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High technologies sector under the conditions of the European integration: innovative development

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Abstract

This paper analyses the needs and priorities of the creation and further development of high technologies sector in the European Union. The general and specific trends of the creation of high technologies sector in the context of enlargement of the European Union are described and analyzed.

The needs and priorities of the creation and further development of high technologies sector in the European Union, as well as the main challenges for the creation, development and further modernization of high technologies sector in the context of globalization, European integration and creation of the knowledge based society and knowledge economy, are discussed. The structure and the main spheres and parts of the contemporary high technologies sector in the European Union are characterized.

New theoretical concept oriented to the creation, development and further modernization of high technologies sector, and based on the priorities of initiation of the synergy effects, is described. The essence of this theoretical concept – orientation to the multifaced interaction between different institutions and organizations representing different activities, functions, systems and interests, and different industries, different spheres of production, manufacturing and services, as well as different sectors of economy and social life in general. The role of the processes of internationalization and their impact on the development of high technologies sector are analyzed. There are many possibilities to implement new the non–traditional ideas of intensive technological development, which could be very successful in the context of contemporary challenges of high technologies sector's development and modernization.. The following ideas are emphasized: (1) the idea of rational specialization of every high technologies sector in every national or regional economic system; (2) the idea of "oases" and of complex clusterization .

Keywords: high technologies sector; European Union; globalization; regional economy; innovation; cluster.

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1. Introduction

The future of the European Union lies in the creation of the knowledge based society and knowledge economy. It is obvious that *the high technologies sector* could be defined as *a key component of the knowledge based society and knowledge economy*. This means that intensive development and further modernization of *the high technologies sector* should be defined as an most important precondition for successful creation and development of the knowledge based society and knowledge economy, as well as especially important priority of the social, economic and technological development in the European Union in general.

Of course, the key issues that require *strategic decisions* on the future of the European Union are to be considered as issues of *creation, development and further modernization* of *the effective high technologies sector.*

The essence of these issues could be revealed in the following:

- *what* should the *high technologies sector* be in the future in the European Union?
- *how* should the *high technologies sector* be created, developed and modernized in the European Union?

Striving to find answers to these questions determines the necessity of elaboration and implementation of appropriate *strategies for creation, development and modernization of high technologies sector*. In its turn, in order to ensure elaboration and implementation *appropriate* concepts and methodologies of preparation and justification of strategic decisions should be used.

This publication analyses a new approach towards the way how *long term strategies* designed to create, develop and modernise *high technologies sector* in the European Union should be prepared. This approach is a result of *scientific research* the object of which has been development *and modernization of high technologies sector* as well as *creation of the knowledge based society and knowledge economy in the contemporary situation of the enlargement of the European Union in general.*

The objective of the completed research has been the proof of the fact that *key priorities* for *development and modernization of high technologies sector* as well as for *creation of the knowledge based society and knowledge economy in general* are *the urge of technological advancement and enhancement of compatibility and productivity* using such opportunities as *specialization of national and regional economies, creation of clusters and their networks,* as well as *the development of so called economic "oases" and hyper-clusters in the entire economic space of the European Union.*

The main *result* of the completed research is the concept of *strategies oriented towards the development and modernization of high technologies sector,* the basis for which is the *universal principle of „creation of a new technological quality",* as well as implementation of these strategies into practical activities for creation of knowledge based society and knowledge economy in the European Union.

Key *tasks* of the completed research have been the following:

- demonstrate the fact that *high technologies sector* in the European Union should be created , developed and modernized according to the *universal principle of creation of a new technological quality,*
- reveal the essence of the *rational specialization of national and regional high technologies sectors* ,
- show the necessity of creation and expansion of *regional, cross-regional and international networks of clusters and economic "oases"* in the European Union,
- prove the necessity to create and apply *the strategies oriented towards the development and modernization of high technologies sector.*

These tasks have been of a *priority* in the context of the processes of the creation of modern knowledge based society and knowledge economy in the European Union.

2. High technologies sector's development and modernization in the European Union: needs and priorities

The problems, processes and priorities of the high technologies sector's development and its modernization in the European Union should be analysed in the context of the processes of globalization, of European integration and of development and enlargement of the European Union in general, as well as in the context of the processes of the creation of knowledge based society and knowledge economy: the processes of globalization, of European integration and of development and enlargement of the European Union, and the processes of the creation of knowledge based society and knowledge economy should be defined as *the environment* of the high technologies

sector's development and modernization in the European Union.

