



Students Scientific Conference

Innovation and/or technology transfer

Which is the driver of local economy?

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1. Some introductory thought on innovation

From the ancient times of mankind the innovation plays a very important role in our daily lives. Any invention, reform and modernization which make our daily lives more comfortable can be called Innovation. Innovation is more than just a successfully accomplished R & D activity. Successful innovation is the only research and development what is fully completed and the result is regarded profitable for the research institutions and for the implementers as well.

Innovation is also known as modernization and without any misunderstanding we might call it “the economy's driver”, since those countries whose system works well in the modernization of their countries are economically far ahead of Hungary. For example: USA, Ireland and Japan. The innovation, understanding as new discoveries have an important role in the economic competition. Companies can increase their result with lower input, or even a longer or shorter period of time can monopolize the market with their specific product or production technology, which means that the monopoly price may be imposed. It is outmost important for the market leading companies to have a wide range of expenditure in R & D (research & development) and innovation field. The guaranty for the long run success of a company gives the investment in research and innovation. We have seen many times that the big companies with a huge market shear are leading in inventions and adaptation of innovative technologies.

But why is it good for ordinary people? The answer is very simple. Without innovation we would still be in the prehistory. With that I would like to conclude that the invention has a very serious impact on people's well-being. How we could live now days without vaccinations, electricity, modern communications technology and advanced traffic? The whole history of mankind accompanies innovation, from the invention of wheel, to the nuclear power stations. The capitalist free market system and innovation system is one of the most important criteria in the conditions of competition that would encourage companies to devote more and more funds for research and development. After all, it is not yet a monopoly of some companies when they invest in research and development but the states must be vigilant that monopolies do not happen.

Innovation system is a three-party system, researchers, investors (companies) and users. The initial effort of innovation is always an R & D activity. The research activities can be divided into three layers: basic research, applied research and development. The basic research is not intended directly for use, it wants to understand things of the world deeper and more

thorough. The applied research results can be used in the industrially to deliver brand new products. The development process of applied research goes thru the next phases: refine, optimize, finalize.

The next question of the modernization is: Who is doing it? Well the answer is simple, we all are doing it. The innovation process actually takes place within us, our role outcomes from our decisions and assessments. Here you have to remember also that the acceptance of innovation among users of different companies and institutions output, such as those who are running in manufacturing, or marketing methods, varies, but we can easily understand that operationally they complete our concept of innovation. The users of innovation in our concept most natural way are involved into the whole process. This means that we should know the needs of users, the use of new, inventive product. So what's new if it is not better than the existing, or simply cheaper? In summary, let us take into the model of the users, even the passive ones; they will judge the finished products: if the product meets their requirements they will buy it, if not, they do not ask for it.

The functional roles of investors are a bit controversial. They are the ones who are located between the other players, the others have to maintain the connection to the investor, so the others practically independent of each other. Now we can see that actually the „real player" role is theirs, they are the ones who take the decisions in to launch a spin off business or not. In fact, the investor is who takes the risk in the game. The investor will not take care of basic research, because it's not worth it, there is the state, who should act. However, the results applied by investors. Applied research and development carried out, usually in the investor's own innovation executive department. In fact, the investors have simply but risky task in this model, because they play the "game" and collect the “winnings”. But there are some problems. In fact, successful innovation supposes plurality of decision making. The actual situation needs revising mainly in the underdeveloped countries.

2. Ten Survival Strategies for 21st Century and the innovation challenges

Joseph N. Pelton and Peter Marshall in their famous works ("Mega crunch: Ten Survival Strategies for 21st Century Challenges ") predict in 10 points the great challenges for the 21st century.

The ten-point agenda by Joseph Pelton and Peter Marshall includes:

“1. Reduce world population to 4 billion or fewer. There is considerable evidence to suggest that all we need to do to destroy human civilization is to keep expanding human population.

To discuss this point is out of interest of this paper!

2. Develop renewable energy sources such as geothermal and wind, as well as improve efficiency.
3. Reduce carbon footprints globally by offering incentives for cleaning up coal-fired plants, reducing emissions, and so on.
4. Move to a structured market economy that reforms pricing systems to reflect longer-term economic and environmental costs.

This point not directly linked to the innovation issue.

5. Promote smart growth that emphasizes greater use of information technology and communications to reduce inefficiencies.
6. Promote smart transportation powered by renewable, nonpolluting energy sources.
7. Develop and promote futuring at the local, regional, national, and international levels.

This point not directly linked to the innovation issue.

8. Prepare for a “post singularity” world by anticipating the potential disruptions of super automation.
9. Explore new technologies, including those promoting space developments.
10. Act now on all of these reforms, because further delays will increase the costs of any actions taken.”

This point not directly linked to the innovation issue.

