INNOVATION ROLE IN SUSTAINABLE DEVELOPMENT

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Abstract

In Latvia, there is an actual necessity to create the premise for transition from the present economic model to an innovative development model. In this new economic model, innovation must become one of the principal factors in formation and increase of competitiveness and sustainable development. Innovative development will directly be able to increase the labour productivity and the return of resources used in production process, to decrease the costs of production and services. The aim of the paper is to provide a new view to already existing and possibly well known concepts that is innovation and sustainable development, to show how the role of innovation changes in different phases of the business cycle, how it influences the productivity and what the economy gains on the whole. The level of labour productivity is influenced by several factors. The principal attention in the paper is paid to the development of innovations and education, to their interaction and impact on the productivity. Especially, the role of innovations increases under conditions of the crisis, because innovations directly are able to advance the economy to the improvement phase of the business cycle. To be able to carry out innovative solutions practically, well-educated and qualified workers are necessary; otherwise the innovation will be left without support. In its turn, the solution of education and innovation problems will make a positive impact on the productivity and successful sustainable development.

Key words: innovation, education, productivity, sustainable development, business cycle.

Introduction

The end of the twenty century was the beginning of important international political processes that was marked by the start of a new way of thinking. For the first time, the concept of sustainable development was mentioned in Stockholm in 1972, however, it became topical in 1980 in relation to the Report of the Committee of Brandt “North-South: A Programme for Survival”, and later in 1987 with the Report of the Committee of Gru Harlem Bruntland “Our Common Future”; the next time was the Rio de Janeiro Summit in 1992. Sustainable development is a concept that has to combine economic growth with such use of natural resources that provide a benefit for the society as a whole. A sustainable development is such development that satisfies the needs of our generation without creating threat to satisfaction of the needs of the future generations: with such or similar words, the main idea of sustainable development are defined in the documents of both the UNO and the EU. In achievement of a sustainable development, a great role is played by innovation that, in its turn, cannot develop successfully without knowledgeable and qualified staff. The long-term development has three dimensions: environmental, economic and social. In this paper, the attention will be accentuated on economic dimension.

In the Latvian National Development Plan and in other government documents, it is underlined that it is necessary to create preconditions for transition from the existing economic model, characterized by production of the products with low added value, and using of insufficiently skilled labour force, to an innovative development model. In this new economic model, the innovation must become one of the principal factors in creation and increase of competitiveness. Exactly, the innovative development is able to provide the increase of productivity and the return on resources, being used in the process of production, diminishing of the costs in production and services.

The aim of this paper is to provide a new viewpoint, as it may seem, related to well-known things that include such economic concepts as innovation, human capital, sustainable development and productivity, and to show how the role of innovation can change in different phases of the business cycle, what impact it makes on economy. To achieve the aim, the following tasks are to be fulfilled: to characterize the role of innovation and human capital in economic development; to accentuate the role of innovation and education in productivity increase and in sustainable development of economy. The limited scope of the paper makes it like a thesis to a certain extent.
1. The Role of Innovation and Human Capital in Development of Economy

For more than two centuries, the development, the accumulation and the use of human working capacity attract the attention of economists. Yet its essential development, the theory of human capital has gained on the basis of researches of G. Becker and his colleagues of Chicago University T. Schultz, B. Veisbord, G. Mincer and L. Hansen. This theory offered an undivided viewpoint on such seemingly different things as the contribution of education to economic growth, the demand in medical and educational services etc. For the first time, the term “human capital” was used by Theodor Schultz, but Gary Becker, in his turn, developed this idea further, substantiating the efficiency of investments into human capital and formulating the economic approach to human behaviour. The book of Becker Gary, S. “Human capital: theoretical and empirical analysis, with special reference to education” [1] may be regarded, to a great extent, as a classical work that has made an impact on all further researches in this field. Human capital is the stock of knowledge, skills, motivations, abilities and health, formed and accumulated on the basis of investments by human, which stimulates the increase of labour productivity and income of an individual. Investments in human capital include, for the most part, costs of education (all-round and special, formal and informal), health care (prophylaxis, medical services etc.), as well as the creation of ethical and value norms (for example, loyalty of one to his enterprise). Since in the future, these costs will be compensated frequently with the income they must be regarded as productive, but not as consumptive costs. Exactly, the research on human capital provided the opportunity to understand that a principally important source of economic growth and welfare is the knowledge and competences. Educated and healthy people are the force that forms the national richness; therefore investments into human capital are justified and necessary. Only the educated population are able to generate new ideas, to transform them into innovations and implement into entrepreneurship successfully.