The necessity for the high technologies sector's development and its modernization in the European Union is determined by a number of *problems* which analysis and systematization is described in various scientific publications (Melnikas, 2002, 2011; Melnikas & Reichelt, 2004).

Main *problems* typical to the contemporary situation in the European Union which require essential and radical decisions in the area of high technologies sector's development and modernization are the following:

1. Within the territory of the European Union there are *very limited sources of energy and raw-materials*. In the environment of the development of the economy needs for these resources have been steadily growing which means that the European Union becomes more and more dependent on the possibilities for the increase of needs, consumption and usage of these resources: *perspectives of economic development* of the European Union, along with *economic and energetic security* of the European Union has been influenced by various economic and political factors characterizing export of these resources to the European Union;

2. There are many *employment proble*ms in the European Union, especially - many problems of employment for *well-educated young people*. On the other hand, there are many cases where the *lack of a simple labour force*, as well as the *lack of certain types of specialists* begins to limit the economic growth, business activities and technological progress;

3. Within the countries of the European Union *very high standards of living are being implemented here* including the spheres of social security and social warranties, as well as environmental protection. As a consequence, all economic endeavours within the territory of the European Union require substantial expenditure which subsequently means that the *cost price* of the products manufactured in the European Union is *very high*. The increase of the cost price which is disproportionate to the quality of products determines the fact that products manufactured in the European Union become increasingly *incompatible;*

4. Key indicator for the well-being in the European Union is the ability to manufacture products to the increasing extent and more massively both in their local and global markets, and sell products of high quality and price. This means that in the European Union the need for more markets in order to sell their own products has increasingly growing (besides, it is of crucial importance that there is an adequately high purchase power). Inadequacy of such markets threatens the development of the economies of the European Union.

These problems indicate that there are strong needs of both *quantitative* and *qualitative* transformations in the European Union. It could be noted that these transformations includes the processes of the high technologies sector's creation, development and modernization.

Necessity to respond to these problems determines main *challenges* to the European Union and its development:

1. *Quantitative increase of the European Union* is orientated to the following:
    - European Union could win possibly more markets top sell their production,
    - European Union could possibly gain better "direct" access to the countries in Eastern Europe, Central Asia and the Near and Central East where huge supply of energy and raw materials is accumulated and where great potential markets for the products manufactured in the European Union;

2. Qualitative *development of the European Union* is oriented to the goal to create *the knowledge based society and knowledge economy* in the territory of the European Union: This could ensure the following:
    - ability to create within the European Union the alternative energy sector and other sectors of economy, which could allow strongly decrease the dependence of the economies of the European Union on the import of traditional energy and raw materials,
    - ability to create and widely distribute brand new products and technologies in the global which could allow the European Union to become a worldly leader in many spheres of economic and social life.

It is worth mentioning that over the last decade greater possibilities to ensure *quantitative increase* can be observed in the European Union, whereas in the sphere of *qualitative development* numerous difficulties and unpredicted obstacles can be seen (Melnikas & Reichelt, 2004, Melnikas, 2011, 2012). For this reason qualitative development of the European Union should receive priority consideration: prospects of the European Union are basically influenced by *creation of the knowledge based society and knowledge based economy*, especially – by creation*, development and further modernization of high technologies sector*.

3. High technologies sector: main definitions and specific features

High technologies sector in the European Union could be defined as a very important and very complicated and multifaceted part of the contemporary economy and of the system of the social and economic life in the present day world in general and especially – in the European space. At the same time could be said that the high technologies sector in the European Union could be defined as a very important and very complicated and multifaceted object of scientific cognition, research and studies.

There are many quite different approaches to the definitions as well as to the composition and structure of the high technologies sector (Melnikas, 2011).

