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Formation and Development of High-Technology Export Corporate Potential*

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ABSTRACT. This paper investigates the essence and peculiarities of high-Technology products exports in conditions of global competition with performed classification of its models on a corporate level. Peculiarities of corporate motivation of exporting high-technology products have been determined. Interconnection between innovation management system in transnational corporations and their capabilities of strengthening their competitive positions on world markets of high-technology products has been shown. Tendencies of fixing studies and developments during the last decade of leading companies, along with their influence on corporate innovative potential have been studied. On the example of aerospace sector of Ukraine, possibilities of strengthening the influence of high-technology export on rising of national economy international competitiveness have been determined. The need has been proved, and the ways have been shown for attraction of international investments into high-technology sectors of Ukrainian economy through improvement of business conduct area, defense of intellectual property rights, and development of cooperation between national and transnational companies. Directions of use of integration factors of rising of volumes of export of high-technology Ukrainian products on the basis of developing cooperation of national enterprises with Russian partners have been shown.
KEYWORDS. High-technology products, export, high-technology export, transnational corporations, innovative activities, research and development, corporate potential, export models, export motivation, export cooperation, global competition.

Introduction

Activities of transnational corporations in different branches are a subject matter of research conducted by numerous specialists both from our country and abroad. In particular, let us note

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* This article was translated from its original in Ukrainian.

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the classic work by S. Robock and K. Simmonds[2], which has numerous editions. Another book popular not only among foreign but also among Post-Soviet readers is one written by R. Griffin and M. Pastey[3]. The popular textbook by S. Pivovarov and L. Tarasevych shall be marked out as one of the most popular book by Russian authors[4]. Editions of famous specialists of Institute of International Relations of Taras Shevchenko National University of Kyiv, V.A. Vergun and O.I. Rogach, are also well-known in Ukraine[5]. Subject areas of transnational corporations functioning and researchers State Higher Educational Establishment 'Kyiv National Economic University named after Vadym Hetman', in particular, V.A. Biloshapko[6], I.G. Panchenko[7], L.V. Rudenko-Sudareva, don't stay aside as well[8]. These and the other papers deal with key activities of transnational corporations, including the sphere of international trade, in particular, export of own high-technology products.

Publications of different nature having proper demand and authority in foreign countries should also be taken into consideration. These publications throw light upon managing experience of leading global corporations, including trade, and their authors are their former directors, real business leaders of the end of the last century and the beginning of this one. The most famous and popular works, also completely accessible for national readers, include the following works by directors: Jack Welch (General Electric)[9]; Louis Gerstner (IBM)[10]; Steve Jobs (Apple)[11]; Kon-

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[2] *Robock Stefan H.* International Business and Multinational Enterprises / Stefan H. Robock, Kenneth Simmonds. Seventh Edition. – Homewood, Illinois: IRWIN, Inc, 2014. – 777 p.

[3] *Griffin R.* International business. 4th ed. / R. Griffin, M. Pastei / Translation from English, edited by A.G. Medvedev. – SPb.: «Peter», 2006. – 1088 p. – (Series "MBA Classics"). [In Russian].

[4] *Pivovarov S.E.* International management: textbook for higher educational establishments. 4th ed. / edited by E. Pivovarov, L.S. Tarasevych. – SPb.: «Peter», 2008. – 720 p. [In Russian].

[5] International business: textbook / Edited by. Prof V.A. Verguna. – K.: VAD EX, 2014. – 810 p. [In Ukrainian]; Rogach O.I. Transnational corporations: textbook / O.I. Rogach. - K.: Publishing and Printing Center "Kyiv University", 2008. - 400 p. [In Ukrainian].

[6] *Biloshapka V.A.* Managerial effectiveness in the development of international companies: monograph / V.A. Biloshapka. - A.: Graphics & Printing, 2007 = 236 p. [In Ukrainian].

[7] *Panchenko E.G.* International management: guidance for independent study of the subject. / E.G. Panchenko. - K.: KNUU, 2004. - 468 p. [In Ukrainian].

[8] *Rudenko L.V.* Transnational corporations: guidance for independent study of the subject / L.V. Rudenko. – K.: KNEU, 2004. – 227 p. [In Ukrainian].

[9] *Welch J. Jack:* The Essence: Translation from English. / J. Welch, D. Byrn. - M.: «Publishing House AST" LLC; "Tranzitkniga" LLC, 2004. - 474 p. [In Russian]; J. Welch. Winner / J. Welch and Suzy Welch: Translation from English. Yu. Yablokova. - M.: AST: AST MOSCOW: KHRANITEL, 2007. - 443 p. [In Russian].

[10] *Louis Gerstner.* Who Says Elephants Can't Dance? IBM Corporation Renaissance: A View from the Inside / Translation from English. M. Shalunova / Louis Gerstner. - M.: Alpina Publisher, 2003. - 320 p.

[11] *Isaacson Walter.* Steve Jobs / Translation from English N. Gerbish et al. / Walter Isaacson. - K.: Kyrychenko, 2012. - 608 p. [In Russian]; *Wozniak S.* Steve Jobs and I : the True Story of Apple. S. Wozniak, J. Smith / Translation from English. A.V. Pryzhnikova, A.S. Shirikova. - M.: Eksmo, 2012. -288 p. [In Russian].

soke Mazusita (Mazusita Electric)[12]; Akio Morita (Sony)[13]; Imai Maasaki (Toyota)[14]; Carlos Gon (Renault-Nissan)[15].

These and other leading global corporation's accumulated vast experience not only in creation and manufacture of high-technology products and services, but also in their export to different countries. However, this experience is known only to a very circle of specialists, mainly foreign, and it is practically not disclosed in the stated publications of both given types. Therefore, national managers have to accept the fact that it is very difficult to export even the pioneering high-technology products to other countries without thorough preparation and state support, and the existing corporate potential in this area is used inefficiently. In connection with this, opinion of authors of fundamental monograph "Strategic challenges of the 21st century to society and economics of Ukraine" concerning the fact that "at present, in the opinion of Ukrainian specialists, the state has practically dissociated itself from solving problems of science and hi-tech branches, along with exporting their products and services, farming everything to market, and very poorly supports science intensive branches" is quite reasonable[16].

