kingdom) for the period of 1991-1999. The OECD has determined the companies' costs for R&D measured as value-added and company expenses for R&D measured for output flow as the main criteria of this methodology, which should determine the level of technology industries.

The division of industries into super-high-technology, high-tech middle-level, middle-level low-tech and low-tech was classified according to the level of these indicators. According to the results of the research, the OECD relegated those industries whose indicators were higher than average for both criteria to the high-tech industries. Those industries, whose cost is more than 5%, and the cost of R&D, measured for output flow which is more than 2%, are classified as high-tech.

In particular, according to the latest calculations by the OECD specialists (based on data for 1991-1999 for 12 OECD countries), in the above mentioned sectors, R&D costs measured as value-added are 17.9-29.1%, and R&D costs measured for output flow – 7,2-10,5%.

In order to implement our own comprehensive assessment of the competitiveness level of companies that, according to the OECD classification were assigned to high-tech industries, we conducted a study in which we analyzed the characteristic indicators, in our opinion, for companies in these industries. Using the graphical estimation method of competitiveness assessment, the so-called "polygon" of competitiveness is constructed, which illustrates a comprehensive assessment of the competitiveness level of selected for the analysis companies.

In our opinion, the main indicators that should be taken into account when assessing the level of competitiveness of high-tech companies are, first of all, the R&D costs, the share of high-tech exports, the number of patents, added value, market capitalization, and, according to the OECD methodology, the cost ratio on R&D to create added value and sales volumes.

This analysis was carried out using a number of financial results of the analyzed companies, published in their annual reports, reports of leading rating agencies and other statistical sources. For comparison and detection of the trend towards changes, we analyzed data for 2014 and 2016.

To conduct a qualitative analysis of the competitiveness level, we have chosen leading companies in each of the high-tech industries. Having calculated the main indicators of these companies, which are covered in Tables 3 and 4, we compiled a summary table of the initial data on the level of their competitiveness (Tables 5, 6 and 7), which are presented below, necessary for constructing a "polygon" of competitiveness (Figures 2 and 3).

Table 3. Rating of the world's largest companies in terms of market capitalization

Company	Country	Field	Position +/-	2014		2016	
				Position	Market capitalization, bln. \$	Position	Market capitalization, bln. \$
Apple Inc	USA	Technologies	32	1	496	33	94
Exxon Mobil Corp	USA	Oil and gas	(1)	2	416	1	337
Google Inc	USA	Technologies	19	3	409	22	110
Microsoft Corp	USA	Technologies	2	4	318	6	163
Berkshire Hathaway Inc	USA	Finances	7	5	286	12	134
Roche Holding AG	Switzerland	Health care	12	6	266	18	119
Johnson & Johnson	USA	Health care	1	7	261	8	145
General Electric Co	USA	Production sector	16	8	256	24	107
Wells Fargo & Co	USA	Finances	46	9	244	55	60
Nestle SA	Switzerland	Consumer goods	5	10	244	15	129
Wal-Mart Stores Inc	USA	Service industry	(8)	11	242	3	204
Royal Dutch Shell PLC	Great Britain	Oil and gas	(3)	12	238	9	139
PetroChina Co Ltd	China	Oil and gas	(11)	13	225	2	287
Novartis AG	Switzerland	Health care	15	14	224	29	100
Chevron Corp	USA	Oil and gas	(4)	15	220	11	135
JPMorgan Chase & Co	USA	Finances	12	16	215	28	100
Procter & Gamble Co	USA	Consumer goods	(7)	17	213	10	138
Samsung Electronics Co Ltd	South Korea	Consumer goods	35	18	209	53	61
Pfizer Inc	USA	Health care	17	19	205	36	92
HSBC Holding PLC	Great Britain	Finances	23	20	199	43	79

Table 4. Indicators of competitiveness of high-tech industries in 2014

Indicators	Apple (billion US dollars)	Cisco (billion US dollars)	GE (billion US dollars)	Microsoft (billion US dollars)	Novartis (billion US dollars)	Boeing (billion US dollars)	KLA encor (billion US dollars)
R&D costs	6,0	6,3	5,3	11,38	9,9	3,05	0,54
Market capitalization	668	145	275	350	224	100	10
Patent potential	1775	910	2086	2814	287	798	90
Share of high-tech exports (place)	1	14	12	4	53	34	69
Added value	70,537	27,769	7,28	59,899	39,175	14,079	1,697
R&D costs/ Creation of added value	8,5	22,69	7,9	18,99	25,27	21,66	31,82
R&D costs/Sales	3,3	13,37	3,6	13,11	17,07	3,3	18,62
Sales amount	182,8	47,1	148,6	86,8	58,0	90,8	2,9