However, in all cases could be said that the high technologies sector has *several essential features* :

- creation, development and further modernization of high technologies sector should be defined as *the main precondition for the qualitative changes and qualitatively new outbursts* in all fields and sectors of contemporary societal life, including all sectors of contemporary economy, all countries and regions, the life and priorities of all groups of society, all areas and directions of the political, social, economic, technological development and of the changes in culture, lifestyle and structure of values,
- *industrial products and various services* of the high technologies sector have *absolutely new quality*, the essence of which – *innovations, new knowledge and new results of the intellectual activities*, as well as *new development or usage potential* accumulated in these products or services,
- *intellectual and innovative activities*, including the creation, multiplication and practical usage of the new knowledge, should be defined as *the main activities* in the high technologies sector,
- *intellectual resources* and *human resources, which are oriented to the intellectual activities, creativity and innovations*, should be defined as *the main resources* in the high technologies sector,
- *qualitatively new features*, especially – characterizing *the new knowledge and innovations, the novelty and new quality of products* as well as *the novelty and new quality of the methods, technologies and organizational forms of activities*, are *the dominant characteristics* of the high technologies sector,
- high technologies sector is *complex and integrated in nature*, this sector covers and involves a *lot of units and parts of different profile with different functions and with orientations to the different and complementary to each other results*,
- development processes and activities in the high technologies sector are based on the *interaction* between various units and parts of this sector, as well as between different structures and systems of the contemporary society and economy in the world, in different countries or regions; in general, development processes and activities in the high technologies sector are based on the *creativity and innovations*, as well as on the *orientations to the various synergy effects*, representing the new quality and qualitatively new results,
- *intensive internationalization* should be defined as *especially important precondition* of the creation, development and further modernization of high technologies sector in various countries, regions and in the global spaces.

In general, these *essential features* could be defined as *the prevailing characteristics of the high technologies sector*. Of course, these characteristics could involve a number of additional features.

It is noted that the high technologies sector involves many different units, parts, industries, as well as different types and forms of production, manufacturing and services.

In all cases it is important to note that *the main preconditions and assumptions* to the high technologies sector's development and its modernization in the future are closely related to *the creativity and intellectual activities, to the innovation processes and innovative activities, internationalization and international cooperation* in all spheres of social, economic, technological development, as well as to *the synergy effects oriented interaction* between different units, parts, structures and systems, especially between units, parts, structures and systems, which are responsible for different functions and activities in various areas of fundamental and applied scientific research, university studies and professional education, consulting and other academic and intellectual activities, in various areas of practical business and industrial activities, in various public and governance institutions and organizations.

The high technologies sector is characterized by the *variety of used technologies and of created products*, as well as by the *variety of legal status and organizational forms* of enterprises, institutions and other organizations operating in this sector.

It is noted that there are many spheres and specific sectors of contemporary economy, which could be defined as *particularly important and typical or traditional parts* of the high technologies sector:

- information and telecommunication technologies sector, as well as modern communication, including the electronics based communication, media and other services, which are characterized by the use of modern information and telecommunication technologies;
- various industries, which are characterized by the use of the mechatronics and modern electronics based technologies, especially – appliances, instruments and machinery manufacturing industries;
- various industries, which are characterized by the use of the modern bio- and chemical technologies, as well as pharmaceutical industries;
- various industries and services, which are oriented to the use of modern transportation technologies and systems of logistics;
- various industries and services, which are oriented to the aircrafts production and aviation modernization, as well as to the aeronautical development and to the activities in the aerospace;
- various industries and services, which are oriented to the creation, production and use of the new materials;
- various industries and services, which are oriented to the maritime transport development, to the modern fishery, as well as to the ships manufacturing;
- various industries and services, which are oriented to the creation and development of the alternative and more effective energetics;
- various industries and services, which are oriented to the creation and development of the more effective agricultural sectors;
- various services in all sectors of health care, as well as medical services in general;
- military industries and security services;
- other and various non-typical or non-traditional parts of the high technologies sector.

All these parts of the high technologies sector could be defined as especially important in the contemporary conditions of the European integration and in the context of development and enlargement of the European Union. In addition, it can be seen, that the processes of the creation, development, multiplication and use of the high technologies are affecting absolutely all areas of the social, economic and technological life of the contemporary society: these processes could be defined as *absolutely universal processes typical for contemporary society*.

4. Theoretical basis to solve the problems of the creation, development and modernization of high technologies sector in the European Union.

Processes of the creation, development and further modernization of high technologies sector in the European Union are inseparable from general processes of the creation of knowledge based society and knowledge economy. This means that the scientific research on the processes of the creation, development and further modernization of high technologies sector could be based on *the same theoretical basis and approaches* as the scientific research on the processes of the creation of knowledge based society and knowledge economy in general. It can be assumed that the general theoretical background for solving the problems of the creation of knowledge based society and knowledge economy could be used in many specific cases of the creation, development and further modernization of high technologies sector.