J. Schumpeter was the first who defined the concept “innovation” in his work “The Theory of Economic Development”. He interpreted the innovation as a new scientific and organisational combination of existing production factors to solve commercial tasks. Just in the innovation, Schumpeter saw the development source of economic systems. Taking into account that the specific content of innovation is changes, he indicated straight to them, paying attention to five typical changes: 1. providing of new technology, new technological processes or new production markets; 2. implementation of products with new qualities; 3. use of new raw materials; 4. changes in production organisation and in the material and technical provision; 5. emergency of new markets [2].

Not all inventions can become innovations; innovations are only such inventions that provide profits to producers and satisfy the demand of the market. In other words, first comes the idea that, thanks to the science, materialises, and the next step is the commercialisation of this idea that transforms the invention into an innovation that provides income. The following saying is here at place: if science is the process that transforms money into knowledge then innovation is the process that transforms knowledge into money, providing an increase in added value. Innovation is the one that does not remain on the level of ideas, but is real for itself and exists in the world of real things.

The opinions differ also in relation to the impact of innovation on the economy. The opinion of the author is that, taking as basis the research results of Kondratjev [3] about the irregular development of innovation and relating it with the cyclical development of economy it may be asserted that this cycle is affected to great extent by the development of base innovations. What does it mean base innovations? J. Schumpeter considered (and these considerations are in full force and effect also in the 21st century) that the base innovations are such innovations that are based on important inventions, and these innovations create new, previously unknown products or processes, which are based on new scientific theories. Base innovations are founders of the new long technological wave.

In development of economy and society, the role of technological cycles manifests itself so that, on the one hand, the mass of productive capital increases, and its technological level increases as well, but, on the other hand, thanks a better education and skills, there increases the qualification level of labour force and the management: as a result, there takes place an increase in return of both production factors – they become used more effectively. In the course of time, with achievement of a more
higher technological level in production, exactly the innovative traits of labour force increase most rapidly, because the qualified labour force not only adopts the new technologies more faster and uses them more effectively, but it also creates these technologies by itself.

In his book “Business Cycles”, Schumpeter [3] combined the long wave theory of N. Kondratiev with his innovation theory and, as a result, created an original theory of cyclical development. His opinion was that the cyclical development of economy is related mainly to the internal mechanism of the system, and that it is the innovation process.

In the world’s economic development, there had been five technological cycles or waves, and presently there is a situation that the fifth wave is in its decline stage, and soon the new one – the sixth wave will come. The advancement phase of every new wave is stimulated, for the most part, by base innovations. The present fifth wave is related to microelements, biotechnologies, computers, telecommunications, and information technologies.

The advancement phase of every new wave contributes to development of investment and economy. Arriving to the top of the wave, the new technology has achieved its maturity and, with the help of diffusion, also an overall spread, but then the development tempo becomes slower. Further follows the downward phase, when the return and amount of investments decrease, and this phase continues up to a time, when a new totality of innovations emerges.

There is not a united opinion in relation to the fact, in what phase of the wave are acting concrete countries, still most economists’ opinion is that the world’s developed countries are presently in the fifth wave.

Analysing the economic situation of the world, and the crisis, having touched more or less all countries, the author comes forward with a hypothesis related to the causes of the crisis. The main causes of the crisis are formulated and analysed, and, agreeing to them fully, the author’s opinion, though, is that there may be one more cause that had not been mentioned up to now: and it is the downward phase of the long waves – in both the countries, where the fourth wave takes place, and in the countries, where the fifth. Especially, it concerns the USA, where the end of the fifth way might have been achieved already in the 2010.

However, as it is well known, even the evil may have a positive side, because the economic crisis, especially the depression, may be regarded as a generator, that favour the emergency of new innovations that create technological basis for a new long wave. In accordance with the opinion of Gerhard Mensch [4], the overall worsening of economic conjuncture triggers active modernisation of production and very active innovative activity of economic subjects being involved. As an example, the period of 1970s-1980s of the 20th century may be mentioned, when the world’s developed countries solved the contradiction, existing between the decrease of economic accumulation opportunities and the necessity of radical change in technical and technological basis of national economic systems, with both the help of investments into new technologies and the help of mobilisation of additional financial funds.