In such conditions, the crucial question rises: how to use efficiently and to increase further the existing corporate potential not only for manufacture but also for export of high-technology products. Answers to this question can be found by contemporary understanding of peculiarities of high-technology products, creating a system for high-technology export motivation, use of efficient models for promoting high-technology products and services at global markets, determination of key factors of corporate po-

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[12] *Matsushita K.* the Business Mission / Konosoke Matsushita / Translation from English. P. Morozova. - M.: Alpina Publisher, 2010. - 193 p. [In Russian].

[13] *Morita A.* Sony: Made in Japan / Akio Morita: With the participation of Edwin M. Raingoyde and Mitsuko Shimomura: Translation from English. O. Radynova, S. Schelova. – 2nd ed. - M.: Alpina Business Books, 2007. - 290 p. [In Russian].

[14] *Imai Masaaki.* Gemba Kaizen: The way to reduce costs and improve the quality / Masaaki Imai / Translation from English. D. Savchenko. - M.: "Harvard Business Review", 2005. - 346 p. - (Series "Management models of leading corporations"). [In Russian]; Jeffrey Liker. Dao Toyota: 4 principles of management in leading companies / Jeffrey Liker; Translation from English. T. Gupman. - M.: Alpina Business Books, 2005. - 402 p. - (Series "Management models of leading corporations"). [In Russian]; J. Liker. Product development system in Toyota: people, processes, technology / Jeffrey Liker, James Morgan; Translation from English. - M.: Alpina Business Books, 2007. - 440 p. - (Series "Management models of leading corporations"). [In Russian].

[15] *Carlos Ghosn.* Citizen of the World / Carlos Ghosn, Philippe Ries / Translation from French by L. Mersona. - M.: CJSC "Olympus-Business", 2005. - 320 p. [In Russian].

[16] Strategic challenges of the 21st century to society and economics of Ukraine: In 3 v. / V. 2: Innovative and technical development of economics / Edited by M.M. Geyts, V.P. Semynozhenko, B.I. Kvasniuk. – K.: Fenix, 2007. – p. 262. [In Ukrainian].

tential increase in Ukraine and use of modern mechanisms of technological convergence with neighboring countries, in particular, with Russian Federation, mutually beneficial relations with which in some high-technology branches, in particular, in aerospace branch, have been historically established.

1. Peculiarities of High-Technology Products as a Subject Matter of International Purchase and Sale Agreements

Everyone connected with international business is familiar with regulations stating that economic relations between its entities, including purchase and sale agreements for high-technology products, are executed under agreements (contracts) entered into by and between them. One of the basic contract components is its subject matter, in our case, high-technology products or services. The subject matter concretization is made in names of high-technology goods, their characteristics, range, etc. One of the important features of high-technology products is the relatively high value added, which gives certain advantages to a manufacturer (supplier, seller) in overpricing its price quote.

Ranking high-technology products due to OECD methodology is carried out not only throughout branch groups, but also within each group with distinct criteria of R&D costs, as shown in the following table.

With regard of objective data, national participants of export and import operations should pay their attention to peculiarities of the certain high-technology products as a subject matter of international purchase and sale agreements. At this, data from Table 1 prove stable interrelations between indices during 1991-2013, dynamics of which absolutely fits market fluctuations. With regard of the stated subject matter peculiarities, conducting successful negotiations with partners concerning entering into international purchase and sale agreements for high-technology products is possible. For example, sales of competitive aerospace high-technology products, volume of manufacture of which in Ukraine is rather large (Clause 1.1) should return much more in-terest in comparison with products of the other directions of this group (1.3; 1.4; 1.5), not mentioning products of the other groups, in the first turn, the 2nd one. On the other hand, returning interest from export of products of the 2nd and the 4th groups is unlikely.

2. High-technology export motivation

The motivation function is a key one in any area of human ac-

Table 1 **Classification of production branches of OECD countries according to manufacturability indices for the period of 1991-2013 (%)**

No.		ISIC code	R&D/P			R&D/VA		
			1991	1999	2013	1991	1999	2013
1	**High-technology branches**							
1.1	Space- and aircraft construction	353	12,9	10,4	9,1	32,1	27,5	26,2
1.2	Pharmaceutics	2423	8,7	10,1	10,5	19,7	25,8	27,1
1.3	Manufacture of computer and office equipment	30	6,4	4,6	4,2	15,2	15,1	14,4
1.4	Manufacture of television, radio and communication devices	32	8,2	7,6	8,0	28,5	22,4	22,0
1.5	Manufacture of medical, measuring and optical instruments	33	6,1	5,6	6,0	12,5	11,9	12,1
2.	**Medium high-technology branches**							
2.1	Manufacture of electric machines and devices	31	2,6	2,3	2,5	5,9	6,7	6,2
2.2	Automotive industry and manufacture of trailers and semitrailers	34	3,0	2,8	3,0	11,9	11,7	12,0
2.3	Chemical industry	24	2,8	2,2	1,8	8,0	7,1	6,6
2.4	Manufacture of transport and rail equipment	35	2,1	2,8	2,4	5,4	7,9	6,7
2.5	Manufacture of machinery	29	2,0	2,1	2,2	4,7	5,3	5,2
3.	**Medium low-technology branches**							
3.1	Shipbuilding, ship and boat repairs	351	0,9	1,0	1,0	2,6	2,9	2,8
3.2	Manufacture of rubber and plastic	25	0,6	1,1	0,9	0,5	3,0	2,2

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3.3	Manufacture of coke, high quality oil products and nuclear fuel	23	0,7	0,3	0,5	3,8	2,7	3,0
3.4	Manufacture of other non-metal mineral products	26	0,6	0,6	0,6	1,5	1,3	1,4
3.5	Manufacture of basic metals and manufactured metal products	27-28	0,6	0,5	0,6	1,6	1,4	1,5
4.	**Low-technology branches**							
4.1	Waste manufacture and treatment	36-37	0,4	0,5	0,4	0,9	1,2	1,0
4.2	Manufacture of wood, paper products, printing and publication	20-22	0,1	0,1	0,1	0,3	0,3	0,3
4.3	Manufacture of food products, drinks and tobacco	15-16	0,3	0,3	0,3	1,1	1,0	1,2
4.4	Manufacture of textile, leather products and shoes	17-19	0,3	0,4	0,4	0,7	1,0	0,9
5.	**Total manufacture**	**15-37**	**2,0**	**2,2**	**2,2**	**5,7**	**6,5**	**6,0**