Table 5. Summary table of the competitiveness level of high-tech industries in 2014

R&D costs	Apple	Cisco	GE	Microsoft	Novartis	Boeing	KLA Tencor
Market capitalization	0,53	0,55	0,47	1	0,87	0,27	0,05
Patent potential	1	0,22	0,41	0,52	0,34	0,15	0,02
Share of high-tech exports (place)	0,63	0,32	0,74	1	0,10	0,28	0,03
Added value	1	0,86	0,88	0,96	0,47	0,66	0,33
R&D costs/ Creation of added value	1	0,39	0,95	0,85	0,56	0,2	0,03
R&D costs/Sales	0,18	0,72	0,19	0,7	0,92	0,18	1
Sales amount	0,27	0,71	0,25	0,59	0,79	0,68	1
R&D costs	0,66	0,54	0,56	0,8	0,58	0,36	0,35

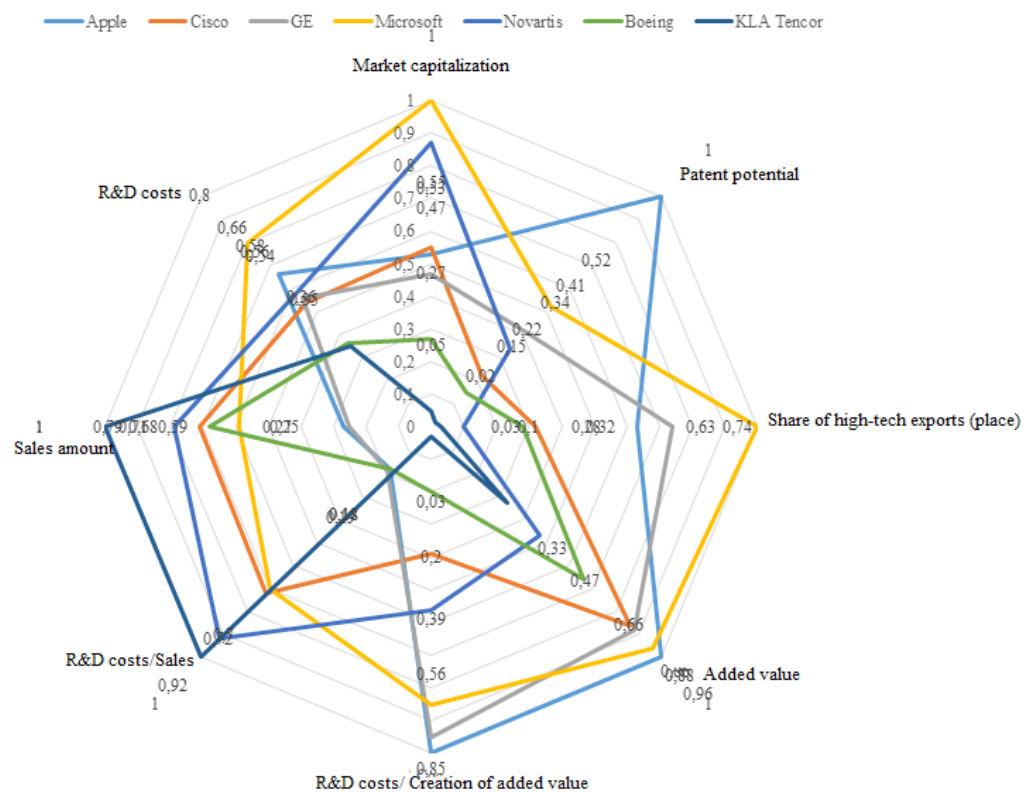


Figure 2. Polygon competitiveness of high-tech industries in 2014

Table 6. Competitiveness indicators of high-tech industries in 2016

Indicators	Apple (billion US dollars)	Cisco (billion US dollars)	GE (billion US dollars)	Microsoft (billion US dollars)	Novartis (billion US dollars)	Boeing (billion US dollars)	KLA Tencor (billion US dollars)
R&D costs	1,33	5,27	3,3	9,01	7,47	6,51	0,37
Market capitalization	84,20	91,68	142,40	160,02	93,39	28,93	3,31
Patent potential	289	913	1379	2929	69	532	70
Share of high-tech exports (place)	1	32	17	4	51	60	73
Added value	17,22	23,09	80,86	46,28	32,92	11,92	0,66
R&D costs/ Creation of added value	7,72	22,25	4,08	19,47	22,69	54,61	56,64
R&D costs/Sales	3,64	14,59	2,10	15,42	16,56	9,53	24,41
Sales amount	36,54	36,12	156,78	58,44	45,10	68,28	1,52

