The role of technological transfer in the societies based on knowledge economy

Rolul transferului de tehnologie în societăţile cu economie bazată pe cunoaştere

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Abstract

The knowledge based economy is an economy based on innovation. Implementing innovation requires acquiring new technology, using the technique of technological transfer. The problems and the timing for implementing an emerging technology are under discussion in this paper.

Keywords: *knowledge based economy, innovation, technology transfer, emerging technology*

Rezumat

Economia bazată pe cunoaştere foloseşte intens inovaţia. A introduce o inovaţie presupune dobândirea unei noi tehnologii, utilizând tehnica transferului de tehnologie. Articolul abordează problemele şi momentul optim de transfer al unei tehnologii emergente.

Cuvinte-cheie: *economia bazată pe cunoaştere, inovaţie, transfer de tehnologie, tehnologie emergentă*

JEL Classification: O14

Introduction

We are living now in a society characterized by a new kind of economy: the knowledge economy. It is defined (Knowledge economy, n.d.) as an economy based on creating, evaluating, and trading knowledge. In a knowledge economy, labor costs become progressively

less important and traditional economic concepts such as scarcity of natural resources and economies of scale cease to apply. The main technologies valued here are the information and communication technologies, known as ITC, but, in fact, all the structures of the economy are affected (Powell and Snellman, 2004). The economic competition, whose effects cover now the entire world, due to the high speed and accessibility of information, is one of the most important changes.

Another definition, largely used, defines the knowledge economy as production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as their rapid obsolescence (Popescu, Meghea, and Pincovschi, 2006). Maybe, here, the key word is rapid obsolescence. That means that products and technologies, from all fields, are continuously changing. As change is brought by innovation, we can conclude that innovation plays an essential role in the knowledge economy. Perhaps, the change has always been wanted by the people, as shown by the Kano diagram (Figure 1). Studying the customer's satisfaction, Kano (What is Kano Model, n.d.; Kano model, n.d.) finds that a product having the same performances but that is obtained in a new way offers much more satisfaction, just because it is new.

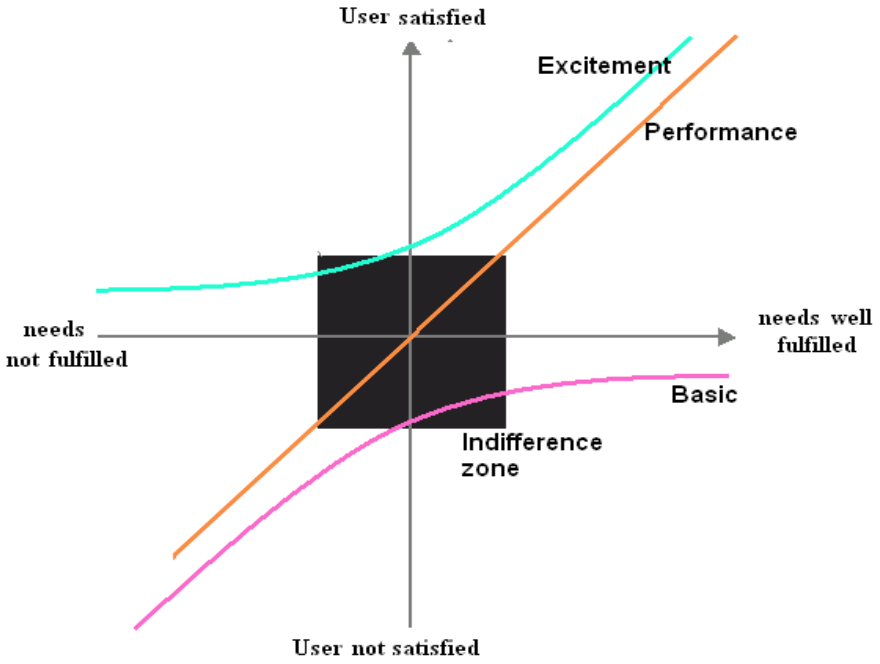

Figure 1. Kano's diagram
(Source Kano Model, n.d.)