Various *theoretical approaches to the processes of the creation of knowledge based society and knowledge economy* could be perceived and defined as *an theoretical basis for the scientific cognition and research on the processes of the creation, development and further modernization of high technologies sector in the European Union*. It is obvious that the main theoretical approaches to the processes of the creation of knowledge based society and knowledge economy could be defined as *quite universal* and as suitable in many cases of the scientific research on the creation, development and further modernization of high technologies sector.

Of course, these quite universal theoretical approaches to the processes of the creation of knowledge based society and knowledge economy, which could be perceived and defined as an theoretical basis for the scientific cognition and research on the processes of the creation, development and further modernization of high technologies sector in the European Union, should be analysed and described more in detail.

Some perspective theoretical approaches to the processes of the creation of knowledge based society and knowledge economy, including - creation of knowledge based society and knowledge economy in the European Union, are described in many scientific publications (Melnikas, 2002, 2011,2012). It is noted, that creation of the knowledge based society and knowledge economy as a key priority of the further development, modernization and enlargement of the European Union could be defined as especially complex process oriented towards formation of the brand new society and the qualitatively new life style. What is more, this process can be described as of *"double" complexity* as it reflects on orientations towards the *striving for the new quality in the following two aspects:*

- the knowledge based society and knowledge economy is being formed which if compared to the "traditional" society and economy is by all means considered as *qualitatively new*,
- forming of the knowledge based society and knowledge economy is completed in the situation of *the enlargement of the European Union,* which means that *qualitative changes* have been happening in the *entire space of the European Union.*

Examining possibilities and prospects for creation of knowledge based society and knowledge economy in the European Union it is recommended to apply the *universal principle of the creation of new quality.* This principle could be applied in various situations of life; it is suitable when examining both processes of the development of the knowledge based society and knowledge economy, and common processes typical to the European Union, and its political, social and economic development and enlargement.

Universal principle of the creation of a new quality could be defined as follows: *new quality always develops by the amalgamation when elements of different origin that never had belonged to the same system collide.* This principle expresses the idea of the developing and using the synergy effect, and demonstrates that *qualitative transformations* always require *actions and means* necessary to *join elements of different origin to the common system.*

Applying the *universal principle of the creation of new quality,* it is important to consider the fact that as a subsequence of amalgamation there is always *new quality* created. At the same time it is worthwhile mentioning that the *processes of amalgamation* can be very different and in the most common case can represent *two types:*

- processes of integration,
- processes of synthesis.

Processes of the *integration* usually prove that in the course of amalgamation elements that collide *never lose their major primordial features:* this means that the *result of the integration marking the new quality can be disintegrated according to previous features of the amalgamated elements.*

Processes of *synthesis* demonstrate that elements colliding in the course of amalgamation *miss their major primordial features;* this means that that the *result of the synthesis possessing new quality cannot be disintegrated according to the previous features of the collided elements.* We may state that *qualitative changes within the synthesis are never recurrent*, whereas *qualitative changes within the integration* in some cases *may recur.*

Understanding the meaning of the processes of integration and synthesis as processes of creation of a new quality allows broadly applying *the universal principle of the creation of new quality,* examining very complex manifestations of the development, modernization and enlargement of the European Union, including creation of knowledge based society and knowledge economy. When analysing these manifestations, it is critical to assess *to what extent* the development, modernization and enlargement of the European Union is based on the processes of *integration* and to *what extent* the processes of *synthesis* determine the development, modernization and enlargement of the European Union.

Elaborating and implementing the strategies of creation of the knowledge based society and knowledge economy it is necessary to logically forecast various vehicles designed for expansion and development of the *integral economic, social and cultural space of the European Union:* among these vehicles there should inevitably be the vehicles oriented towards both processes of *integration* and *synthesis.*

Rational complementation of the vehicles designed for integration and synthesis can be a basis for implementation very effective strategies of creation knowledge based society and knowledge economy in the European Union. Subsequently application of the *universal principle of creation "of the new quality"* should be considered as a *priority* when elaborating and implementing strategies designed for the development, modernization and enlargement of the European Union (Melnikas, 2011, 2012).

Can be repeat that these quite universal theoretical approaches to the processes of the creation of knowledge based society and knowledge economy could be used in many cases of solving problems of the creation, development and further modernization of high technologies sector in the European Union.

