# THE COOPERATION OF BUSINESS AND UNIVERSITY PREPARING SPECIALISTS FOR THE "GREEN" ECONOMY

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**Abstract**

*The article highlights the problems specified in UNEP documents that are associated with the negative consequences of human impact on the environment. The article considers the prospects of transition to sustainable development and «green economy» and the main constraints of such transition. It is shown that for modernization of the economy trained professionals with new thinking are required, and it can be carried out only with close cooperation with the real sector of the economy. The education paradigm should be also changed. The article describes the experience of cooperation between the Kazan Federal University with the scientific-technical and technological centers of JSC «KAMAZ» while training engineers of motor area.*

**Key words:** *sustainable development, «green» economy, engineering education; automobile branch; competitive personnel*

## 1. INTRODUCTION

The world economy in the new millennium is characterized by two main trends: on the one hand it is the rapid development of equipment and technology, requiring significant number of resources and causing the emergence of an increasing number of sources of negative environmental impact, on the other hand it is the increase in the number of supporters of the transition to a green economy, initiating the development of strategies and policy documents on sustainable development (SD) in all spheres of human activity. Though international debate on SD issues are conducted from the 90-ies of the last century, since the publication of the report «Our common future» of the World Commission on environment and development (World Commission, 1987), however, already in the new millennium a number of documents are adopted that identified new targets, the need to achieve which is due to the negative consequences of urbanization, the development of the real sector of the economy, and more often unreasonable adverse effects on the environment.

The most significant of these documents are the following: the report of the UNEP Global green new deal (UNEPCOM, 2008; UNEP, 2009), the reports of the ILO «On global employment trends» (Doklad MOT, 2009) and to the world day of labour protection «Promoting safety and health in the green economy» (Doklad MOT, 2012), the Declaration of the summit Rio +20 «The Future we want» (United nations, 2012). The change in the paradigm of development of economy of any country assumes availability of trained professionals capable of implementing the strategy developed. First of all, it refers to engineering personnel, therefore improving the system of training highly qualified personnel for the real sector of the economy is relevant both for developed European countries and Russia.

## 2. THE GOALS OF THE MILLENIUM AND THEIR REFLECTION IN THE MODERNIZATION OF THE SYSTEM OF ENGINEERING EDUCATION

Socio-economic development prospects are of concern to the world community, as a disastrous impact on the environment is increasing with the development of equipment and technologies. In (Ignat'eva, A.A., 2011) the stages of development of the global problems of environment protection are shown, during which the mankind has passed from the awareness of harmful effects of the economy on the environment (the middle of the last century) to understanding that overuse of natural resources and the pollution caused by the economic development undermine the economy itself (70-ies of the past

century). As a result, in developed countries at the level of both the governments and the business community the idea of ecological modernization has been actively promoted, the basic premise of which is that the environmental adaptation of economic growth and industrial development is cost-effective because it helps to save resources and creates competitive advantages for companies implementing «green» technology and product innovation. This approach circumvents the contradictions between economic and environmental interests within the market system, affirming that environmental damage can be decoupled from economic growth through the development of technologies reducing the specific damage per unit of production. «Green» economy is understood as an economy, «which increases the welfare of people and ensures social justice, and this substantially reduces the risks to the environment and its impoverishment» (UNEP definition) (UNEP, 2011a). Briefly, the «green» economy must be low-carbon, resource-efficient and socially inclusive. At the same time in the experts environment the concept of «sustainable development» was formed. The beginning of the millennium marks the fourth stage, which is characterized by the recognition of the concept of sustainable development in international and national law, the business environment, public debate and the media. Most frequently formulation of the Brundtland Commission (1987) is used as a basic definition for the concept «sustainable development» (World Commission, 1987): «Sustainable development is a development that «meets the needs of the present without compromising the ability of future generations to meet their own needs».

Researches indicate that priority directions of the «greening» of the economy differ in various countries of the European region: «some topics (for example, sustainable consumption and production (SCP), innovation) are characteristic only for the country EEA[*] , while others (e.g., governance, energy) generally are developing in Eastern Europe, the Caucasus and Central Asia and in the Russian Federation» (EAOS, 2011).