Source: *OECD Directorate for Science Technology and Industry Economic Analysis and Statistic Divisions, 07.07.2011; 15.07.2014. OECD ANBERD and STAN data bases May 2003, Nay 2014 [Online resource] – Access mode: http://epp.eurostat.ecevropa.eu/cache/ITY*

tivities, including high-technology export enhancement, because it is, according to Koch, author of the popular management dictionary, a “reason making people work or stimulating their energy."[17] The more detailed definition of motivation is offered by one of the classic authors on management, D. McClelland. In his opinion, human motivation is activation of specific excitation in the certain conditions. The motive assumes recurrent care on target state or conditions, and guides and chooses an individual’s behavior."[18]. In management science, there are many different and interesting motivation concepts that have been offered by scientists from different countries, beginning from the traditional approach by P. Taylor, according to which money is the only stimulus of labor activities, and ending with the concept of " motivation calculation" by the contemporary management guru Ch. Handy when each individual in the context of his/her own needs and the possible consequences of some certain action calculates how much effort he/she must spend in order to achieve the de-sired result. Purely theoretically, each of these existing motivation theories is applied in high-technology export management practice in one way or another. Nevertheless, unlike quality management products, labor efficiency, manufacture rhythm, labor discipline, foreign trade activities, etc., the literature provides no systematic generalization of theory and experience of leading transnational corporations concerning high-technology export motivation.

From the methodological point of view, development of such system involves two key steps: 1) defining the accepted motivation model and 2) basis of peculiarities of using motivation mechanisms and tools at three key levels of high-technology export management in companies: top (strategic), medium (tactical) and lower (operational).

Literature gives plenty of different motivation models. Let use of one of the most clear and understandable one for further study, which includes the following links: needs, behavior, Reward and feedback[19].

The link "needs" is the most studied in the above model, and that is why the contemporary psychological science offers several tens of concepts: content (the hierarchy of needs by A. Maslow, the two-factor theory by F. Hertsberg, the theory of acquired needs by D. McClelland, etc.) and process (the theory of justice by S. Adams, the expectancy theory by V. Vroom, the complex

[17] *R. Koch.* Management and finance from A to Z / Translation from English edited by Y.N. Kan-turevskyi / R. Koch. – SPb.: «Peter» Publishing House, 1999. – p. 201. [In Russian].

[18] Classics of management / Edited by M. Warner / Translation from English by Y.N. Kanturevskyi. – SPb.: «Peter» Publishing House, 2001. (“Business Class” series), – p. 481. [In Russian].

[19] *R.L. Daft* Management / R.L. Daft. – SPb.: «Peter» Publishing House, 2000. – p. 499.

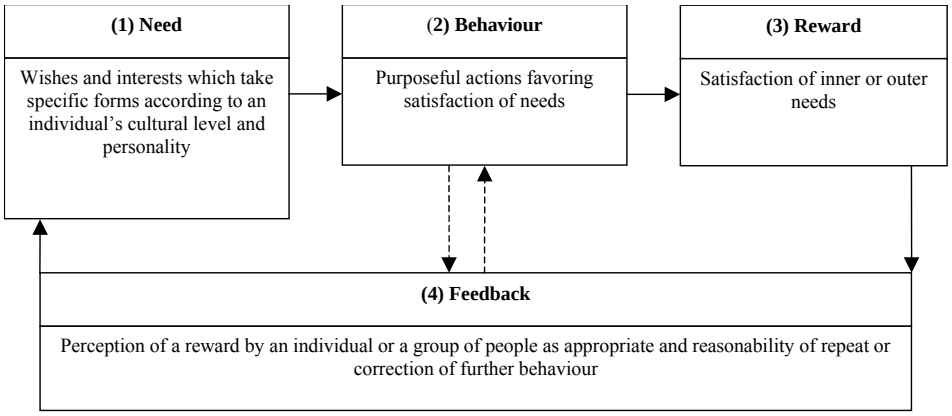

Fig. 1. Classic motivation model

Source: adapted: Daft L. Management / L. Daft / Translation from English by V. Volskyi, et al. – SPb.: 'Peter' Publishing House, 2000. – C. 499. [In Russian].

process theory by L. Porter and E. Lawler, etc.). As successful activities in the area of high-technology export require from employees not only quite profound competencies, but the respective experience, the most relevant theory for our study is the Three Needs Theory by D. McClelland, whose development strongly influenced the development of the scientific literature on practical management problems.

According to this theory, the process of labor activities provides three basic, actual motives, or needs:

— need for success (NS) – an endeavor to surpass the others or operating standards, taking efforts to achieve success;

— need for power (NP) – a need to make the others behave in the way they would not ever behave on their own will;

— need for involvement (NI) – a wish of friendly and close interpersonal relations with colleagues.

Of course, the question rises what is the success criterion in the area of high-technology export? In our opinion, as the generally accepted statistical reports of transnational corporations (TNC) in this area are unavailable, we can use the market capitalization index. After all, there are international corporations who are the subjects of the most global high-technology export. Table 2 shows market capitalization indices of leading TNC confirming the relations between this index and the leading positions of Apple, Google, Microsoft, etc., that is, the companies manufacturing high-technology products, over three thirds of which are exported abroad. It should be mentioned that the USA remain the leader in this list of 100 countries (47 companies in

Table 2 **Rating of the largest world companies under market capitalization indicators**

Name of the company	Country	Sector	Position +/-	March 31, 2014		March 31, 2009	
				Position	Market capitalization, billion $	Position	Market capitalization, billion $
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	Finance	7	5	286	12	134
Roche Holding AG	Switzerland	Life safety	12	6	266	18	119
Johnson&Johnson	USA	Life safety	1	7	261	8	145
General Electric Co	USA	Industry	16	8	256	24	107
Wels Fargo&Co	USA	Finance	46	9	244	55	60
Nestle SA	Switzerland	Consumer goods	5	10	244	15	129
Wal-Mart Stores Inc	USA	Service industries	(8)	141	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	Life safety	15	14	224	29	100
Chevron Corp	USA	Oil and gas	(4)	15	220	11	135
JPMorgan Chase&Co	USA	Finance	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	Life safety	17	19	205	36	92
HSBC Holding PLC	Great Britain	Finance	23	20	199	43	79

Source: Top 100 largest world companies under market capitalization. [Online resource]. – Access mode: www.pwc.com/structure. – July 2014. – P. 18.