At the same time it can be seen that there are some *specific circumstances* typical for the processes of the creation, development and further modernization of high technologies sector in the European Union: these *specific circumstances* could be defined as a very important and as having significant impact on the situation in social, economic and technological space of the European Union. Of course, these specific *circumstances* could be characterized more in detail.

The main *specific circumstances* typical for the processes of the creation, development and further modernization of high technologies sector in the European Union are as follows:

- priority orientations on *scientific progress and technological development*, especially on the creation, multiplication and use of the *innovative and effective new technologies*, as well as of the *new technological oriented lifestyle's models and stereotypes*,
- priorities *to use of new technologies* for solving the actual social, economic, ecological, technical, as well as military and other problems in all areas of the life of contemporary society,
- particularly important role of *the creativeness* and of *orientations to the innovation activities*, especially – in various fields and areas of the scientific and technological progress, as well as significance of various *legal and ethical* factors and aspects of the *intellectual property* development,
- specific aspects of *internationalization* processes typical for the creation, development and further modernization of high technologies sector, including specific aspects of governance and management in the high technologies sector in the context of contemporary processes of globalization, European integration and enlargement of the European Union,
- multifaced *international, intercultural, interregional* as well as *interprocessional, intersectoral interaction* and interaction of other types.

It can be noted that *multifaced international, intercultural, interregional* as well as *interprocessional, intersectoral interaction* and *interaction of other types* should be defined as an especially important factor and as an particularly significant type of *specific circumstances* typical for the processes of the creation, development and further modernization of high technologies sector in the European Union. These interaction processes are very different, and the most important among them could be considered as follows:

- *interprocessional interaction*, that should be *very intensive, goal-oriented and generating the synergy effects,* and that should be defined as characterising *the interaction between the mutually complementary processes of different nature, different types and different orientations*: interaction between various *mutually complementary* processes of the scientific research, academic studies, applied research, professional education, consulting, processes of the political development, business and public activities, including goal-oriented business initiatives as well as goal-oriented initiatives to change the lifestyle and consumption in various fields and areas of societal life and of different business and public sectors, could and should be defined as an particularly important precondition for the creation, development and further modernization of high technologies sector in general and especially in the European Union,
- *intersectoral interaction*, that also should be *very intensive, goal-oriented and generating the synergy effects,* and that should be defined as characterising *the interaction between the different sectors of the societal life, of the economy and of the different groups of the society*: interaction between various sectors of the societal life and of the economy, especially between different industries and service sectors, as well as between different production, manufacturing and private and public service sectors, could and should be defined as an particularly important precondition for the creation, development and further modernization of high technologies sector in general and especially in the European Union,
- *international, interregional and intercultural interaction*, that objective should be more and more *intensive in the future in the context of globalization and multifaced internationalization processes*, that is very important factor of the *generating the synergy effects,* and that should be in general defined as characterising the interaction between various and quite different national cultures and various organisational systems, which are belonging to different countries, regions and groups of countries and nations: this kind of interaction could be defined as an

especially important cultural, political and environmental precondition for goal-oriented development of the high technologies sector.

In addition, it may be noted that there is *specific circumstance* related to *the use and adaptation* of the *universal principle of the creation of the new quality* in the conditions of solving the problems of the creation, development and further modernization of high technologies sector in the European Union. This principle, which is interpreted as *an universal principle* of the scientific research and practical activities related to the processes of the creation of knowledge based society and knowledge economy, could be interpreted as *an specific principle of the creation of the new technological quality* in the conditions of solving the problems of the creation, development and further modernization of high technologies sector in the EU. That main reason to change the interpretation of this principle is that specific features of the high technologies sector represents many orientations and priorities to the creation, use, development, multiplication and modernization of high technologies and technological oriented products: it could be say that identification and formulation of this principle as an *specific principle of the creation of the new technological quality* is more precise and more adequately describes the specifics of high technologies sector.

In general, it may be say that the *specific principle of the creation of the new technological quality* could be interpreted as a very important component of the theoretical basis to solve the problems of the creation, development and modernization of high technologies sector in the European Union.

5. Strategic decisions oriented towards innovativeness and rationalization of national and regional economic systems: ideas of "oases", hyper-clusters and networking in the high technologies sector

The strategies oriented towards the development, modernization and further enlargement of the European Union in general, as well as towards the intensive creation, development and modernization of the high technologies sector in the European Union, could include wide range of solutions and strategic decisions covering different spheres of social and economic life.