Numerous examples in the UNEP report suggest that the transition to a «green» economy, although very slowly, but is already happening. This ongoing transformation of the economic model is based mainly on technological development of previous years and decades, which are connected with application of low-carbon energy sources and the reduction of energy consumption and the production of consumer goods and rational waste management. On February 17, 2011, on the threshold of «Rio +20» conference a UNEP report (UNEP, 2011b) was published and its authors stressed the importance of public policy SD and new investment strategy. In the UNEP report (UNEP, 2011a) 10 key sectors of the green economy were indicated, which need to be invested by an amount of less than one-tenth of annual volume of investments in fixed capital. Such sectors are the following: agriculture, construction, energy supply, fisheries, forestry, energy efficiency, tourism, transport, waste management, water resource management. The transition to a «green» economy requires active intervention of the state in the economy: as the free market has failed to prove its ability to efficient and sustainable self-regulation, even in traditionally liberal-democratic states, public opinion is increasingly in favor of stricter state regulation of economy.

Russia also realizes the necessity of transition to the new type of economic system. In the report of Public Chamber of the Russian Federation (Bobylev S.N., 2010) it was emphasized that the greening of the economy has now become the main purpose, and not a secondary effect. In the near future the key definition for the advanced economies of the world will be «green» and «low carbon» economy with its high efficiency and minimal impact on the climate system.

The mechanisms of the Kyoto Protocol to reduce global climate change became the most important precedent for the transition to a new type of economic development for the Russian Federation. This was actually the first in its history agreement on the establishment of the global market, where unusual «selling the air» took place – that is market on greenhouse gases. In addition, on April 30th, 2012, principles of state policy in the field of ecological development of the Russian Federation for the

[*] EEA — European Environment Agency which collects and analyses of environmental information in 32 participating countries, including the 27 EU members and also Iceland, Liechtenstein, Norway, Switzerland and Turkey.

period until 2030 (Osnovy …, 2012) were approved, where «the priority for the society of life-supporting functions of the biosphere in relation to the direct exploitation of their resources» and defined the main goal of «providing «green» economic growth» were declared.

In «Global green new course» the revival of the world economy, the preservation of existing and creation of new jobs and the interests of the least protected groups of the population are defined as the primary short-term goal of states. While short-term goals should not contradict the mid-term (sustainable economic growth and achievement of the millennium development goals) and long term (reducing dependence on hydrocarbons and the preservation and restoration of biodiversity and ecosystem services). On the other hand, the consistency and continuity with respect to short-term solutions should be outlined in the long-term plans and development strategies.

In international practice the «roadmaps» has recently become a common form for such documents - literally «road maps» (or «route map»), which is a kind of action plan. The road map sets out the objectives of development in specific areas, priority of objectives and targets, as well as programmes and specific measures indicating the time frame for their implementation in the short, medium and long term. Such a «road map» is developed both for separate kinds of activity (R&D, policy development, specific technologies) and for sectors of the economy. Thus, for the last few years in California a number of «routes» in the field of «green» energy development of the state until 2020 was prepared - on decentralization and the introduction of combined energy production (cogeneration) (Staff report, 2007), support for R&D in renewable energy (Research & Development, 2007), development of «smart» electricity («smart grid») (Chuang A. et al. 2011) and other.

An example of a more comprehensive approach to the definition of «green» economy is a «route map», published by the UK government in summer 2011 (HM Government, 2011), which states that «greening» must concern all sectors and industries and all kinds of activities at the level of the state, business and society. British «route map» gives recommendations about the form in which the state and business can contribute to the transition to a green economy. In particular, the role of local entrepreneurial partnerships in development of programs of training and retraining for «green» jobs is mentioned.

The question of what education should be to assist SD and «greening» of the economy and society, is closely linked to the question of the stimulating effect on the economy and society of innovations in the field of information technologies. Almost unlimited possibilities of using the world wide web for access to unlimited amounts not always reliable information may harm the quality of education and scientific research, because of increased risk of plagiarism. Obviously, one of the main conditions of the transition to a green economy is to support and dissemination of innovations in technological and economic and socio-cultural spheres. Competitiveness of national economies in the information age (unlike the economies of the industrial period, when the national progress was determined by the access to raw materials and industrial technologies) is based on the ability to generate new ideas and approaches to solving problems, and opportunities for research on the effectiveness of these innovations and their wide introduction. Because in modern conditions innovations have a much broader meaning and application need not just new technology, but a radical change of the economic structure. This means that for stimulation of innovative development mechanisms to promote both individual and collective creativity of broad layers of the society are important (Marfenin N.N., 2010).