2014, and in 2009 — 42). The headliner of this list is Apple which increased the volume of market capitalization for the last 5 years by four times, to USD 469 billion, having whirled upward from the 33rd position to the 1st one.

Beside three types of needs, D. McClelland's studies allow, in total with the self-control (SC) index, defining peculiarities of behavior of managers of different levels. For example, to managers of top (strategic) level, a great wish to succeed, a neutral attitude to power, a low level of involvement at high self-control are typical. Formula for effective leader's (EL) conduct (EL) in this case will have the following form:

$EL = (\uparrow NS + NP + \downarrow NI) \times \uparrow SC$[20]

Behavior of employees from export subdivisions is based on the motivation confirmation theory. The main assumption at this is based regulating an employee's behavior with the help of the law of effect according to which individuals try to repeat the positively supported behavior and, vice versa, avoid demonstrating the unsupported actions again. First, employees from export departments are limited in their actions with numerous standards of their parent country and accepting countries, along with different international agreements and customs which should be strictly followed. Second, in the process of export of high-technology products it is very important to consider numerous cross-culture peculiarities of partners and customers of importing countries and to make instant decisions independently, without a possibility to counsel with management or colleagues. Third, motivation of behavior of employees from export subdivisions should be agreed with activities of innovative subdivisions where high-technology products or services have been created.

The final motivation stage is reward the importance of which in our country is still underestimated due to underdevelopment of economic and management culture, simplicity of its understanding. That is whey, first of all, we should emphasize the key role of reward in any motivation model. In theory and practice of contemporary international business, the so-called "world's most important management principle" by M. Leboeuf is widely known, "You get what you reward"[21].

Reward for high-technology export members is much more complex and diverse not only due to innovative subject of con-

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[20] Prepared after: Classics of management, p. 482; Stephan P. Robins. Fundamentals of management / Stephan P. Robins, David A. DeCenzo / Translation from English by A. Oliinyk et al. – K.: Solomiya Pavlychko Publishing House "Osnovy", 2002. – p. 402-404. [In Ukrainian].

[21] *LeBoeut Machael*. GMP: The Greatest Management Principle in the World / Michael LeBoeut. – New York: Berkley Books, 1985. – 157 p.

tract, but also due to special business relations with partners that have an international nature and for which, the specifics of the other national cultures should be thoroughly considered.

In the most national companies, reward for the successful export, in particular, for high-technology export, is paid in a rather traditional way. The obtained profits from export operations are partly (after payment of dividends to key stakeholders from private companies) distributed in proportion to the employees' salaries with regard of "proximity" to the management. In transnational corporation, reward to members of international operations related to export of high-technology products is quite different. In accordance with "world's most important management principle" by M. Leboeuf, which tells about the reasonability of using the following reward principles for high-technology business[22]:

1) efficiency – deeply grounded solutions concerning the subject and the other components of international sale and purchase agreement for high-technology products (services) should be encouraged;

2) riskiness – the reward should support the employees' desire to find opportunities to offer high-technology products at new global markets rather than to avoid risky solutions;

3) creativity – the ability of employees to offer original high-technology products to foreign customers, together with offers on strengthening their international competitiveness through the use of these products;

4) determination – support of the employees' active position in promoting high-technology products t global markets instead of inactive observation;

5) rationality – encouraging smart, not intense activities on high-technology export;

6) simplicity – defining and encouraging the contribution of employees from export subdivisions into simplicity but not into complication of high-technology products structure, their manufacture and operation with regard of customers' estimates and offers;

7) planning – establishing such business relations between the parties of export of high-technology products that enable them to safely and efficiency fulfill their obligations without the formation of crisis situations and different options of rush in supplying products;

8) quality – a stress on quality but not fast manufacture and supplies of high-technology products;

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[22] *LeBoeut Machael.* The Greatest Management Principle in the World / Michael LeBoeut // Working Women. – 1998/ - January. P. 70-72.

9) loyalty – devotion of the company wishing to strengthen its competitive positions at the global market of high-technology products.

The most considerable peculiarities of high-technology export motivation were summarized by the authors in Table 3.

Table 3 **Peculiarities of motivation of high-technology export for managers of different level from transnational corporations in points (3- high motivation, 2 – medium motivation, 1 – low motivation)**

No.	Motivation levels	Top level managers	Medium level managers	Lower level managers
1	Needs (motivations) of a corporation as an international business entity			
1.1.	Increase of competitiveness at global markets of high-technology products	3	2	1
1.2	Market capitalization	3	1	1
1.3	R&D costs	1	3	2
1.4	Level of the company innovativeness according to Booz&Co study	2	1	1
2	Business conduct:			
2.1	Formula for effective leadership	EL= (↑NS+ NP+↓NI)x↑SC	EL= (NS+↑NP +NI)x↑SC	EL= (↓NS+ NP +↑NI)xSC
2.2	Behavior ethics	3	2	1
2.3	Importance of service tasks (functions)	3	3	3
2.4	Independent activities	3	2	2
3	Reward principles			
3.1	Efficiency	3	2	1
3.2	Riskiness	2	1	1
3.3	Creativity	1	2	3
3.4	Determination	3	2	1
3.5	Rationality	2	2	3
3.6	Simplicity	2	2	2
3.7	Planning	3	3	2
3.8	Quality	3	3	3

3.9	Loyalty	3	2	2
4	Reward forms			
4.1	Outer material	3	2	2
4.2	Outer non-material	1	2	2
4.3	Inner	1	2	3
5	Feedback			
5.1	Planning reports to management	2	3	3
5.2	Initiative office offers	1	2	2
5.3	Informal electronic communication	3	3	3
5.4	Personal communication	1	2	2