Of course, this has always been true. But, in the knowledge economy, the information goes very fast, so do innovation, which always implies something new, thus imposing itself easily.

Innovation in knowledge economy

The knowledge economy, imposing innovation, new technologies, much more informatics, changed the structure of all economies, in practical all the countries (OECD, 2004; Economic Forum, 2006). Only the innovative companies can resist on the market, so one of the main tasks of the organizations is now to manage knowledge and people able to create and use it. Also, all organizations, big or small, have to protect innovations or new ideas, by patents. An invention can be protected by a patent if it fulfills three conditions to be protected by a patent. It must be of practical use**;** it must evince an element of absolute novelty, that is, some new characteristic which is not known in the body of existing knowledge in its technical field and it has to be able to be put in practice (Jaffe and Trajtenberg, 2002).

The economies who are able to valorize the innovation faster and very efficient are the first to obtain a good position in the very competitive world that appeared due to the very fast circulation of information. Here, the most important are the innovations concerning new products or services but also these who enhance the productivity. Information and communication technologies (ICT) allow large increases in productivity, e.g. in retail and wholesale activities (Nayak, 2007). The aim of implementing new innovations can be different in different countries: for the high developed countries, it is important to create new products, services and technologies: for less developed economies, improving the productivity can be the best solution. In both cases, adopting innovations supposes a sustained investment in R & D activities, a good partnership between industry, research institutes, universities and government as well as a good protection of intellectual property. Governments have to sustain a specific policy of innovation, adapted to each country. Of course, small and poor countries are not able to sustain large R & D projects, but they can encourage small innovative increments, which can be applied in small organizations without serious difficulties. Such small innovations, cumulated, can improve considerably the economic performances of the country (Torun and Cicekci, 2007). But, here is another condition: new innovations have to diffuse in an efficient mode. At first, the diffusion takes place in the economic field where it was created. In the second step, the innovation can pass to other sectors, bringing here considerable advantages (Shaffer, Deller and Marcouiller, 2004).

The diffusion of innovation in the economic field where it was created can be illustrated in Figure 2.

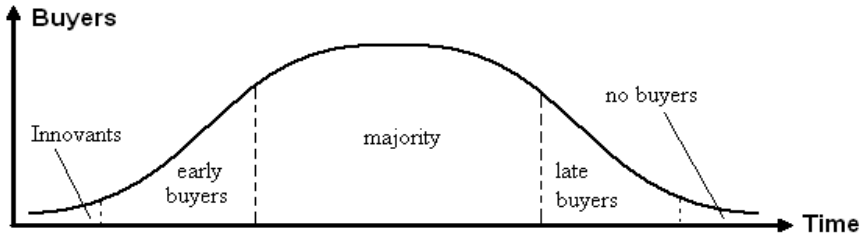

Figure 2. **Different types of adopters of a new technology**
(Source: Băloiu, and Frăsineanu, 2004)

The innovators are few and daring. The early buyers have a solid position and they can influence the decision of the others. The late buyers are companies with a low mobility and probably they will not resist very long time in the market. The majority will adopt the new technology when their old technology is no more competitive. The no buyers will probably never adopt the new technology and will disappear soon. An example of such no buyers was the steel mill in Reşita. They keep using the Siemens–Martin fours, much more expensive that the technology of oxygen converters and finally, in the early 2000-th, were eliminated.

A technology passing from an economic field to another can bring considerable advantages. The testing of cars in aerodynamic tunnel was first adopted by Citroen in 1950 due to the fact that his chief engineer was an expert in aviation before coming to Citroen. Another example is the technology of distance measurement of biologic parameters. It was used initially in astronautics to follow the state of astronauts but now it can be found in all hospitals. A particular field of inspiration for technology transfer is the nature, whose systems can be converted in technologies. The sonar is probably one of the first such examples.

Probably, the technology who influenced the most the economy in the last period was the informatics. The way it acted can be illustrated in Figure 3 (Génélot, 1998).