Table 7. Summary table of the competitiveness level of companies in high-tech industries in 2016

Indicators	Apple	Cisco	GE	Microsoft	Novartis	Boeing	KLA Tencor
R&D costs	0,15	0,58	0,37	1	0,83	0,72	0,04
Market capitalization	0,53	0,57	0,89	1	0,58	0,18	0,02
Patent potential	0,1	0,31	0,47	1	0,02	0,18	0,02
Share of high-tech exports (place)	1	0,68	0,83	0,96	0,49	0,4	0,27
Added value	0,21	0,29	1	0,57	0,41	0,15	0,01
Share of R&D costs in total expenses of the company	0,15	0,60	0,09	0,63	0,68	0,39	1
Share of R&D costs in creation of surplus value	0,14	0,39	0,07	0,34	0,40	0,96	1
Integrated index	0,33	0,49	0,53	0,79	0,49	0,43	0,34

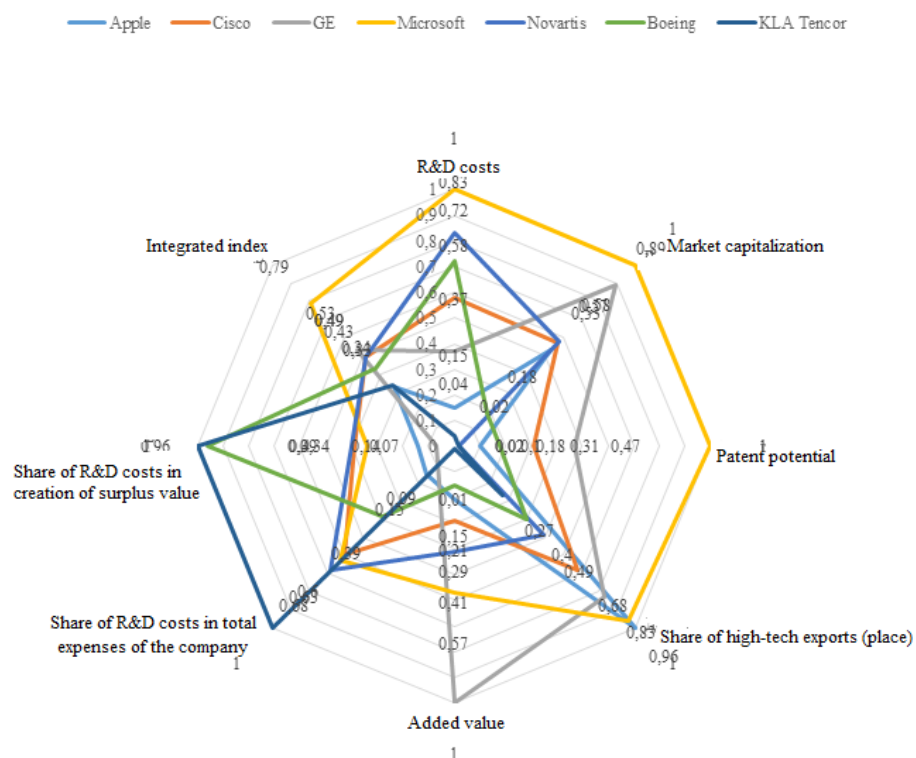


Figure 3. Polygon competitiveness of high-tech industries in 2016

A study of the competitiveness level of leading companies in high-tech industries has shown that the R&D cost of these companies, measured as value-added range from 8.5 to 31.82%. In turn, R&D costs, measured for output flow – from 3.3 to 18.62%, which allows us to conclude that the companies analyzed by us really belong to the high-tech and high-tech middle-level, according to

the classification of industries in compliance to the level of their manufacturability developed by the OECD.

The evaluation of the effectiveness of high-tech companies management, based on the analysis of a group of key high-tech industries inherent to companies and indicators, allows us to conclude that the greater the share of R&D costs in creating added value and in the company's total sales, which characterizes the high level of products embodied in the technologies' products, the more high-tech is the company and, accordingly, the industry in which it operates.