Convention:
EL – efficient leadership;
↑(↓) – high (low) need level;
NS – need for success;
NP – need for power;
NI. – need for involvement;
SC – self-control
Source: Author's development on the basis of generalization of survey of staff of export subdivisions of the following companies: General Electric Plastics (the Netherlands), Emergency one Timoney (Ireland), National Starch&Chemical Limited (Great Britain), Ukrinmash (Ukraine) during 2010-2014 p

3. The high-technology export model in conditions of globalization

Modeling activities concerning export of high-technology products plays a significant role in increasing the efficiency of foreign trade activities management system both of national companies and transnational corporations. Export division into direct and indirect, widely spread in theory and practice of international trade, is prospective in connection with this. In particular, I.M. Solodkovskyi, depending on the export form (direct and indirect) and type of export behavior (reactive and proactive) identifies the following corporate models of export activities management:

— enthusiasm providing for active export behavior caused by strong motivation, ability to use direct well-controlled distribution channels;

— export expansion meeting performance and innovation cri-

teria in conditions of lower level of export sustainability which is explained by the company choice of indirect form of export with all existing signs of proactive type of export behavior due to the management inability or unwillingness of management to raise additional resources, due to a lack of confidence in the success of its product at the international market;

— forced export in the conditions of the company reactive behavior at foreign markets and the use of direct form of export;

— ungrounded export based on the exporter's reactive behavior and indirect foreign trade relations[23].

However, use of the proposed models for study and practical improvement of high-technology export managing is challenging. First, a limit between reactive and proactive types of export behavior in high-technology sector is rather conditional and has to strict criteria. Second, the proposed matrix does not allow taking into account the crucial key role of transnational corporations in comparison with national. Third, success in the area of high-technology export is determined by two types of factors: innovative and marketing which also should be taken into account in determining models. With regard to this, we offer a matrix of high-technology export management corporate models based on two types of business entities in this sector (TNC and national companies) on the one part, and two types of economic relations between members of export activities (direct links between consumers and producers of high-technology products, the share of which is growing in international business, and intermediate trade when the whole network of business structures operates between the manufacturer and the end user). This matrix is given on Fig. 2. together with typical examples of companies.

As it can be seen from this matrix, TNC use two high-technology export models: global network for consumer goods, primarily, computer hardware and software products, and global partnership based on direct relations between manufacturers of unique products and their consumers. Benefits of the global network model are related to obtaining the scale effect in the manufacturing process at many enterprises and vigorous promotion of their products at world markets, primarily due to original marketing decisions.

As it can be seen from this matrix, TNC use two high-technology export models: global network for consumer goods, primarily, computer hardware and software products, and global

[23] *Solodkovskyy I.M.* Competitive export models: autoref. Thesis for obtaining the degree of candidate of economic sciences: spec. 08.05.01 «World economy and international economic relations» / I.M. Solodkovskyi. – K.: 2005. – p. 6-7. [In Ukrainian].

Types of international relations		Transnational corporations	National companies
	Trade and mediatory	**Global network** • Apple (USA, technologies) • Google (USA, technologies) • Microsoft (USA, technologies) • Samsung Electronics (S. Korea, consumer goods) • Novartis (Switzerland, life safety)	**Limited expansion** • Khartron (Kharkiv, industry) • Indar (Kyiv, life safety) • Biopharma (Kyiv, life safety)
	Direct without mediators	**Global partnership** • General Electric (USA, industry) • Siemens (FRG, industry) • Boeing (USA, industry) • Dell Computer (USA, technologies)	**Point export** • Pivdenmash (Dnipropetrovsk, industry) • Aviation Technological Complex "Antonov" (Kyiv, industry) • Motor-Sich (Zaporizhia, industry)
		High-technology export subjects	

Fig. 2. Matrix of high-technology export management corporate models

Source: Author's development.

partnership based on direct relations between manufacturers of unique products and their consumers. Benefits of the global network model are related to obtaining the scale effect in the manufacturing process at many enterprises and vigorous promotion of their products at world markets, primarily due to original marketing decisions.

The business model looks fundamentally different, also in the high-technology business sector which is now called the 'Global Partnership'. Companies in this sector, due to their own long-term high efficient research and development, accumulated huge innovative potential, which allows them creating unique types of equipment, devices and products, with extremely narrow area of use at initial stages.

As for high-technology export models of national companies, their effectiveness considerably depends on state support, first of all, in the tax area. Nevertheless, national companies, especially large state-owned and private medium and small, use two models of promoting high-technology products to foreign markets. The large spot export model is typical for enterprises that managed to

save their innovative potential and, what is also very important, international relations in their business. For example, the State Enterprise "Pivdenmash" successfully cooperates with Russian partners at the Baikonur space centre, and with other companies within the "Sea Launch" project. Somewhat narrower opportunities of promoting high-technology products to global markets are created by the limited expansion model because it is inferior to its foreign analogues in competitiveness.

That is why national companies are forced to enter the additional markets, also limited by size, receiving small income at this. The most successful strategy at this can be focused specialization.

4. Corporate potential of high-technology export

According to statistics, annual volume of sales at world markets of science intensive high-technology products exceeds USD 3 trillion. Over 90% of it falls on transnational corporations, including American – 40%, Japanese – 30%, German – 16%, Russian – 0.3%, national – 0.05 – 0,1%[24]. Because of the fact that the company is the key subject of high-technology export, and a question on methodology of defining corporate potential in this area is important.

Connection between these potential and innovative activities of the company is absolutely evident because it is the key factor of creating high-technology products and services which become the subject matter of export contracts. Although, the question arises on defining volumes of innovative potential of companies. There are different views on this issue which can be conditionally divided into three groups.

The part of researchers connects innovative potential with the human factor because the company employees, in the first turn, staff of research and development and marketing services, create and commercialize high-technology products[25]. Although, at the absence of a single generally recognized human factor assessment method it is impossible to connect it quantitatively with the innovative, and, thus, the export potential of the company.