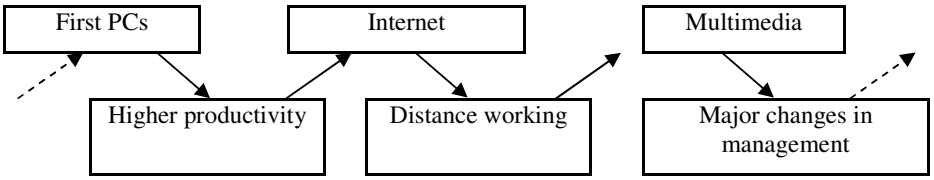

Figure 3. Example of interactions between PC technology and economic environment

Another point to discuss here is the transfer between science (represented by universities and research institutes) and industry. A good example is the field of

bio-technology, where the border between research and industrial applications is really blur. The same thing is true in what nano-technogies are concerned. As the knowledge economy develops, the number of such examples increases rapidly. As a consequence, the structure, organization and management of companies have to change too.

Emerging technologies transfer

A process innovation frequently consists of implementing a new technology for a new product. Once created, the emergent technology as well as the new product has to be imposed. The problems (Peppard and Ward, 2004) to be considered here are:

- Market is new and unproven, the results of marketing inquiries about the future of the new product are highly uncertain. Information about customers and market conditions are hard to obtain and test.
- Buyers are first-time users, and the time to impose the product on the market can be long.
- Marketing task involves inducing initial purchase and overcoming customer concerns; the advertising has to be more elaborate as usual.
- Technological know-how is not mastered; it will probably change several times before stabilization, following an Abernaty type schema (Christensen, 1997) as first-generation products improved rapidly
- Uncertainty about how fast demand for product will grow and how big market will get.
- Entry barriers tend to be low but problems can appear in securing raw materials as well as in implementing distribution channels.
- Experience curve and scale effects often permit significant cost reductions as volume of production becomes larger.
- Firms run frequently short of funds for R&D & start-up.

In the second step, the new imposed technology has to widespread and this is realized by technological transfer. Technology transfer is defined (Technology transfer, n.d.) as the process of sharing of skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities among governments and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services. Another (Chambers, 2005) definition: Technology transfer is the process of developing practical applications for the results of scientific research. It is a term used to describe a formal transfer of rights to use and commercialize new discoveries and innovations resulting from scientific research to another party.

An organization intending to acquire a new technology by technologic transfer has to answer to questions such as:

- What are the steps in the transfer process?
- What barriers exist?
- How the potential of emerging technology can to be measured?
- How should be shared the value creation along the fabrication chain?
- What is the contribution of the new technology on the organization economy and development? Can it induce further innovations?
- Is the organization prepared to adopt the new technology (people, logistics, etc.)?

The main problem consists of knowing how extensively or how quickly can the new technology be adopted in applied contexts and what value does it add? The outcome measure of our research is a continuum running from 'a little' to 'a lot'. A successful new technology has an evolution as presented in Figure 4.

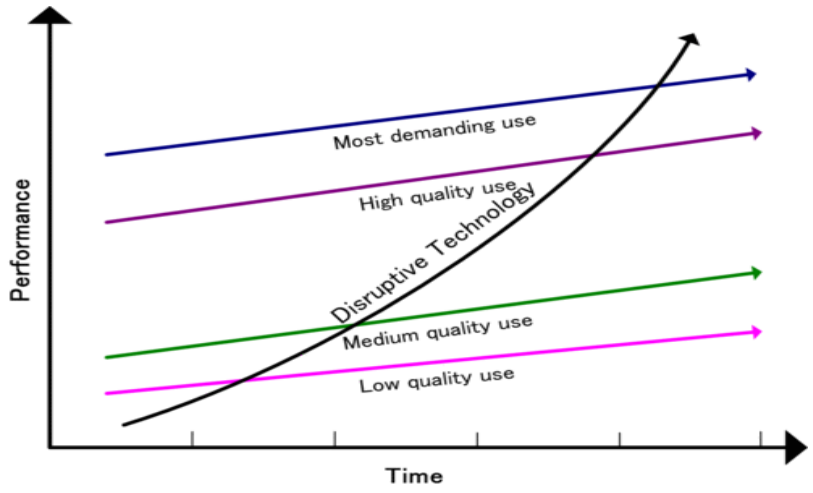

Figure 4. The time evolution of a disruptive technology
Source: (Bower and Christensen, 1995)

If we shall enlarge the perspective, the evolution of the new technology has the trend presented in Figure 5, trend known as the S curve (Slocum, 1999). The question is: when is the best moment to acquire the new technology?