Exactly in the depression phase, the economy is structurally ready for transition to new base innovations, and the base innovation clusters are forming in this phase. In the case of lasting economic crises, in the enterprise there takes place a transition from a profit maximisation strategy (being used during the prosperity period) to a relative risk diminishing strategy. As long as the existing production and technology provide considerable profit, the inclination of the enterprise to implement innovations is small, because the innovations are always related to risks. But, when the economy is in a lasting crisis and the perspectives in traditional structures become worse, the innovative risk is no more unsurpassable hindrance, because any other investment project may turn out as a more risky one. And, as a conclusion is: most of base innovations, i.e. the products come into being, exactly, during the lasting and heavy depressions. Consequently, exactly the innovations transform the recession of economic conjuncture into an ascent, and create waving.

Similarly, the innovation is one of the main factors, with the help of which it is possible to increase the labour productivity and to enable a sustainable development. To provide that it takes place, the state needs a certain scientific potential, being able to create new products and technologies, entrepreneurs who are interested in their implementation into production, as well as there must be an educated labour force, being able to carry out it all practically. Is it all on a sufficient level in Latvia? This problem is ana-
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lysed by the author in her previous papers, therefore, there are discussed only some data related to the innovative development in Latvia.

The conception on the subject of innovation development in Latvia may be obtained on the basis of the materials of the EU, for example, from European Innovation Scoreboard [5]. It contains the data about 27 countries of the EU, as well as of some other countries of the world. In this report, all countries are grouped in four groups, in accordance with the results of 24 indicators: Innovation leaders, Innovation followers, Moderate innovators, and Modest innovators:

1. Denmark, Finland, Germany, Sweden all shows a performance well above that of the EU27. These countries are the Innovation leaders.
2. Austria, Belgium, Cyprus, Estonia, France, Ireland, Luxembourg, Netherlands, Slovenia and the UK all show a performance close to that of the EU27. These countries are the Innovation followers.
3. The performance of Czech Republic, Greece, Hungary, Italy, Malta, Poland, Portugal, Slovakia and Spain is below that of the EU27. These countries are Moderate innovators.
4. The performance of Bulgaria, Latvia, Lithuania and Romania is well below that of the EU27. These countries are Modest innovators.

In accordance with the summary innovation index, Latvia is on the 27th place, while Lithuania, in its turn, on the 25th place, but Estonia on the 18th. In its turn, Latvia has not succeeded in it (it has suffered from the economic crisis harder than the neighbouring countries). The backwardness from other countries of the EU is to be seen, especially, in such parameters as private sector’s investments into financing of innovations, fully insufficient relationship between several links of the innovative chain, especially between the science and the entrepreneurship, low economic efficiency and others.

One of the main factors that have caused such situation in Latvia is the low level of state and private sector investments into research and development. In 2004, the summary financing of R&D was only 0.42% of GDP, in 2005 – 0.56%, in 2007 – 0.59%, in 2008 – 0.61%, in 2009 – 0.46%, and in 2010 – 0.50%. In comparison, in 2007, the financing for research and development in the EU27 made, in average, 1.84%. In the strategy “Europe 2020” there is the aim to increase this indicator to 3%, yet Latvia plans to achieve only 1.5% [6, 7].

2. Human Capital in Latvia (Education Component)

The opinion that Latvia is a country with a qualified, highly educated work force has put down deep roots. Let us have a look, if it is so in reality.

One of the indicators, describing the human capital, is the Nation development index, which has several components related to education level, health of the population and lifespan. According to the Nation development index, Latvia in 2010 was in the 48th place of the 169 [7].

One of the components – the literacy of adults is, in reality, on a high level (99.8%), and Latvia already, for a long time, is in the group of the leading countries. However, this minimal knowledge level does not yet give evidence of a level of the human capital development that may be able to work productively and create a competitive economy. The proportion of the population with secondary education in the age group from 25 to 64 makes 60.7%. The summary indicator in the EU27 is 46.8%, but in Czech Republic 75.9%, Poland 66.8%, and in Lithuania 60.4% [7]. One less researched problem is such that a part of children does not go to school at all. According to the data summarized by the State Service of Educational Quality, in 2010/2011, 11,3 thousand pupils, in the obligatory educational age, did not go to school. In 2009, the proportion of population in the age group of 18-24, having not finished the school (having not obtained the secondary education and continuing not their education), made 13.9%. The causes of it may be different, but, mostly, they are of social economic nature. Because of the demographic situation in Latvia, there takes place a diminishing tendency of the number of pupils at schools. In 2010/2011, the school year was begun by 858 general educational schools with the number of pupils – 229,0 thousand that is by 10,8 thousand or 4.5% less than in previous school year [7].