At the same time, as the data of these tables show, there is no clear correlation between how much companies spend on R&D and their financial efficiency. An exemplary example here is Apple, which spends one of the smallest sums on R&D, among the companies we surveyed, while occupying the first place among the most innovative companies as of 2016 and a similar place in terms of market capitalization, which is a clear characteristic of the success of the joint-stock company. Having increased the volume of market capitalization almost eight times over the past 5 years, the company has solely headed the list.

Apple's spending on R&D does not mean that the company is interested in R&D less than other active players in the consumer electronics market. On the contrary, Apple recognizes that investing in the research and development of new devices is a critical area of its activities. This indicates reasonable spending and is driven by the company's efforts to concentrate efforts on projects that are critical to the success of the company in the future, which should be an example for many companies.

As we can see, the amount spent on research and development is a key indicator necessary to determine the level of technology in the industry, because it is one of the main characteristics of the scientific and technological development of the company. Based on the results of research and development, key decisions are made in high-tech business. Increasing importance is played by R&D for marketing, because companies monitor the latest developments of competitors and the needs of consumers in order to adapt their own research. At the same time, R&D is one of the most difficult areas from the company's management point of view, because the distinctive feature of most studies is the difficult predictability of the final results of research and their possible commercialization. As a result, the high cost of R&D does not always guarantee a large profit or a large market share.

The overall picture of high-tech companies spending on R&D by industries for 2016 and 2015 is shown in Figures 4 and 5.

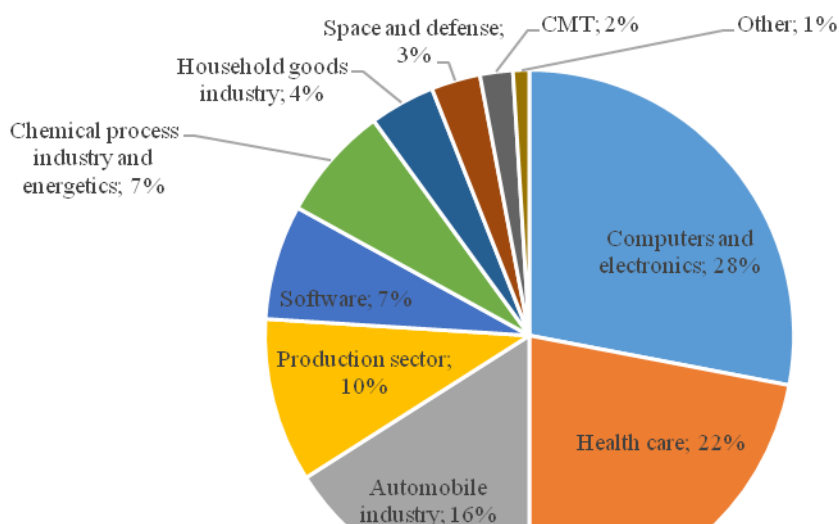


Figure 4. Costs of companies on R&D by industry in 2015

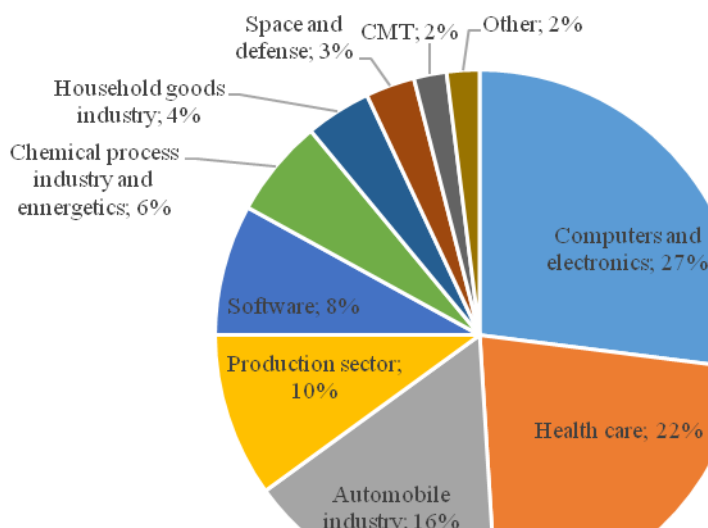


Figure 5. Costs of companies on R&D by industry in 2016

As can be seen from the diagrams, the three largest industries in the costs of research and development are high-tech and cover more than 60% of the total cost of all industries and are unchanged for two years.

Compared to 2015, in 2016, R&D expenditures increased 1.4%, which is equivalent to \$ 9 billion and amounted to \$ 647 billion, compared to \$ 638 billion in 2015.