In English literature, the term «education in the interests of «green» economy» is often interpreted as a demand for new personnel or retraining of old in connection with change of structure of employment as labour market during the development of «green» industries increased demand for specialists of new professions - the so-called «green-collar». Also, often there is a noticeable deficit of specialists of specific qualifications. However, in addition to specific qualifications and competences, related to the employment in the sector of environmental goods and services, not less important is the task of «greening» of the working capital. Thus, the thematic report of the British government's called specific competencies «dark green», and more general competencies, including the competence related to the tasks of management (life cycle analysis and incremental cost calculations, the organization of low-carbon procurement, planning, impact on the environment assessment and risk management, leadership and execution of administrative functions, provide resource efficiency, financial

management) - «light green». The second important group of general competencies related to scientific-technical aspects: modeling, interpretation, knowledge and understanding of climate change and other.

In content, approaches and methods education for «green» economy is, first of all, education for a change, which, in fact, coincides with the concept of «education for sustainable development». In the new conditions effective preparing creative initiative personalities, capable of solving complicated problems of innovative and flexible ways are required from education. And for this, first of all, the transition from reproductive creative approach to organization of educational systems and educational process, and also in the content and teaching methods is needed (Marfenin N.N., 2010).

Despite the fact that currently the development of human capital is internationally recognized as one of the key objectives and conditions for the successful development, a shortage of investment in education is observed. Commercialization processes and formalization of education are of great concern at the level of the national educational systems. Thus, the transition to the testing form to check knowledge, the growth of the number of institutions unable to provide quality education, are not unique Russian problems. Formal indicators do not give a fair presentation of the effectiveness of the education system in the implementation of a public order for a new type of personality, adapted to the new conditions. Although the formal institutions of general education must retain, their role as a provider of knowledge, abilities, skills or competencies is not exclusive, as before. Thus, in opinion of the expert in the field of educational policy and information technology Daniel Araya, a global network of capitalism, which came to replace the industrial capitalism, embodies the network model, implying the democratization of the educational process, development of horizontal global relations, strengthening of self-organization and interactive beginning, which will determine the organization of education in the future (Araya D., 2010). John Seely Brown, the author of the article (Brown, John Seely), believes that a mandatory component of the learning content should provide only basic competencies such as literacy, arithmetic, and critical thinking. Other content («open» component) should be determined by the students and should be based on the abundance of options and opportunities that offer (or will in the future offer) so-called «educational social network» - distributed network platforms, contributing to the creation and transfer of knowledge and experience, taking into account the interests and motivation of the participants.

However, a virtual platform can not fully substitute for live interaction between instructor and trainees and among trainees themselves. In addition, a significant portion of skills and competences, which are the focus of education for sustainable development, can only be formed on the basis of experience of joint practical activities. It should be noted that an important role in providing education for the future is media literacy. In order to understand the avalanche of information falling upon us every day from different sources, it is not enough just to have skills in critical thinking: media-literate people not only understand and adequately perceive information, but also can filter redundant. In formal education, this problem has not received much attention. «The task of media literacy in the transformation of mass media in active and critical process, helping people to better understand the potential manipulation (especially in advertising and PR), and also to help people to understand the role of media and civil society, joint media in building a view of reality» (Mediagramotnost').

Another aspect that should be paid attention to, if we are talking about «sustainable» or «green» universities, is that not only the content and methods of teaching, but also other aspects of their activities should be remembered . That is, the University is considered as experimental playground, as a physical medium, based on the principles of sustainability (resource and energy efficiency of buildings and equipment, rational consumption of energy and materials, separate waste collection, organization green areas).

## 3. WAYS OF QUALITY ASSURANCE OF EDUCATION FOR SUSTAINABLE DEVELOPMENT

Quality of education is one of the main issues that concern both the University community and employers. The article Francisco J. Lozano and Rodrigo Lozano (Lozano Francisco J., Lozano Rodrigo, 2014) arises the problems in the development of curricula and organization of education for SD. The authors emphasize the difficulties that arise when developing educational programmes not directly connected with the problems of the SD, while in the society there is the real necessity of creating a graduate of the University with holistic system of perception of the world from the position of SD and responsibility before the future generations and that will help them to be agents of change, contributing to the sustainability of society. The systematic approach is to integrate the ideas of sustainability in all the disciplines of curricula and educational practices. The authors cite the example of the implementation of the developed concepts for development of educational programs of preparation of bachelors in engineering for sustainable development (EngSD) in a leading private institution of higher education in Latin America - Tecnologico de Monterrey. The authors stress that in the development of educational programs 4 main approaches for mainstreaming SD were implemented:

1. The inclusion of some of the environmental issues and the material in an existing module or course (Davis S.A. et al., 2003; Thomas I., 2004);

2. Specific course SD (Thomas I., 2004; Abdul-Wahab, S.A., Abdulraheem, M.Y., Hutchinson, M., 2003; Boks C., Diehl J.C., 2006; Cortese A.D., 2003; Kamp L., 2006; von Blottnitz H., 2006);

3. SD issues are included in the concepts of a major disciplinary courses adapted to the nature of each specific course (Thomas I., 2004; Abdul-Wahab, S.A., Abdulraheem, M.Y., Hutchinson, M., 2003; Kamp L., 2006; Peet D.-J., Mulder K.F., Bijma A., 2004);

4. Sustainable development as an opportunity for specialization within each faculty (Kamp L., 2006).

The authors developed a conceptual scheme (map), which is a graph, showing the interaction between different disciplines of the curriculum, to identify the causal relations and subsequently to construct a hierarchy of disciplines.

Article of Kasper Boks and Yan Karel Dil (Boks C., Diehl J.C., 2006) states that the integration of environmental sustainability into traditional technologies of industrial design innovative products is the problem caused by lack of trained students, as evidenced by the results of the design that do not meet the set objectives. Experience of Delft University suggests that one of the important issues for the development of training courses is realistic situations, the rationale of the decisions taken. The inclusion of security issues in the wider scope of increasing the quality of training of students in matters of SD.

Another direction in the creation of the system of training of engineers for SD is to use the methodology of problem-and project-based learning. The authors of the article (Xiangyun Du, Liya Su, Jingling Liu, 2013) indicate that sustainability requires alternative approaches, in contrast to the traditional pedagogy, based on the lectures. This article is devoted to the review of the implementation of the education initiative and the research project, implemented in the framework of cooperation between Beijing Normal University of China and Olborski University of Denmark. The project aims to develop educational programmes for sustainable development, using the methodology of problem-and project-based learning (PBL) in the Chinese context. The theoretical basis of the project was to establish the relationship and analysis of the changes of the curriculum in the field of sustainable development, using the methodology of PBL. The empirical part of the project consisted in the analysis of the results of the first year of implementation of this methodology in engineering, scientific, and educational activities. The authors show that the use of PBL can successfully promote critical comprehension of a material, development of systems thinking, creativity and cultural consciousness, the core values of sustainability. However, as the authors state, implementation of new educational programs using new methods of teaching and learning may be more complex than expected. Many issues affecting the implementation process, create problems for further development:

revising the existing system of classification, provision of both teachers and students prior knowledge of the new methods of PBL. Important aspects are issues of getting organizational support and consideration of traditional social and cultural specificities, as a wide range of cultural aspects can influence the process and curriculum changes. Of paramount importance is the institutional support of further practice within the school and university system: it is not sufficient for educational change, only the changes to the curriculum requires an extension of the range of cultural changes in the institution, the economy and society (Blewitt J., 2004; Sterling S., 2001; Tilbury D., 2004). Sustainability of education promotes greening the university or the integration of the environmental perspective in the curriculum, that is more important for education, and promote changes in the social sphere and in society.

The use of practice-oriented approach in project activities implemented at the universities of Europe in the process of solving real problems and participation in the project «Formula student». This approach is associated with a change in paradigm for engineering education - from «teaching» to «learning». In the article (Huw Charles Davies, 2012) there is given an experience of Cardiff University for the implementation of this approach in training engineers, indicating the advantages of the approach, which allows to create individual learning paths and a community of practice; obtain synergy effect during the design and implementation of project, and also creation of conditions for targeted demonstration of knowledge and the received result. The author describes the six steps reflected and implemented in an integrated model of training and evaluation of progress (start - determine - execute - evaluate - learn - watch).