The data mentioned above are showing not only the one year’s situation, but reflect a long-term tendency, the improvement in which is not to be seen. The education on the school level is related to a lot of problems, which have to do with closing of the schools (most strikingly, this
moment took place in 2009). Especially destructive, the closing of schools is in the rural areas, where there, simultaneously with closing of the schools, go gradually away also people. The information about unfavourable implications of such behaviour may be found also in the experience of neighbouring countries, for example, Sweden.

A serious problem is both the obtained and the missed knowledge. For a long time, insufficient attention was paid to such sciences as mathematics, physics, chemistry etc, but exactly these sciences are necessary to provide that the staff might be able to adopt new technologies, to implement new products, and to produce export goods in order to develop a really knowledge based economy.

The quantitative indicators are important, but it should not be forgotten about the qualitative indicators, which provide evidence of the quality of education. There we have the following tendency. If we analyse the knowledge level of the fourth class, then the indicators in Latvia are higher than the average level of 70 countries, and this level remains even up to the eight classes. The results of centralized exams evidence that, in average, the knowledge of the most pupils is on a middle level or lower than it.

Is must also be taken into consideration that a number of pupils does not take examinations in such disciplines as physics, chemistry, biology (exam in mathematics is obligatory) at all. As a result, the higher educational institutions have often to listen to complaints related to the knowledge quality of the graduates. But how they might be able to provide perfect specialists from the material, they have received from the schools? [9]

In Latvia, the higher education is provided by 58 higher educational institutions. During the five last years, the number of students of higher educational institutions decreases. In 2010/2011, the number of the students of higher schools and colleges made 103,9 thousand that is by 8,7 thousand less that in the previous year. The number of matriculated has also decreased: from 31,5 thousand in 2009/2010 to 31,0 thousand in 2010/2011. In 2010/2011, the number of students per 10000 inhabitants of Latvia made 492 that, although this number has decreased, are yet one of the highest indicators in the world. In comparison, in the 2006/2007 academic year there where 566 students per 10000 inhabitants, and it was the second highest indicator in the world. A higher indicator had only Canada – 580 (the USA – 520) [9]. In the context of the Strategy “Europe20”, the aim of Latvia is to increase the proportion of population with higher education in the age group 30-34 in 2020 up to 34-36%; in 2009 this indicator was 30,1%. The average target indicator in the EU is 40% [14], in 2009 the 32,3% were achieved.

In the higher education, one of the problems is the provision of its adequacy to requirements of the labour market and the economic sector. Still there are not sufficiently specialists in the areas of engineering, production, processing and other technologies. The most popular thematic areas with the vast majority of the students are the social sciences, commerce and rights (49,9%). Engineering, production and construction is studied by 12,6% of higher school students, natural sciences, mathematics, and information technologies – by 5,5%. In 2010/2011, the number of students has increased in the studies financed by the state budget, however, 66% students pay for the studies themselves.

The main political directions and measures to increase the number of graduates are: modernization of higher education, bringing up-to-date of material technical bases of higher educational institutions, increase of efficiency in use of resources, provision of an equal accessibility of higher education and improvement of it in both quality of scientific activities [7].

One of the development indicators of scientific system is the increase of scientists per year and the number of persons having taken their doctors. In fact, the following data link two areas – the innovation and the education. In 2010/2011 academic year, the number of doctoral programme students were 2418 that makes 2% of the whole number of students. In 2010, the number of defended theses made 132; for comparison: in 2007 it was 146, in 2008 – 139. The major doctoral programme students are related to social sciences, commerce and rights, making 27% (the situation has improved a little in comparison with the previous year, when this indicator was 35%) of all doctoral programme students. The studies of natural sciences, mathematics and information technologies were chosen only by 15% (unchanged) of all doctoral programme students, and 21% (previously 15%) of all students were involved in doctoral programme studies related to engineering, production and construction. The interest in doctoral
Consequently, it may be concluded that the level of literacy of the adult population in Latvia is high, but the quality of education has different shortages, for example, insufficient knowledge in natural sciences that is felt clearly by the higher schools, being not able to correct all faults, having taken place at the school. As a result, the economy does not receive fully all necessary specialists with adequate knowledge level. The number of young scientists and the total of all involved in the scientific area remain still insufficient.