Another of the characteristic indicators for a high-tech company, which we believe was appropriate to analyze, is the patent potential. Indeed, the efficiency of the development of high-tech industries is increasingly dependent on its intangible assets, which play an incredibly significant role. It is from the effectiveness of the intellectual property use of companies that its level of innovation depends and, as a result, the efficiency of the activity. The number of patents in the company and the ability to commercialize them can act as an indicator of such activity. It is as a result of the technologies commercialization that innovation takes on a reality – when protected intellectual property commences to work commercially. To a large extent, it is the number of patents and the effectiveness of their commercialization that determine the innovativeness of the company and is the measure of the company's development as a whole. The data analyzed by us showed that Microsoft is the leader in this indicator, and the figures of General Electric and Apple are quite significant. Comparing the data of 2016 according to the data of 2015, we see that the companies of General Electric and Microsoft in terms of the patents' number retained leadership, although they decreased their performance somewhat, while Apple, on the contrary, patented six times more inventions than in 2015, and quickly became one of the leaders, which once again confirms that the recombination of leaders in high-tech industries is very fast and only those companies that have been able to recognize the future needs of the market and react quickly to them, are becoming successful.

Effective management of the competitiveness of high-tech companies in such a dynamic environment requires the construction of a system that will allow companies to take into account all important elements of ensuring competitiveness and build effective business processes in the company.

To this end, for the first time, we developed the TNC competitiveness management system for high-tech business (Figure 6), in which we tried to cover all the most important aspects that run like a golden thread on the way to achieving the leadership of a high-tech company.