Studies have shown that a similar approach could be used to produce not only engineers, but also engineers and other areas. The common principles consist of the fact that the focus of work in the student team passes from the learning objectives of the course to participation in the competition; writing reports and MS PowerPoint skills required by the terms of the competition. It should be remembered, however, that this in itself is not enough to assess the work of the students, because not all students equally interested in the results, and it is difficult to estimate the load on each of them. However, for the purpose of work in the team contribute to the development of students in professional activities and in the interests of sustainable development and environmental protection. The project promotes the growth of motivation of the students for skills development, provides the opportunity to implement them in practice and allows you to compare their results against other teams of a similar profile. The end result - improvement of quality of training and improvement of professional skills necessary for professional practice.

## 4. TASKS ON PREPARING OF THE ENGINEERING STAFF FOR THE AUTOMOTIVE INDUSTRY IN THE INTERESTS OF SUSTAINABLE DEVELOPMENT

Requirements for the competence of personnel, reflected in the strategy of development of auto industry of Russia 2020 and the Concept of the staffing Strategy of development of car industry of the Russian Federation for the period until 2020, cannot be implemented in the existing system of personnel training without significant changes of the educational paradigm.

High-tech manufacturing are needed not just for engineers, engineers of the new formation, capable to bring our industry on the level of world high-tech industries (Makarova I., Khabibullin R. 2013[a]). The open lecture to the students of the Institute of KFU «Russia's Accession to the WTO: pluses and minuses for the automotive industry», held on March 18, 2013, the General Director of JSC «KAMAZ» Kogogin S.A. noted: «Today we are waiting for University students who have basic modern knowledge, able to solve production problems, know modern methods of designing, modeling, English language».

Speaking about the problems and challenges facing the industry Kogogin S.A. identified one of the main directions of the innovative breakthrough: «...in order not to lag behind in development, we have asked the government of Russia and Tatarstan, and offered the project of creation in Naberezhnye Chelny engineering center for the automotive industry in the cluster of commercial vehicles and buses. According to the project there will be constructed a modern landfill and create at least 500 engineering

jobs with a high level of payment. Appear research labs that allow us to count on state investments into the development of our industry».

Because the requirements for the product change, personnel requirements should be adjusted too. The educational system must overcome inertia and adapt to the realities of the economy and production, the development of which is only possible thanks to the development of the educational system (Makarova I. et al., 2009).

Agency for strategic initiatives, which aims to «Create opportunities for the young and ambitious leaders who will lead Russia to a leading position in the world, to build a country where you want to live and work» (ASI, 2013) conducts extensive work on the development and promotion of innovative projects, in particular aimed at improving the educational system. The proposed project «foresight competencies 2030» is considering the possibility of organization of interaction between the educational system, labour markets and innovative economy. In the project «Roadmap for the transition to the National System of Competencies and Qualifications (NSCQ)» considered the ways of solving the problems existing in the field of education, as well as detailed analysis of the opportunities and constraints in conducting reforms on improving the system of training professionals. One of the activities in the «Education is indicated: «Reshaping of the regional Universities in the narrow OS». In our opinion, this measure will contribute to closer interaction with a specific employer, in the following directions: formation of requirements to competence, coordination of educational programs, forming an order for the specialists, training of teachers, organization of joint teams at the scientific-research and experimental-design developments etc. Moreover, narrow specialization of the University will give an opportunity to implement training of specialists in the context of the life-cycle support, enhance the responsibility of the parties for the quality of training specialists (Makarova I., Khabibullin R. 2013[b])..

In this respect Naberezhnochelninskij Institute of KFU has clear competitive advantages as a location in the capital of the truck industry of Russia, and also presence of the spectrum of fields relevant to the entire life cycle of vehicles. The University was created to solve the problem of qualified personnel of the main enterprise - OJSC «KAMAZ», developed in parallel with it and will be competitive only through close interaction in all directions. Given these factors, as well as the existing experience of interaction with the strategic employer - JSC KAMAZ organization the PCU, as well as the implementation of the project «Formation of a system of continuous professional training automotive profile based on social partnership» (Makarova Irina et al., 2011) and «Problem-oriented approach to formation of the system of continuous training of automotive profile» at the present time strategy agreed to create on the basis of two technical faculties of the Institute of innovative scientific and educational site – «Higher school of automobile engineering» (hereinafter School), which provides training of specialists at the global level and research at the level of the leading car scientific and educational centers.