3. Productivity

The problems of educational and scientific areas make their impact also on the productivity and competitiveness of Latvia. On the state level, the productivity is calculated on the basis of the indicators of gross domestic product (GDP) and number of employed. The table contains data about productivity level in several countries of the EU, reflecting the level of Latvia in comparison with the older countries of the EU and its nearest neighbours.

![Table: GDP per capita in PPS (EU-27 = 100)](http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&code=tec00114)

In Latvia, the productivity increased gradually since 2000 (in reality since 1997), but with the beginning of the crisis it decreased rapidly. As it is to be seen from the data, not only Latvia has problems with the productivity, but also the whole EU, for the USA has overtaken it. The success of the USA in this area is based on several reasons. One of them is such that the Americans work longer hours per year than people in the majority of developed countries; however, it seems that a more serious there may be another cause. Namely, it is the serious financial investments into development of information technologies in 1990s, and not only into development of IT, but also into implementation of offered by it opportunities into other spheres as well. In its turn, the EU, on the whole, has serious problems in the areas of innovations, and namely with implementation of the newest technologies and commercialization.
of scientific research results. One more serious problem of the European Union is related to demography – the ageing of population that also has a negative effect on this indicator. On the other hand, the working hours in Latvia are even longer than in the USA, but the result is such as it is. For the medium term period – up to 2015, the Ministry of Economics has elaborated three forecast scenarios – the variants of a basic, a faster and a weak growth [13]. We will pay attention to the medium variant because, taken into consideration the present situation in the world, it has a certain reason.

In 2009, a considerable decrease of economic activities was foreseen – the decrease in GDP by 18% (that also came true). Notwithstanding the improvement of the situation in the second half of 2010, the growth rate of GDP remained negative in 2010. The situation in 2009 and 2010 was caused mainly by the weak outer and shrinking inner demand. A positive economic growth recrudesced in 2011, surely, the financial markets stabilized in the world. In the scenarios of the Ministry of Economics, the enlargement of export capacity is regarded as the main growth factor, which, in its turn, is related to the development of industry and increase of competitiveness. Up to now, as the main competitiveness factors in Latvia there were used the relatively cheap labour force and the low overheads. Unfortunately, it is to be recognized that such factors of competitiveness are not sustainable; it was already argued far and wide by M. Porter in the past century. Many Asian “tigers” made use of cheap labour force for some time, but they linked it to the new technologies. So we return again to the impact of innovation on productivity and economy all in all. In the scenarios to be analysed, it is also underlined that the old methods are no more of use, that it is necessary to increase the productivity and to favour the export capacity. However, it is a great deal the declaration of an intention because the aim is indentified, but the instruments, with the help of which the aim may be achieved, are not analysed deep sufficiently.

In accordance with the calculations of the basic scenario, the expected development from the period 2011-2015 will not be able to compensate the big decline that had begun in 2008, and Latvia, in fact, will be in its development on the level of 2006. A true sustainable development is, actually, not to be seen in the present situation.

Conclusions

Summing up the above mentioned, it must be pointed out the following more important moments: one of the principal driving forces is innovation that makes an impact on development with the help of new products, services and technologies, and, secondly, the innovation makes a positive impact on the productivity and sustainable development of the country. Especially, the role of innovation increases during the circumstances that are related to the crisis because, directly, the innovation is the one that is able to move the economy to a business cycle recovery phase. To be able to implement innovative solutions practically, highly educated, qualified workers are necessary, consequently, the attention must be paid mainly to the area of education, realising a well-considered long-term policy. Consequently, the main conclusion: sustainable development of economy is possible, if innovation is supported. On the basis of conclusions, the recommendations derive: more financing on the government level must be granted to scientific and educational areas, a more active involvement of entrepreneurs in financing of these areas must be promoted, the knowledge level of second school graduates must be improved, especially in natural sciences, interesting of the youth in science, strengthening of the relationship between science and entrepreneurship must be provided.

References