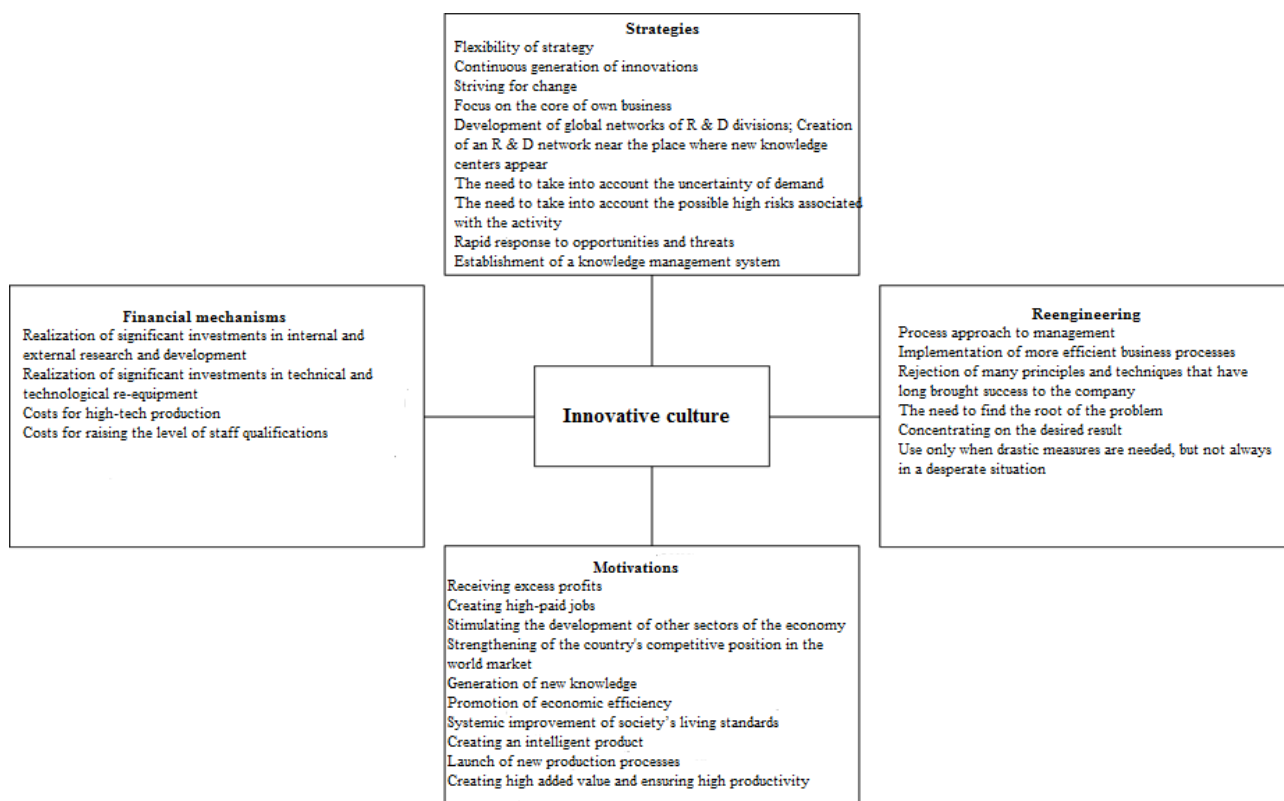


Figure 6. TNC's competitiveness management system for high-tech businesses

In our opinion, the central element in the activity of a high-tech company is the presence of a developed innovative culture. Innovative culture should be the central part of the high-tech company's DNA. Continuous work in the direction of changes, the receptivity of company employees to new ideas, the willingness and opportunity to implement them, and thereby ensure a qualitative growth in the company's performance – all this forms a positive innovative culture of the company and must be developed in companies that aspire to leadership. If the corporation is striving for the factor of global corporate leadership, it must first of all measure on the innovation imperative by justifying and implementing key innovative priorities (Shin, 2014b). That is why to achieve global leadership, leading corporations focus on innovative development, which not only requires large investments, but also involves high risks. On the other hand, corporations do not pay enough attention to innovations, they quickly lose their positions. This is convincingly evidenced by numerous studies by consulting and auditing companies on the relationship of transnational corporations to innovation. We believe that a developed innovative culture that gives impetus to the synthesis of new ideas, the creation of new models of actions and values, is a strategic resource of the 21st century. In turn, it is a key impetus to the development of innovative strategies for the companies' development. The strategies of high-tech companies are somewhat different from the strategies of companies in other industries. The key difference is the lack of static strategies, because the dynamics of the market and the competition on it are quite high. A distinctive feature of

the business strategy of a high-tech company is that technology is its key element. Technology, of course, is not the only strategic element, as market, financial and production factors also have a significant impact on the formation of the company's business strategy, but forming a strategy without paying close attention to the opportunities and threats of technology-oriented technologies in high-tech companies, is the same as assembling a symphony orchestra without its string group.

An integral part of the system for managing the competitiveness of high-tech business is also, in our opinion, the motivation of companies.

Here you should ask: what motivates companies to be high-tech? First and foremost, high-tech companies, introducing effective innovations before their competitors, receive super-profits, which makes it possible to break away from competitors and consolidate leadership for a certain time. High-tech companies have a number of other motivations that encourage them to introduce innovations, including the creation of high added value and high labor productivity, the creation of an intellectual product, the generation of new knowledge, the launch of new production processes, the promotion of economic system's efficiency and the improvement of society's living standards, the introduction of highly paid jobs, the strengthening of the country's competitive position in the world market and the like.

No less important element of the system is, in our opinion, reengineering, which implies the rejection of many principles and techniques that have long brought success to the company and, by focusing on the desired result, building effective business processes in the company.

Finally, the last, in our opinion, element of the competitiveness management system of high-tech companies are financial mechanisms, primarily for making significant investments in research and development, the costs of raising the level of skills of the company's employees, as well as increasing involvement and ensuring the dominance in the employment structure of technologically oriented specialists who are able to generate new knowledge, produce, adapt and use the newest technologies. Financial management permeates all links of the financial system and is an important part of the management structure in the market. The basis of financial management is a financial policy based on the analysis of factors for the effective use of financial resources in the short and long term and determines the direction of the financial services.

Today, all companies use technology in the course of their activities. Therefore, to a certain extent, each company is technological. However, only some companies create technological products, processes and services. For them, technology is the key, and often the key is a competitive tool. Managers in such companies face challenges and opportunities, which are usually the result of technology dependence.

The above five-component model of competitiveness management is inherent in medium-high-tech TNCs. As for super high-tech TNCs, such a system has not yet been described in the

literature, although the companies of this group use a large number of various tools. Leading global corporations have accumulated vast experience in strengthening their competitive positions in the world high-tech markets by not only creating and manufacturing these products, but also exporting them to various countries. However, this experience is known only to an extremely narrow circle of specialists, mostly foreign. At present, in Russia, the state has practically withdrawn from solving the problems of science and high-tech industries, as well as exporting their products and services, giving everything to the market, and extremely weakly supports knowledge-intensive industries.

It should be noted that a significant barrier to the construction of a complete model for managing the competitiveness of high-tech companies is a serious divergence of specialists' views on methodological approaches to constructing such a model. Foreign specialists focus on applied aspects and specific tools for managing the competitiveness of TNCs. As for domestic researchers, they focus only on one instrument – mergers and acquisitions.