The second concept group is based on the definition of the corporation patent potential as the most important element of its intellectual property. In connection with this, curious publications

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[24] International business, quoted paper, p. 772.

[25] *Batteris M.* Corporate diamonds: how to keep talented employees in the company / M. Batteris, B. Reuter / Translation from English. E.I. Smykovskyi. – M.: GrossMedia, 2005. – p. 13. [In Russian]; Welch J. Winner, quoted paper, p. 53. [In Russian].

both by foreign and national specialists have been published for the recent time[26]. Although attempts to define patent potential of pioneering corporations did not bring success so far, and the patents themselves do not protect intellectual property rights in any way and do not guarantee them against manufacture of pirate products. It is enough to mention numerous claims of Microsoft to Ukraine in connection with this.

The third concept group connects the corporate innovative-export potential with R&D costs contained in financial reports of corporations and defining volume of resources for different kinds of innovative activities. Advantages of this concept are connected with the following peculiarities. First, it is based on logical connection between the innovative activities as the basic factor and high-technology export as the result of this factor action. Second, R&D costs can be quantitatively assessed in dynamics and compared to different TNC. These costs are given in Table 4.

However, there is a question: to what extent are R&D costs and efficiency of innovative activities of export-oriented companies (EIAEOC) interrelated?

In 2009-2011, Booz&Co carried out a survey of over 450 innovative leaders from over 400 companies and 10 branches with the purpose to determine the most innovative world companies and concluded that companies investing the most funds in research and development are not always the most innovative, which again proves the need for efficient innovative activities management.

Survey results are confirmed by the fact that the top 10 largest export-oriented innovators is significantly ahead of the top 10 companies spending the most funds on research and development of key financial indices (Fig. 3). Only three companies, Samsung, Microsoft and Toyota, entered both top 10 ratings, this fact proving once again that success in the implementation of innovative activities of export-oriented companies depends not on the amount of funds spent by the company but on the way how it spends money. At this, the leader of the R&D cost rating, Toyota, took the 7th place in a survey.

The above analysis suggests that the size of R&D financing of are not directly connected with the innovation, and, therefore, with TNC high-technology export, as evidenced by differences in ratings of companies in Tables 4 and 5. According to many ex-

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[26] *Andrissen D.* Weightless wealth. Define your company value in non-material assets economy / D. Andrissen, R. Tissen / Translation from English by E. Pestreva. – M.: CJSC 'Olimp-Business', 2004. – 304 p. [In Russian]; L.I. Lukicheva. In-house management of intellectual assets / L.I. Lukicheva, D.N. Yegorychev. – M.: Omega L LLC, 2004. – 192 p. [In Russian]; Fundamentals of patenting and licensing: tutorial, 2nd edition, revised and enlarged. / G.O. Androshchiuk, A.I. Kredisov, I.I. Nazarenko, V.O. Raksha; Edited by A.I. Kredisov. – K.: Znannya Ukrainy, 2007. – 306 p. [In Ukrainian].

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Table 4 **The largest world companies under research and development costs for the period from 2004 to 2011**

Rating position/year								Company	R&D costs, million USD								Headquarters location	Branch
04	05	06	07	08	09	10	**11**		**11**	10	09	08	07	06	05	04		
5	3	1	1	1	4	6	1	Toyota	9,9	8,546	7,822	8,994	8,386	7,691	7,178	7,025	Asia	Automotive industry
18	16	14	11	9	6	3	2	Novartis	9,6	9,070	7,469	7,217	6,430	5,349	4,846	4,207	Europe	Life safety
19	19	16	8	3	1	1	3	Roche Holding	9,4	9,646	9,120	8,168	6,985	5,262	4,578	4,067	Europe	Life safety
2	2	2	3	6	5	2	4	Pfizer	9,1	9,413	7,739	7,945	8,089	7,599	7,442	7,684	North America	Life safety
1	8	7	7	4	2	4	5	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	7	6	Samsung	9	7,873	6,002	6,413	6,536	5,924	5,428	4,320	Asia	Computers and electronic equipment
20	22	19	17	23	14	5	7	Merck	8,5	8,591	5,613	4,806	4,883	4,783	3,848	4,010	North America	Life safety
12	12	12	14	14	13	11	8	Intel	8,4	6,576	5,653	5,722	5,755	5,873	5,145	4,778	North America	Computers and electronic equipment
6	5	6	2	5	11	9	9	General Motors	8,1	6,962	6,000	8,000	8,100	6,600	6,700	6,500	North America	Automotive industry
15	17	18	4	2	3	8	10	Nokia	7,8	7,778	8,240	8,733	7,727	4,892	4,753	4,640	Europe	Computers and electronic equipment
13	13	15	19	17	15	14	11	Volkswagen	7,7	6,089	5,359	5,429	4,757	5,312	5,071	4,719	Europe	Automotive industry
10	7	4	5	7	7	10	12	Johnson& Johnson	7,5	6,844	6,986	7,577	7,680	7,125	6,312	5,203	North America	Life safety
-	14	13	12	10	8	16	13	Sanofi	6,7	5,838	6,391	6,695	6,208	5,571	5,025	-	Europe	Life safety
-	15	17	18	20	18	12	14	Panasonic	6,6	6,176	5,143	5,152	4,850	4,992	4,989	5,726	Asia	Computers and electronic equipment
16	20	20	16	16	19	17	15	Honda	6,6	5,704	4,996	5,603	5,142	4,765	4,508	4,352	Asia	Automotive industry
11	10	8	10	11	9	13	16	Glaxo SmithKline	6,3	6,127	6,187	6,425	6,476	6,351	5,700	5,200	Europe	Life safety
9	9	10	13	13	12	15	17	IBM	6,3	6,026	5,820	6,337	6,153	6,107	5,842	5,673	North America	Computers and electronic equipment
-	-	-	22	19	17	19	18	Cisco Systems	5,8	5,273	5,208	5,153	4,500	-	-	-	North America	Computers and electronic equipment
4	4	5	-	-	-	26	19	Daimler	5,8	4,286	-	-	-	6,678	7,019	7,032	Europe	Automotive industry
-	-	25	15	18	22	18	20	AstraZeneca	5,5	5,318	4,432	5,179	5,162	3,902	-	-	Europe	Life safety