As we see only three points from above ten are not connected to the R & D activities.

The authors from their thesis derived the 21st century innovation challenges and made a comparison with in the 20th century topics, have been passed over (Table 1st).

1st table: The 20th and 21st century's innovation challenges

20th Century Innovation Topics		21st Century Innovation Topics
1.	Electrification	Energy conservation
2.	Automobile	Resource protection
3.	Airplane	Food and water production and distribution
4.	Water supply and distribution	Waste management
5.	Electronics	Education and learning
6.	Radio and television	Medicine and prolonging life
7.	Agricultural mechanization	Security and counter-terrorism
8.	Computers	New technology
9.	Telephone	Genetics and cloning
10.	Air conditioning/refrigeration	Global communication
11.	Interstate highways	Traffic and population logistics
12.	Space flight	Knowledge sharing
13.	Internet	Integrated electronic environment
14.	Imaging	Globalization
15.	Household appliances	AI (Artificial Intelligence), interfaces and robotics
16.	Health technologies	Weather prediction and control
17.	Petrochemical technology	Sustainable development
18.	Laser and fiber optics	Entertainment
19.	Nuclear technologies	Space exploration
20.	High-performance materials	"Virtualization" and VR (Virtual Reality)
21.		Preservation of history
22.		Preservation of species

By Eugene S. Meieran (<http://www.engineeringchallenges.org/cms/7126/8275.aspx>)

The 20th century innovation process, three things stand out:

First: The innovation effects were universal throughout the world, affected all levels of the humanity, even if it's true, we should recognize that the innovation achievements for the people in large groups are unavailable.

Second: The developed technologies had a great variety, were spread in time and place and improved in parallel around the world. Particular progress has been made in quantum theory, nuclear physics and the theory of relativity and the mathematics and medicine.

Third: The products of all these types of innovations (telephone, airplanes, computers, power plants, cars, generators, motors, etc.) were produced in such quantity and quality that become available for a large number of people.

The 20th century innovation processes are dominated by physical capital and a lot of technical facilities, it is likely that the intellectual capital and the virtual objects will dominate the 21st century. Of course, the 21st century's a list of innovation the will be incorrect, as for example, at the beginning of 1900s the automobile, the aviation, the phone, could be foreseen and the nuclear energy use would have been predictable too, but the computer and the internet in their various applications certainly not.

The comparison of the two lists shows that the 20th century is the period which is dominated by constriction of electrical networks, availability of cheap energy, the installations, such as manufacturing plants, oil wells and refineries. The main point the 21st century list are the resources for science, the internet, the computer technology, the communication technology (using for instance for weather forecast and manipulation, transport and logistics, security etc) become important in terms of knowledge and also the rapid transfer of knowledge, the spread scientific information between specialized researcher. While the 20th century was the realm of physical and technical realities the 21st century will be the empire of spiritual and the virtual reality.

4. Innovation in Hungary a brief description

The European Commission ranked Hungary on the 15th in innovation respect amongst the EU states. This is not very prominent place, we're way behind. There are three main reasons to consider: Disadvantageous conditions for technical, scientific and economic-education; less spread of broadband internet and the small proportion of people studying / training life-long. This is evidenced by the fact that the economic growth is much smaller comparing to Western Europe because low level of innovation expenditures. It is generally accepted opinion that the 70 to 75 percent of economic growth comes from innovation, while in Hungary country it is only 42 to 43 percent. In 2002, a new peak of expenditure was realized i.e. more than 1 per cent of GDP, but after that a reduction is going on again Moreover, the number of patents, which figure, I think is indicate the innovation activities is decreasing in Hungary. Why does