There are *several types of strategic decisions and solutions* that could be defined as a particularly *significant and perspective* in the context of the contemporary challenges of globalization, European integration and of the creation of the knowledge based society and knowledge economy in the European Union. Among such strategic decisions and solutions could be highlighted some *priority strategic decisions* oriented towards *innovativeness and rationalizing of national and regional economic systems*, especially – strategic decisions that are based on the *ideas of "oases , hyper-clusters* and *of networking in the high technologies sector*. All these ideas and types of strategic decisions and solutions are related to the needs to solve problems of the creation, development and modernization of the high technologies sector in the European Union

Of course, the strategies oriented towards the development, modernization and further enlargement of the European Union in general, as well as towards the intensive creation, development and modernization of the high technologies sector in the European Union, can be also designed for the entire European Union as a whole, and particular spheres of social and economic life in the European Union: one of these spheres is *development of national and regional economic systems* and *creation of cluster based economy of a new type*.

Strategic decisions that are oriented towards *innovativeness and rationalizing of national and regional economic systems*, as well as the ideas of "oases" , *hyper-clusters* and *of networking in the high technologies sector*, are based on the *intention to rationalize the structures of national and regional economic systems and to create favourable conditions for innovative and intensive development of every national or regional economy* .

The essence of *the intention to rationalize the structures of national and regional economic systems*, as well as of the *ideas of "oases" , hyper-clusters* and *of networking in the high technologies sector* is *the priorities to create and to develop an economy* , which should be characterised by very high efficiency, priorities of sustainability, continuously growing, as well as by growth of the high technologies sector.

The essence of the idea of "oases" is the creation of the particularly favourable conditions for the development, modernization and certain activities in various areas and spheres of the societal life: creation of regional (territorial) or sectorial "oases" could be defined as especially perspective way of the effective, innovative and intensive social and economic development in the European Union, including – an active high technologies sector's development.

In general "oasis" can be explained as an *economic system*, *possessing extremely advantageous political, legal, economic and other conditions for activities and development*. These conditions are as a rule exclusive and in their

presence the "oasis" as economic system receives various privileges or extremely beneficial environment is created for it. "Oases" can be established on behalf of political will of a *state* or even a *group of states*: by the way, the idea of regional "oases" is very viable in the improvement and implementation of regional policy of the European Union, with the intentions of creation of "oases" not only in particular countries, but also regions, comprised of regions of different countries.

Regional "oasis" is one where exceptionally advantageous conditions for economic development are created in a territorially outlined area (region). This area may coincide with systems of administrative territorial division of particular countries or may not.

Sectorial "oasis" is one where exceptionally advantageous conditions are created for particular branch of economy, and particular segments of business or public sector.

Creating and developing "oases" it is very important to consider demographic situation, possibilities to attract, concentrate and efficiently utilise human and financial and other resources, as well as possibilities rapidly expand various innovations.

The idea of "oases" can be used as a basis to solve many problems of the so-called *rational specialization of the national and regional economic systems*.

Contemporary economic principles and practices confirm that in *efficiently operating economic systems their surplus value* is *created at greater extent*. This statement works in all cases where ways to increase efficiency and compatibility on the scale of both particular economic subjects and large national and regional economic systems (Boldrin & Canova, 2001; Bond, Syropoulos, Winters, 2001; Chortares & Pelagidis, 2001; Dutta, 1999; Guy, 2001; Redding & Venables, 2004; Sangmon, 2002; Melnikas, 2011)

The main precondition to ensure high efficiency and compatibility of any economic system is to achieve that any economic system should be *properly specialised (*Hummels, Ishii, Kei–Mu Yi, 2001; Huseman & Godman, 1999; Melnikas, 1997, 2002, 2011; Olsen & Osmundsen, 2003).

Under the *proper specialisation* can be understood the situation where the range of products produced within the *economic system* guarantees *magnification of the surplus value within this system*: the economic system should be exceptionally oriented towards the series of products, services and activities, whose structure allows to achieve potentially greater surplus value or higher velocity of the increase of this value.

For the sake of the rationalisation of the national or regional economic system various means may be implemented. These means should create a *solid complex*, and have to be *long-term* and *consecutive.* The idea of the means should ensure that the entire economic system of particular region or country is developed as a *large macro-cluster or hyper-cluste*r. These large macro-or-hyper-clusters may be *multi-profiled* and oriented towards *creation* of different and diverse *final products*, and it is very important to create final products that are compatible in *global markets*.