Source: Prepared after: Jaruzelski B. The Global Innovation 1000: strategy+business. – 2008-2011. – Access mode: http: // www.booz.com/global/home/what_we_think/featured_content/innovation_1000_2008_2012

Table 5 **The most innovative export-oriented world companies in 2009-2011 years under Booz&Co study**

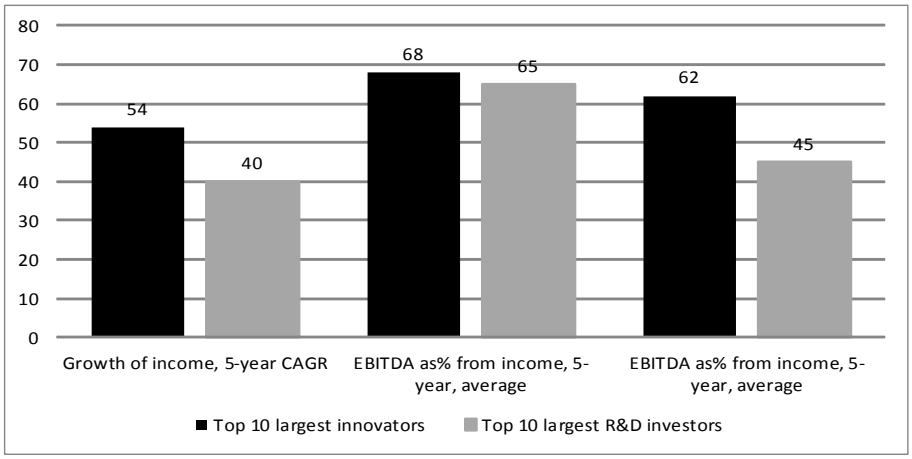
Company	2009			2010			2011	
	R&D costs, million USD, (position after R&D costs)	R&D costs as % from sale	Rating position, EI-AEOC	R&D costs, million USD, (position after R&D costs)	R&D costs as % from sale	Rating position, EI-AEOC	R&D costs, million USD, (position after R&D costs)	R&D costs as % from sale	Rating position, EI-AEOC
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
3M	1,293 (84)	5,6%	3	1,434 (86)	5,4%	3	1,6 (86)	5,3%	3
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

Source: Jaruzelski B. Recited paper, p. 12.

perts, indices of Table 5 are more objective because they are more closely related to TNC market capitalization shown in Table 2. It would seem that the decision concerning connection between the innovative potential and the high-technology export comes to identification of correlation coefficients. For regret, unavailability of statistical data on the structure of TNC export operations in the context of adaptability does not allow this.

5. Up-to-date Condition of High-Technology Export of Ukraine and Means of Its Raising

Ukraine, being the industrially developed country, has all pos-sibilities and is very much interested in building-up export vol-umes, in the first turn, high-technology because, on the one part, it is the most beneficial due to the relatively high share of value added, and, on the other part, manufacture of high-technology products favors realization of considerable potential of qualified staff and the state social and economical development in whole. For regret, business of this sector for the last years is far from de-sirable.



Note: digits on this Figure match point assigned by Booz&Co given that 0 is the lowest index of companies' activities, 50 is the standard index, 100 is the highest index.

Fig. 3. Comparison of financial indicators of 10 largest export-oriented innovators and 10 largest R&D investors in 2011

Source: Jaruzelski B. Recited paper, p. 12.

In spite of some increase of export volumes for the last several years, in particular, mechanical engineering and chemical industry, are negative, causing concerns of many researchers[27]. If in 2009 the share of the stated export branches was 25,8%, in 2010 it fell to 24,1%, and in 2014, to 22%. On the other part, the share of these branches in the import structure didn't almost change and amounts now to approximately 30,3%[28], which proves increase in dependence of our state on the other countries not only in the medium high-technology but also in the high-technology sector.

Nevertheless, high-technology export in Ukraine is still carried out. According to the World Bank estimates, supply of high-technology Ukrainian products to foreign markets in the last ten

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[27] Three years of membership in WTO: trends of Ukrainian foreign trade in the post-crisis period: analytic report. / I.V. Klymenko, O.A. Fedirko, I.V. Us. – K.: NIS, 2011. – 120 p. [In Ukrainian].

[28] Calculated according to data of State Service of Statistics for the respective years. [E-source]. – Access mode: www.ukrstat.gov.ua. [In Ukrainian].

years did not exceeded the mark of 7% of the total industrial export, and its average value ranged within 4-4.5% (similar index in Russia – 8%, Germany – 16%, USA – 24%). At this, according to the World Bank methods, the high-technology sectors include manufacture of pharmaceutical products, aerospace products, computers, electrical machinery and scientific instruments[29]. International systems of classification of high-technology products complement this list with telecommunications equipment. However, Ukraine is not yet able to compete at the global market none of the stated product items, except aerospace.

Nevertheless, high-technology export in Ukraine is still carried out. According to the World Bank estimates, supply of high-technology Ukrainian products to foreign markets in the last ten years did not exceeded the mark of 7% of the total industrial export, and its average value ranged within 4-4.5% (similar index in Russia – 8%, Germany – 16%, USA – 24%). At this, according to the World Bank methods, the high-technology sectors include manufacture of pharmaceutical products, aerospace products, computers, electrical machinery and scientific instruments.

The world market for space products began to emerge in 1962 at the funds of the USA government and several private founders of the first commercial corporation Comstar, the owner of the first created satellite communication space system.

The world market for space products is one of the most dynamic ones. According to the World Bank estimates, this market gross volume increases sharply: 1995 – USD 75 billion, 1999 – USD 105 billion, 2005 – USD 187 billion, 2014 – around USD 400 billion. According to the experts, its in 2025 will reach USD 1,6 trillion. Number of employees in this branch is around 2 million people. Around 70 thousand new high-technology work places are created annually[30].

Aerospace industry is one of priority branches of innovative breakthrough for Ukrainian economy having qualified staff, possessing an exclusively high multiplication effect and favoring development of numerous branches connected with it: chemical, metallurgical, radioelectronic, nano- and biotechnology branches. Another weighty argument in favor of accelerated development of aerospace branch is connected with positive ratio between export

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[29] Official World Bank Web page [E-source]. – Access mode: http://www.wov/dbank.org. [In Ukrainian].