The globalization of the world economy has created an extremely competitive environment in which most TNCs consider the participation in the process of transnational mergers and acquisitions as a crucial condition for the growth of their economic power and victory in today's competitive struggle.

Of course, mergers and acquisitions are an extremely important direction for increasing the competitiveness of TNCs, including those in high-tech ones. We can recall the experience of companies such as General Electric, which carried out more than a thousand such transactions during the management of Jack Welch (1981-2001). The unfortunate merger of the automobile giants Daimler and Chrysler was widely publicized at the turn of the millennium. However, in addition to mergers and acquisitions, there are a large number of instruments for managing competitiveness. In this connection methodological questions arise: how to systematically present or simulate them.

A significant number of researchers are following the way of using different indices of TNC functioning, which are compiled by various organizations and published by the mass media.

The most constructive in this regard is the structurally functional matrix approach, which is based on the global competitiveness management model of high-tech transnational corporations, identifying key management tools to strengthen the competitive positions of companies that allow to specify the use of basic management functions (strategic forecasting and dominance, organization, processes, metrics, remuneration, training, staff) in the context of achieving priority (strong leadership positions in the relevant sectors, mental and business integration, strategic coherence, creative values, neutralization of organizational antibodies, network activity, competitive-value parameterization). This model is presented in Table 8.

Table 8. Structural-functional matrix of the main instruments for managing the global competitiveness of super-high-tech TNCs

Priority competitive objectives	Modernized business functions of TNCs							
	Models	Strategies	Structures	Processes	Metrics	Remuneration	Training	Culture
Strong leadership market positions	Hypercompetition	Winning	Innovative integration	Generating ideas	Competitive Positions	Work preservation	Models: act – learn	Power transparency
Mental and business integration	Radical innovation	Enhanced competitiveness	Innovative radical	Selection of ideas	Innovative portfolio	Incentive contracts	Internal training	Corporate values
Strategic coherence	Non-radical innovation	Focusing	Corporate venture	Experiment	Project resources	Value and innovative levers	Building	Rules of business conduct
Creative values	Value propositions	Synergism and creativity	Focus on creativity	Rules for creating a prototype	Private evaluation	Internal satisfaction	Competences	Communications
Elimination of organizational barriers	Experimental innovation	Outsourcing	Structured platform	Portfolio plan	Sustainability of values	Team reward	External training	Readiness for change
Networking activities	Incremental innovation	Value chain	Strategic alliance, mergers and acquisitions	Conclusion of the transaction	Investment risks	Horizontal compensation	Flexible structures	National values
Competitive and value parameterization	Technological innovation	Differentiation	Value-group focusing	Commercialization	Profitability of investing	Dependence of "salary-productivity"	Network internships	Ethical codes

As can be seen from this table, the horizontal lines contain the components of the competitiveness of high-tech TNCs on the basis of innovation activity, and the vertical columns reflect the eight modernized business functions of TNCs. At the intersection, we can see the tools for managing the global competitiveness of super-high-tech TNCs, for which the science intensity of the commodity output is no less than 6%, and in the added value it is no less than 12%.

The advantages of this matrix are in the ability to combine qualitative and quantitative approaches in the choice of ways to increase the competitiveness of TNCs. If, for example, TNC management chooses strong leadership positions in the super-high-tech sector (line 1 of the table), then in this case it will be necessary to use the tools of hypercompetition (the "model" column) the "play to win" strategy in the terminology of the Wharton School of Business (USA), innovative integration as the basis of the structure's formation, etc. to the creation of "power transparency" (column "culture") ultimately.

Let us consider in more detail the priority competitive objectives. Strong leadership market positions. This applies not only to companies in general, but to senior management above all, as a necessary condition for achieving success in innovation. S. Jobs in Apple, B. Gates in Microsoft, A. Lafley in Procter & Gamble, J. Ollila in Nokia are classic examples of CEOs leading their management teams in the company as a whole to the highest levels of competitiveness. The signs of these positions according to the latest surveys of the Financial Times have three components:

- the potential of the management team as the most important factor for new investments (95% of respondents);
- market advantages in their high-tech sector by demonstrating their own business model (72% of respondents);
- technological leadership in the balance of the technological portfolio (68% of respondents).

Mental and business integration. It consists of two processes: technological (research, creation or development of a new product) and strategic (definition of a business model). In doing so, we must weigh on internal factors (technical capabilities, organizational capabilities, the success of the current business model, financing, preferences of top management) and external factors (opportunities in the environment, industry structure, competition, technological change). An example of a successful combination of these factors is the activity of the pharmaceutical corporation Pfizer in 2002, which managed to achieve a reduction in the level of cholesterol in 44 million people on the planet due to the daily use of Lipitor. This success motivated the increase in annual spending on R&D to 35 billion dollars.