It is obvious that large macro – or- hyper- clusters in particular countries or regions should meet the following requirements:

- large clusters of this kind function as *open systems*, maintaining both internal and external economic and technological relations in international and global markets,
- *inside* of the large clusters of this kind various specialised clusters can be created within incorporated diverse institutions of science, research and education, enterprises of production and services, business incubators, parks of science and technology, centres for innovation, and industrial, trade, transportation and communication companies.

Development of large economic systems in a way of *clusterisation* may be of great variety. A very prospective method to implement this way is creation of *regional (territorial)* or *sectorial "oases".*

It should be particularly noted that *international networking* of the "oases" and of the large macro – or- hyper-clusters could be defined and interpreted as an especially perspective way of the creation, development and modernization of high technologies sector in the European Union: in turn, creation and development of *the international networks of the high technologies oriented clusters and "oases"* could be defined and interpreted as an significant precondition for the intensive social, economic and technological development in the European Union in general. It means, all strategies for the clusterisation, creation and development of "oases", as well as strategies for rational specialization of national and regional economies should include the strategic decisions and solutions

covering various aspects of the international networking oriented to the development and modernization of the high technologies sector in the European Union.

Of course, all strategies for the clusterisation, creation and development of "oases", as well as strategies for rational specialization of national and regional economies should include both *the strategies oriented towards integration* and *the strategies oriented towards synthesis:* the strategies oriented towards integration and the strategies oriented towards synthesis are characterized by *different purpose* and *different content* (Melnikas, 2011, 2012).

6. Conclusions and recommendations

Creation, development and modernization of high technologies sector in the European Union, as well as creation of the knowledge based society and knowledge economy in the European Union in general is a very complex, long-term and multifaceted process.

Key *challenges and priorities* that require main attention in the context of the creation, development and modernization of high technologies sector in the European Union, as well as of the creation of the knowledge based society and knowledge economy in general are the following:

1. Creation, development and modernization of high technologies sector in the European Union, as well as creation of knowledge based society and knowledge economy in the European Union in general should be oriented towards the solution of the following problems*:*

- problems *of insufficiency and increase in the cost* of energy and raw-material, as well as problems of *secure and reliable* import of these resources, along with problems of creation of *alternative energy* and *economies oriented towards alternative raw materials*,
- problems of *new prospective markets* necessary *for implementation* of production in the European Union, and problems of its development and introduction,
- problems of the required potential development for *state-of-the-art* products, as well as problems of *compatibility of the products oriented towards high technologies in the* global markets,
- problems of *social security, economic well-being,* as well as *social, legal and ecological environment* improvement;

2. The basis for creation, development and modernization of high technologies sector in the European Union, as well as for creation of knowledge based society and knowledge economy in the European Union in general, is the implementation of *the universal principles of creation of a new quality* and *of creation of a new technological quality* , designed to complete the following:

- development of the society and economy of a new type is going under concurrent *processes of integration and synthesis,*
- when creating the knowledge based society and knowledge economy in the European Union, including processes of the creation, development and modernization of high technologies sector, *integral cultural space* should be created*,*
- when creating the knowledge based society and knowledge economy in the European Union, including processes of the creation, development and modernization of high technologies sector, *the strategies oriented towards integration and synthesis* should be created and implemented*;*

3. In the *strategies* designed to create the knowledge based society and knowledge economy in the European Union, including – to create, develop and modernize the high technologies sector, main emphasis should be put on the following priorities:

- *rational specialization* of national and regional economies*,* ensuring *high compatibility* both in the European Union and in global markets,
- transformation of national, regional and sectorial economies into the *macro –or hyper –clusters* and *systems of such clusters,*
- development of *clusters and networks of economic "oases" in the entire space of* the European Union;

4. In the situation of the further development and enlargement of the European Union the following provisions should be implemented:

- issues of modernization and compatibility increase for the national, regional and sectorial systems should be tackled *in the strategies oriented towards integration*,
- issues related to creation of the *integral and undivided* knowledge based society and knowledge economy, including the high technologies sector, should be tackled *in the systems oriented towards synthesis in the entire space of the European Union.*

Further scientific research and practice dedicated to creation of strategies for the knowledge based society and knowledge economy in the European Union, including processes of the creation, development and modernization of high technologies sector, are greatly promising and important.

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