[30] *Moiseyev I.M.* Development of space industry in Russia: basic strategies / I.M. Moiseyev // Earth and Space. – 2014. – No. 13. – p. 7-14. [In Russian].

and import of this industry products in Ukraine which amounted to 5,1 (in average) for the period of 1995-2014.

Attention should be paid to historical conditions of forming the aerospace branch in Ukraine, which inherited from the former USSR economic complex about a third of the space potential. Nearly 100 enterprises and institutions are involved into missile and satellite construction. The branch possibilities are also proved by the following fact: from 20 000 intercontinental ballistic missiles, 12,000 have been developed and manufactured in Ukraine. In the whole, national enterprises own 17 out of 22 world space technologies and participate in 50 international projects, the most significant of which are considered "Sea Launch" "Land Launch", "Dnipro", "Cyclone-4", "Vega", "International Space Station (ISS)", "Radioastron", "Spectrum-UV", and "Galileo". Within these project, independent Ukraine signed cooperation agreements with many countries, namely, with Russia, France, Germany, Norway, USA, Brazil, China, India. Income from space branch income in 2013 amounted to USD 305 million[31].

However, for build-up and efficient use of the branch potential, it is extremely important to ensure the full cycle of scientific and technical and technological measures of basic research, development, manufacturing, inspection and operation of space technology. These measures are contained in the Law of Ukraine "On approval of the national target scientific and technical space program of Ukraine for 2013-2017 years", the Action Plan of the Cabinet of Ministers of Ukraine on implementation the state policy in the field of space activities by the end of 2032, the Program of Russian and Ukrainian cooperation in investigation branch and use of outer space for peaceful purposes for 2012-2016, etc.

Ukraine and Russian Federation are two countries from the Central and Eastern European Region with the largest territories characterized by high level of historically formed manufacturing cooperative and technological relations between two countries. And despite the obvious tendency in the political and information environment of both countries to stressing negative aspects of bilateral cooperation, industrial enterprises of Ukraine continue demonstrating high interest in maintaining potential of cooperation with Russian partners in strategically important industrial branches, in particular, in aerospace industry. This trend is dem-

[31] Strategic challenges of the 21st century, quoted paper, p. 245-255.

onstrated by positive dynamics of the total volume of foreign trade of Ukraine with aerospace sector goods, which, in the final analysis, proves the crucial interdependence of trade and economic relations of both countries in this area.

Certainly, Ukraine has adequate capabilities to build its high-technology export in the other branches as well, namely, aircraft construction, mechanical engineering, shipbuilding, military and industrial complex, pharmaceutical industry. Although, this is a subject for a separate paper.

Conclusion

1. It should be pointed out in the conclusion that the formation and development of high-technology export corporate potential in the conditions of global competition requires both from management of transnational i national companies and from state authorities and administration a consistent and systematic approach performed by reconsideration of "high-technology products" category in the context of OESD criteria, creation of contemporary motivation mechanisms in this area, development and implementation of contemporary innovative and marketing foreign-economic strategies.

2. Taking into account the current state of global markets, leading transnational corporations are trying to promote such high-technology products which contain the highest proportion of value added in their price. These products include devices and services of aerospace industry, pharmaceutical industry, computer and office equipment, telecommunications and instrument sectors. In distinction from this practice, national enterprises do not pay enough attention to this aspect, offering at foreign markets mostly products with twice less of value added of medium high-technology sectors: mechanical equipment, chemical industry, vehicles and road equipment, losing at this not only significant profits but also competitive positions at global high-technology markets.

3. Speculations given in this paper are pointed at overcoming simplistic traditional ideas concerning the high-technology export motivation, when they are reduced to the company interest to obtain profits and to maintain or enhance its competitive positions at this market. In fact, the experience of leading TNC clearly proves that, according to the GMP (The Greatest Management, Principle in the World) concept, the company interest is combined with integrated system of employees' reward when management tools at every motivation stage (formation of

needs, business conduct, reward and feedback) are adapted to peculiarities of activities of managers of top (strategic), medium (tactical) and lower (operational) levels.

4. The authors identified criteria of high-technology export corporate potential. At this, the analysis of such indicators as the human factor, intellectual property (number and value of patents) and research and development costs of companies was made. The last index is used the most frequently as a high-technology export corporate potential indicator due to statistical data availability of and ease of calculations.

With that, the thorough analysis of R&D financing processes allows making a disappointing conclusion: the amount of this funding fits neither the level of export-oriented TNC innovativeness nor their market capitalization. It requires additional search of more advanced performance indicators of TNC innovative activities. The most acceptable among them is the research factor reflecting the impact of R&D costs on income increase and the company market capitalization. In combination with considering the indicator of the innovative and economic favorability of the parent country environment, the stated indices thoroughly characterize the corporate potential at the global market of high-technology products.

5. The substantiation of the optimal model of the given activity is of the fundamental importance for the formation of efficient corporate management of high-technology products export. Analysis of the theoretical developments in this area and of the experience of leading multinational corporations allows identifying four such models, namely, global networks, global partnership, spot export and limited expansion. The global networks model is inherent to TNC operating in the mass high-technology products markets and widely using trade mediation mechanisms. Competitive advantage of this model is the use of global scale effect. The global partnership model is based on direct relations between TNC and consumers and allows receiving the most part of the value added in the process of operation and maintenance of unique devices. National are less competitive, including domestic companies, and they are forced to use less sophisticated and riskier spot export and limited expansion models.

6. Corporate capacity building of high-technology export should become a priority task for Ukrainian industry because it does not only enhance the state international competitiveness but also increases foreign exchange earnings to the payment budget.

Although such export volume are not large so far due to technological backwardness of Ukrainian enterprises, there are totally real prospects and possibilities to increase scale and diversify the structure of high-technology export of Ukraine, especially in the aerospace branch, due to implementation of national programs, on the zone part, and reengineering of innovative and marketing activities of business entities of this sector, on the other part.

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