Created School will contain the Department, which reproduce the stages of the life cycle of vehicles. It is provided by the introduction of new forms of training and new technologies of training of specialists of the School according to the methodology of «Imagine – Make a project - Implement - Manage» in accordance with 12 international standards of design-oriented education the global initiative on CDIO. The project will create in Naberezhnochelninskij Institute of KFU in 2014 - 2015 competitive conditions for the development, implementation and constant improvement of the original software engineering training highly qualified specialists for automotive industry and the conduct of successful research projects.

Confidence in the reality of goals due to the fact that the key employers in the region are interested in the modernization of the educational process, are ready to participate in the project to improve the quality of training of engineering personnel and bring the level of graduates' competences in line with the real needs of the labour market, and the status of the Federal University of KFU defines a unique opportunity to implement the most ambitious projects and opens access to budget resources at various levels.

Practice orientation and applied context of educational programs are secured by long-term experience of management of the University in organization of industrial practice of students at the workplace, course and diploma designing and system PCU for the development unit of JSC «KAMAZ» (Makarova Irina, Khabibullin Rifat, Belyaev Artur, 2012). The frame of reference for determining the methodological relationship between the stages of the life cycle of the product during the development of innovative educational programs (including BA degree) are qualification requirements for the professional standards of the automotive industry, that provides a holistic perception of a system of sectoral training of engineers car profile.

The presence of all the participants of the project of the common vision of the whole chain of the life-cycle stages of automotive vehicles, ranging from the study of markets and consumer preferences, product design and manufacturing technology, production, promotion products, its operation and maintenance to disposal, is a pledge of skilled engineers training for the automotive industry (Makarova I., Khabibullin R., Belyaev A., 2013).

## 5. THE USE OF BALANCED SCORECARD IN THE MODERNIZATION OF THE EDUCATIONAL SYSTEM

The educational system of a new type should provide informal implementation of the concept of «lifelong learning» by organizing a common information and scientific-educational space of interaction of subsystems of education, science, business and power, as well as subsystems of the educational system by levels of education. This is possible through a system of goals, the General aim of which is the preparation of a specialist with innovative thinking for sustainable development, competitive on the world markets. Only full cycle can provide high quality results, since in this case the purpose subsystems are interconnected and contribute to continuous improvement. In turn, to achieve the objectives of each sub-system should be developed balanced performance indicators, allowing to take into account the resources to consider processes in terms of different perspectives and to identify key success factors.

Given the above, was designated a strategic goal - to create in 2013 - 2015 «The higher school of automotive engineering», competitive among the leading world car of scientific and educational centers, providing conditions for research, development, implementation and constant improvement of the innovative programs of engineering preparation of highly skilled experts of the world level for the automotive industry of Russia.

Prerequisites for the formation of a strategic goal maps WSAI served seven principles of educational activities formulated on the results of the scientific-practical conference «Modern approaches to the formation of legislative fundamentals of education» held in July 2011 under the auspices of the Russian Union of rectors, such as:

1. The principle of the unity of educational space.

2. The principle of parity of training and education.

3. The principle of integration of education and science.

4. The principle of academic freedom.

5. The principle of the unity and continuity of all levels of education – «education through life».

6. The principle of balanced interests of the students, parents, teachers, employers and shareholders as the main participants in the educational process.

7. The principle of transparency (openness) of education for society.

With these principles in mind, as well as analysis of the current state of the education system and the socio-economic situation in Russia and for implementing the mission of WSAI General purpose was formulated and hierarchy of objectives was built, contributing to its implementation.

For this purpose we used the most effective currently method - balanced scorecard (BSC – BalancedScoreCard, BSC), which is a logical relation between objectives and indicators grouped into five basic perspectives: image (goodwill); consumers; internal processes; training and development; resources that are located in strict hierarchical order (Moskovkin V.M., 2007).These prospects are actually reflect the main directions of the strategic development and the transition from a situation «as is» and «as will be» (Fig. 1).

Development of the concept of the introduction and implementation of the BSC was carried out taking into account the specifics of the structure of management and organization of activities typical now for universities, at the same time, based on experience of the leading specialists in the field of strategic management (Moskovkin V.M., 2007; Moskovkin V.M., Rakovskaja-Samojlova A.X., Purtov V.F., 2002) and the introduction of BSC (Moskovkin V.M.,2007; U.Ju. Duhonin et al., 2005).

Order (hierarchy) prospects due to several factors. First goes the importance and the relationship of targets that contribute to the achievement of the General objective.