Strategic coherence means a combination of innovative strategies, through which the company expects to achieve a strengthening of competitive positions, in particular, due to the past radical, current incremental innovation. In the first case, arises the "play to win" situation as

Webvan Corporation has successfully done on the Internet in 2010-2015, and in the second, the situation is "play in order not to lose" when Exxon Mobil corporation cut research expenditures on exploration of new oil fields and gained serious competitive advantages. Sometimes it is necessary to carry out various transitions from one strategy to another, and vice versa, as GE did during the time of J. Welch's leadership in 1981-2001 by introducing a fee for business units of research. The experience of Starbucks was equally successful in using the situation "play in order not to lose" by creating an association of brands with other products that differ from coffee (in particular ice cream) in order to maintain a strong market position.

Creative values are important to consider when looking for a reasonable balance between creative activity and the process of creating value. The hobby of only one component threatens the company with the loss of competitive positions. In this regard, the experience of Canon Corporation of the creation of innovative platforms to enhance its optical and electronic capabilities is worthy of attention, as well as the production of precision instruments on existing facilities. Cisco is successfully using its own Innovation Council to ensure this balance, as well as a variety of partnerships. At the same time, Asian managers highly appreciate the training of personnel and the protection of knowledge, unlike Europeans. American leaders are on middle positions.

Conclusions

The elimination of organizational barriers to the strengthening of the company's competitive position is carried out mainly through the creation of a culture that promotes innovation. Strange as it may seem, however, the FedEx Corporation was the most successful in this regard – the world leader in cargo transportation. Competitive organizational culture unites five links: central – dedicated employees and four peripheral: captured employees, developed employees, communicative employees and confident employees. Each of these links has its own internal structure and corresponding mechanisms. Equally interesting is the experience of Hewlett Packard, which encouraged the adoption of risky solutions in many ways, including impromptu commemorations of failed projects, on which the team mourned failure, lauded attempts, considered the lessons that were made from these attempts, and focused on vital issues of current and future projects that required attention. Like on the real commemoration, the main idea was this: "This is life, everything happens. We must continue to move forward".

Networking focuses on creating innovative partnerships outside the company. The experience of Chevron Texaco in creating an inter-firm incubator, including the R&D department, the technical management service and the external venture or sponsorship fund, is well known in this respect. Incubators fill the gaps between technology, business operations and financing by accelerating the creation of additional costs through one or more mechanisms:

- knowledge and understanding of advanced external technologies;
- acceleration of the domestic technology market;
- accelerated growth of the consumer market;
- increased stream of transactions;
- building networks;
- creation of value through equity stakes;
- improving the image of investors and employees.

As GE convincingly proved, these mechanisms allow us to strengthen the influence of the organizational structure on every aspect of competitiveness. This is the main part of the variable "how" in the equation: How do you compete = What do you innovate.

Competitive-value parameterization means the determination of such remuneration, which, on one hand, corresponds to the contribution of participants in the process of strengthening the company's competitiveness, and on the other hand, to the size of the remuneration budget and avoidance of risks. At the same time, the experience of such companies as Apple, Mobil, Citybank testifies to the expediency of using the following types of economic compensation:

- the expected level of salaries, which should take into account additional skills, knowledge and proficiencies;
- form and the productivity-salary curve of the ratio;
- the timing for incentives, depending on two factors: retention of key employees and a period of time during which the value of radical innovation is realized;
- forms of remuneration payment.

It is important to weigh the fact that external compensation negatively affects internal motivation. Finally, a specific system for managing global competitiveness emerged. In the ideal case, the higher the significance of the criterion, the higher the efficiency should be, that is, the indicators should be in the middle zone. The developed model allows us to draw a number of conclusions. First, the quality of indicators' dispersion is clearly in favor of "hidden champions" (9 vs 3). Secondly, the priority of the indicators is significantly different. If for the "hidden champions" the most important are the motivation of the employees and the commitment, then for TNC – competitive advantages and self-reliance. Thirdly, management style and global orientation are the least priority. Fourthly, in "hidden champions" there is only one indicator remote within one square, while in TNC there are three indicators within one square and three indicators within different squares. All this testifies to the higher efficiency of the global competitiveness management system of "hidden champions" in comparison with large and diversified TNCs.

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