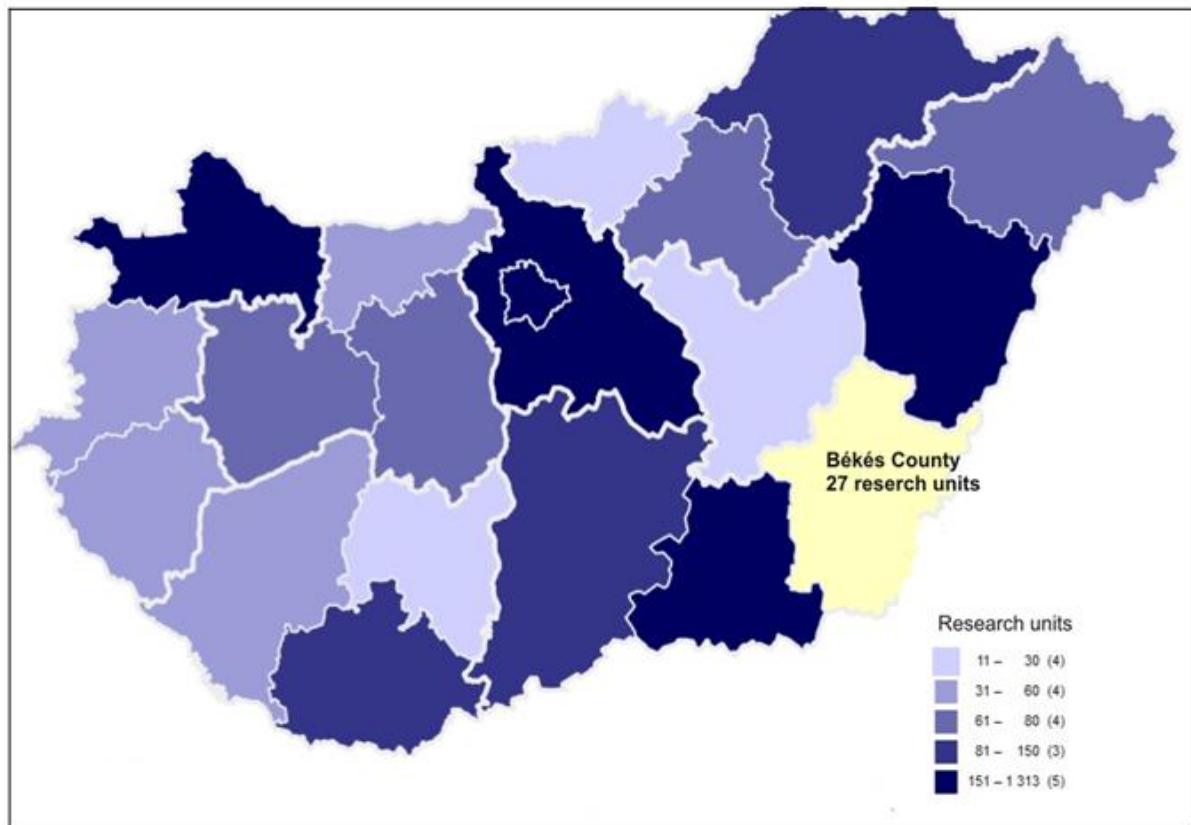
the government spend less and less for the innovation? There are two ways to reduce the budget deficit: either increase revenues (eg, new or more efficient tax system) or reduce costs. I think, from the simplest to the management to take the money, lack of which not cause right tomorrow a disaster. (If, say, the pension would significantly reduce, there would be mass hysteria.) So to extract funds from the research and innovation makes not big complication at once. We argued above the usefulness of innovation. Without innovation, we can bury our country in long-term. Why we should have stumbling innovation?

The State Audit Office analysis based on the two-thirds of research institution found that the 72 percent of their costs still covered by central budget, and 71 percent of the researchers is public employees. There are only a few foreign investors in Hungary, interested in innovation, and they are not too supportive to innovation companies, so they should rely on state funds, which are decreasing. I have already mentioned the need to invest in research, but it has not been mentioned, how to transfer the research results to the market and how to make profit. The major part of research (70 percent) is basic research In Hungary. It is very difficult to sell the basic research; as usual the results are published quickly before everyone would have thought that the result is what for. A lot of basic research results, will be utilized only twenty years later when it was invented. In addition, a problem is that for the basic research there no demand on market and there are hardly to find any companies which can convey between scientists and large, market leading companies. The innovation of innovations should have a significant effort, enthusiasm and some amount of money as well. After all, investment, expects a man to recover his money, and even to get return on it. In such a situation should be improved a better, more performance-oriented motivation, remuneration system for transferring the basic research and innovation results to practice. These clumsy researchers are almost completely excluding from the motivation system, they deserve for more remuneration.

The expenditure for research units even Hungarian countries extremely low. In order to change this situation the government should provide adequate infrastructure, enhanced education, improved health care and so on. It is also important to note that one region or town should be careful and not rely on certain speculation developing infrastructure. Many examples show the truth of this statement in history. When a small town or backward region made huge financial expenses to build a highway and the eagerly awaited company elected another city the invested amount become never recoverable, in any form, investment. The other hand, if a region's infrastructure is underdeveloped it is nonsense to expect foreign or

domestic investments in the region. It should be also considered that the development of infrastructure not only lifting up the attractiveness of an area but also have role in improving the standard of living.