The OA zone is very risky: The technology is not yet accepted and, statistically, there are 90% chances that it will never be accepted.

The AB zone is the best, though the cost of its acquisition is the highest. So, we have to act quickly, immediately after the point A (Freeman, 1992).

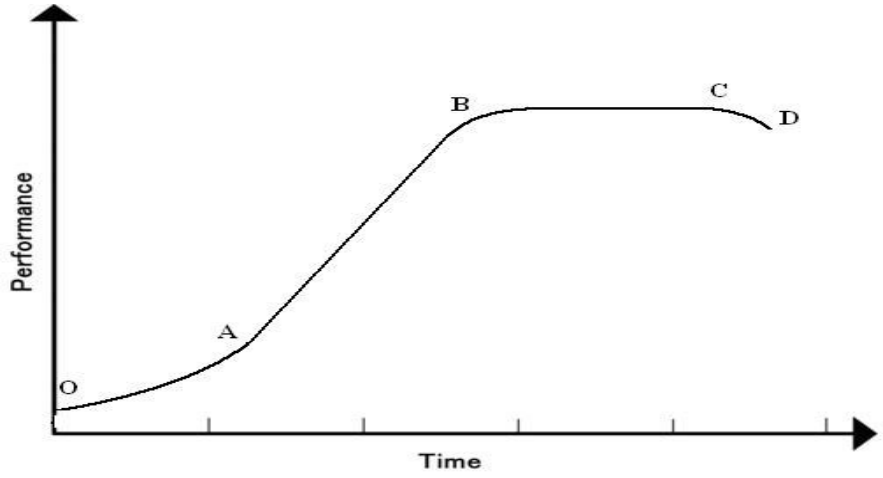

Figure 5. Life cycle of a technology.
Source: (Slocum, 1999)

If the technology is already in the zone BC, i.e. a mature technology, it can no more offer a competitive advantage. May be, twenty years ago, it would be a good policy for countries less developed. But today, in the globalization era, it became useless to come to the market with a non-competitive product or service.

The S curve is discussed, in terms of knowledge economy, by Handy (1994) who takes explicitly in consideration the innovation (Figure 6). This is true also for the technology transfer: a new technology has to be acquired as soon as possible.

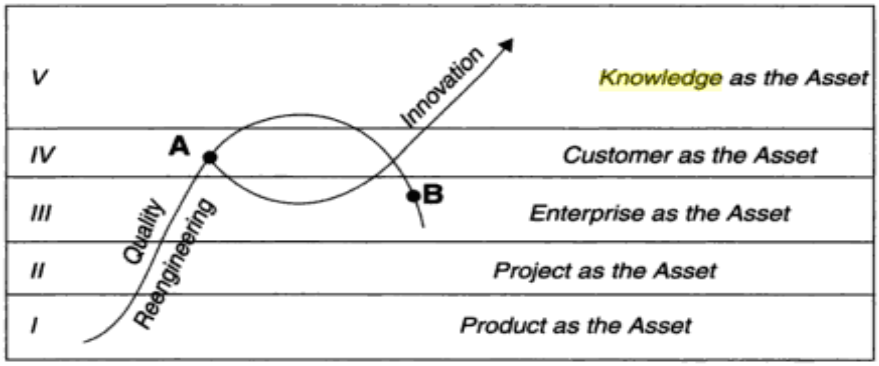

Figure 6. The S curve proposed by Handy (1994)

Handy suggests also that a successful new technology has to start when the curve of the old technology is nearing the peak but yet evolving.

Conclusions

In the knowledge based economy, due to the very fast speed of circulation of the information, continuous innovation is the main condition of success. That means also a continuous transfer of new technologies. This transfer has to be done, for each specific technology, in a specific moment.

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