The second important feature of the BSC is the principle of its build - a system of indicators shows the organization's strategic objectives and reveals the means of achieving them. Statement of questions varies with the principle of «where we are now» on the «where are we to be tomorrow». Situation of the organization is evaluated from the point of view of approaching this goal.

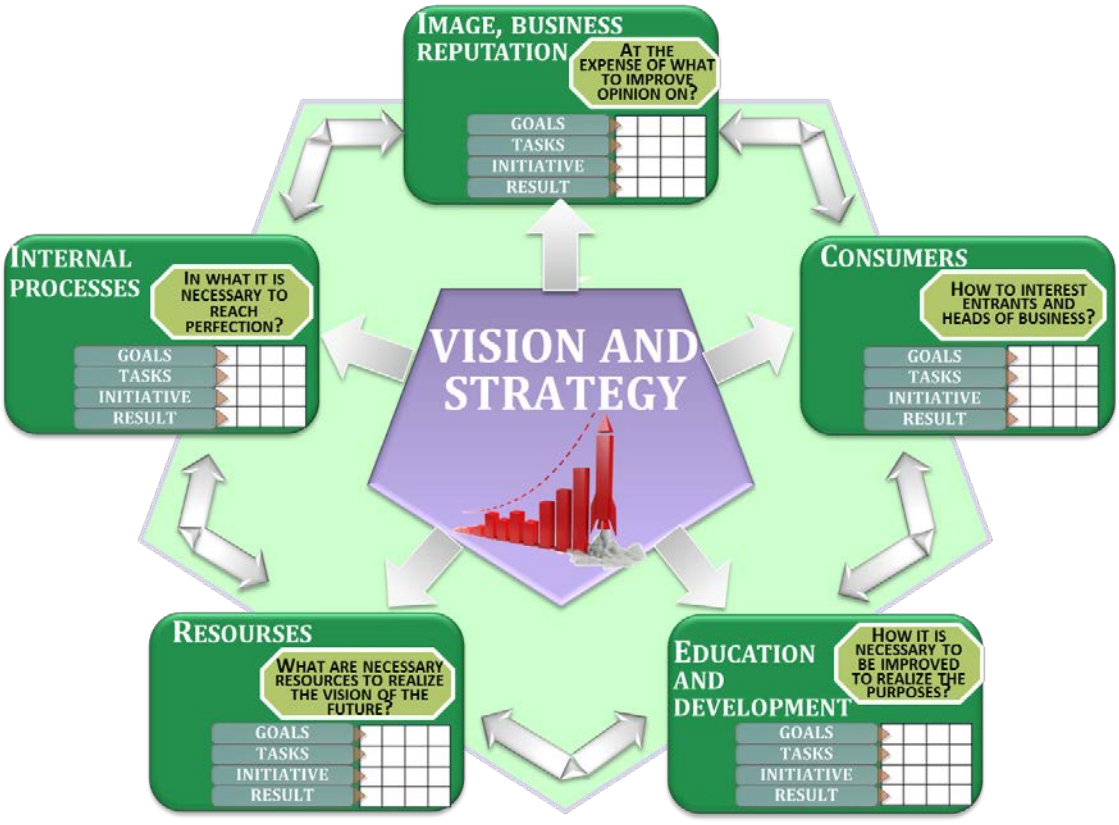



Fig.1. Enlarged map of purposes

The third feature of the BSC is the assessment of the efficiency of processes with the help of intangible indicators. This is because of the tendency of growth of significance of intellectual resources of the organization. The development of the competitive advantage is not only in the growth of the financial performance, and the application of new technologies and intellectual developments not only in the sphere of educational and scientific activity, but also in the field of organization of

processes, inventory management, solving social tasks, etc. should be taken into account that, unlike tangible assets, properties and value of which is static, intangible assets are strongly influenced by their owners and are determined by the qualified personnel. Therefore, an important aspect is to increase the intellectual level PPP, constant actualization of their domain knowledge through internships and courses, and self-improvement, fuelled by the availability of personnel motivation system.

## 6. CONCLUSIONS

Analysis of tendencies of development of system of engineering education in the world from the viewpoint of «green economy» and sustainable development suggests that the system of engineering education in Russia has all the capabilities to meet the challenges in the new millennium. Despite numerous challenges, the joint efforts of education, business and government Russia should revive on a new level of traditions of the Russian school of engineering, thereby ensuring sustainable economic development and competitiveness of their companies on the global markets.

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