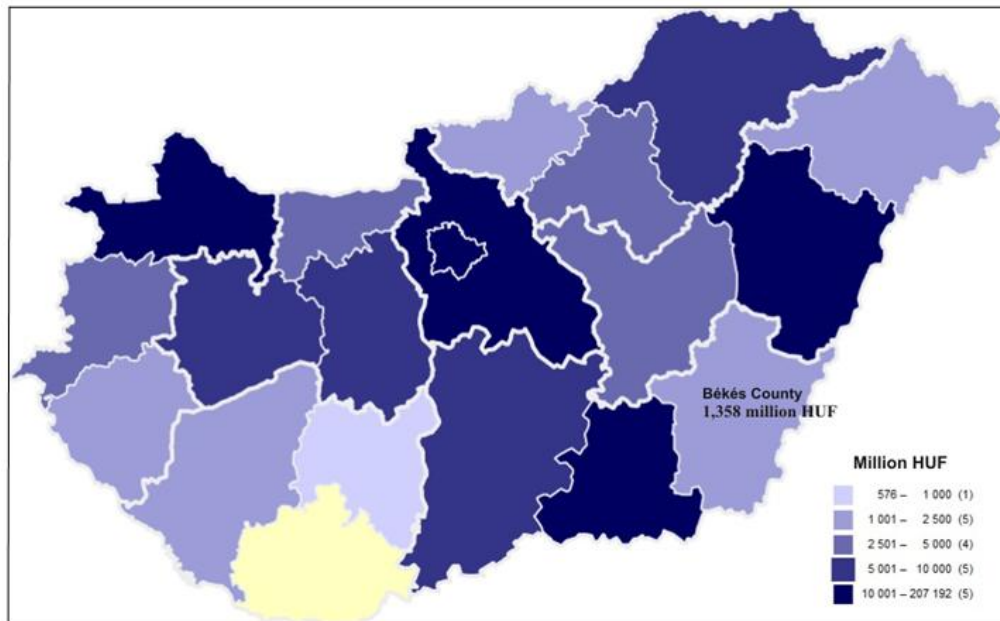
1st figure: Number of research units by counties in Hungary (2012)



Based on data from the Central Bureau of Statistics (KSH)

In this (1st figure) regional comparison we can see, that in Békés County the number of R & D units are relatively low (27), it is much far from the developed regions for example: Pest County, Győr – Moson –Sopron County...etc. So we can safely state out the following: the university cities where the education is much more advanced we can find more R & D units.

2nd figure: Expenditure on research by counties in Hungary (2012)



Based on data from the Central Bureau of Statistics (KSH)

The 2nd table shows that expenditures for research and development of Békés county is very low value, namely 1,358 million HUF compared to other more developed regions for instance Pest, Győr-Moson, Sopron and Csongrád Counties where these amount reaches the 15,000 million HUF.

Finally we can see on these maps that Békés County has backwardness comparing to other regions. We have to spend more amount of money for the education, for transport infrastructure, for basic and applied research to speed up the modernization; we have to be aware of that: the innovation is the main gear of the economic growth.

5. Questionnaire survey on Békés County entrepreneurs

The questionnaire survey carried out among Békés County entrepreneurs focused on the possible reactions for innovation challenges of 21st century (1st table).

Nowadays the most important thing for the economic growth is the innovation or in other words modernization, consequently the innovation diffusion and the technology transfer. All countries what choose the innovation for primary investment objective, they achieved relatively high economic growth, for example USA, Germany, Ireland, Japan...etc. It is evident that, like technology transfer, the innovation as well has to be spread not only between

countries but also between regions within a country. In the scientific literature, a significant response was given to Joseph N. Pelton and Peter Marshall ideas, published in the book "21st Century Innovations", in which 22 topics were formulated for innovation.

For each of the 22 topics four possible answers were given to choose in our questionnaire, as follows:

- a. Békés County has sufficient intellectual capital to get involved to technological innovation.
- b. A focused training and the innovation oriented education could give a chance to get involved in the innovation for the county.
- c. Békés County can only be an adaptor of technologies, developed elsewhere i.e. can be only the receiving end of technology transfer.
- d. Békés County cannot get involved to this topic of innovation.

Do not getting lost in the details the two main statements are the next:

1. The number of possible 240 respondent's answers in 32 cases was thought that the county can participate in the 21st century innovation challenges while in 53 cases it was considered that focused training will give a chance.
2. The county can be only an adopter of technical innovation were the answers in 107 cases, and the respondents thought the same number of times, that the county cannot get involved in the innovation process.

6. Summary

As the innovation and technology transfer cannot be achieved without the good level of infrastructure of transport, energy supply and e-communication networks (network-T, network-E and e-network) we have to conclude, that on these fields Békés County development require first the assistance of the state and also the private investors who has the all assets for the innovation and technology transfer. The state has to increase the funds for the infrastructure; constructs quality road and improve the education, what are the basis of the innovation. In the other hand we have to attract the foreign capital for the new investments. These two elements are the main points of the modernization in Békés County.

This opinion was confirmed by the answers of entrepreneurs given on our questionnaire namely a focused training and the innovation oriented education could give a chance to get involved in the innovation for Békés the county.

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