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SYSTEMIC APPROACH TO TECHNOLOGICAL TRANSFER

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Abstract: The governments of the highly industrialized countries, continuously track such an economic development so that to easily reach a point of founding new nations on the basis of intellectual property. This strategic goal has at its' basis the development or/and the access to advanced technologies from different domains, such as, science of life, environment, social infrastructure, etc, which permit the birth of new industries that insure a lasting economical and social development. So that these activities to take place, the technological transfer with its' many ways plays a fundamental role. As far as enginery is concerned, the main effect is the appearance and the development of the enginery for humans (food, housing, production etc.), of the created by man ecosystems' enginery and of the natural ecosystems' enginery. For all these, are developed and preferred the R&D and innovation activities and also the industrialization, production and commercialisation, technique and technological assistance technological assistance programs, etc. From this perspective, in the paper, are studied from a sistemic point of view the main aspects that define the concept of technological transfer.

1. INTRODUCTION

At the present moment the governments of the highly industrialized countries, such as SUA, Japan, England, etc. have in mind, as their strategic objectives "the foundation of new nations on the basis of intellectual property" [1]. The technology transfer and intellectual property insures important bounds for the development and the management of the scientific domains with the most important role in the progress of the human society [2]:

- "the science of life;
- information and communication science and technology;
- nanotechnologies and nanoscience;
- aeronautics and space;
- the quality and safety of food;
- lasting development and ecosystems;
- the citizen and the government in a society of knowledge;
- boarder science".

In order to obtain these requirements the R&D and innovation activities and also industrialization, production and commercialization, technique and technological programs are strongly financed. Related to this, the important role of the technological transfer is shown by various technical, technological and social requirements, such as [3]:

- the improvement of the industrial competition;
- the improvement of the R&D activities;
- the divert and the improvement of the commercial offer;
- the creation and the development of international commercial markets by means of direct exports;
- the creation of local and international commercial networks;

- the punctual selection and approach of the technological information, of the business opportunities, of the contracts and commercial relationships necessary to commercial activities, etc.

Theoreticians and partitions define the concepts technology transfer in many different ways:

- **“** technology transfer is the process of developing practical applications for the results of scientific research” [4];
- the taking over or/and the appliance process of the Know-how, technologies, programs, etc, that belong to a person, industry or organization by another [5]:
- “technology transfer is the movement of know-how, technical knowledge, or technology from one organizational setting to another” [6]:
- “he movement of know-how, technical knowledge, or technology from one organizational setting to another” [7]

The one who makes the transfer is called source and the other that receives it is called the user. The technological transfer may be done in many ways, such as in the figure 1.

2 THE STRUCURE AND THE MECHANISM OF THE TECHNOLOGICAL TRANSFER

The technology transfer includes a large category of activities. These activities are are presented in the special literature. The systemic approach of these multiple activities is shown in the paper [8]:

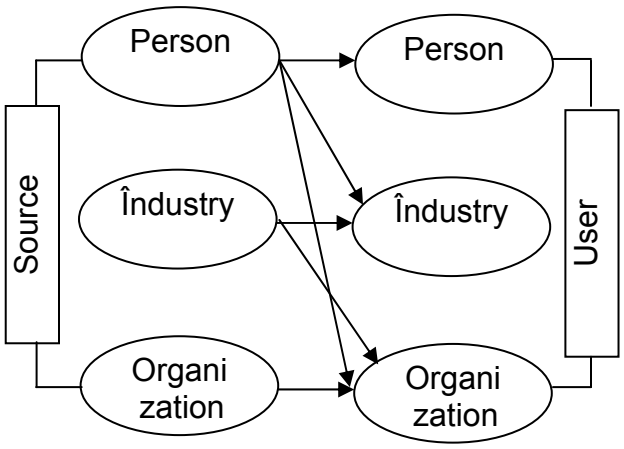

Figure 1 Ways to perform the technological transfer

- ,,direct purchases and licensing;
- franchising and foreign direct investment;
- sale of turn-key plants, joint ventures and subcontracting;
- cooperative research arrangements and co-production agreements;
- export of products, capital goods and commercial visits;
- exchange of scientific and technical personnel, science and technology conferences, trade shows and exhibits;
- education and training (of nationals and foreigners), government assistance programmers;
- open literature, journals, magazines, books, and articles’’.

The technology transfer activities present the fallowing modes [5], [9]:

- *vertical technology transfer;*
- *horizontal technology transfer;*
- *internal technology transfer;*
- *external technology transfer;*
- *normative technology transfer;*
- *explorative technology transfer.*

The normative and explorative technology transfers may be also found as vertical, horizontal, internal and external transfers.

Technology transfers are complex processes that are performed within the 8 levels of technical progress presented bellow [5], [9]:

I the level of the scientific knowledge resources. At this level the results of the scientific research from different domains of science such as mathematics mechanics, optics, chemistry, biology, etc, takes place. Its' purpose is the progressive development of the existing scientific level and also the initiation and the development of the brake through technologies from a series of practical and technological research domains.

Though, it must be said that the new ideas are based on the previously generated ones.

This way is accepted the theory according to which the growing tendency of the scientific, technical or technological parameters are directly proportional to the growing of the accumulated notions [5]. More than this, the scientific research mechanism [10 p.145], [11], puts as one of the main elements "the implementation of precision and accuracy as main distinctive value of the scientific research'' [11].

II technological resources. These are relevant for the potential and the characteristics of the "fundamental", "generic" and "key" technologies and also for the multidisciplinary, multisectoriale and innovating characteristics of the technologies. The technological resources represent the main technological creation fund for the technological transfer and industrial knowledge mechanism.

III individual technologies. Starting with the process technologies (mechanical, fine mechanics, mechatronical, electrical, chemical), and ending with other individual technologies classified on globally functional criteria, the individual technologies represent by their association of products or/and services, structural elements of the technology transfers [12]. The assembling of these technologies in "banks of technological knowledge" and their exploiting by means of expert systems represents a basic component of the technological transfers mechanism.

IV.punctual technological systems

V The applications or/and services technology. It is ended by the industrial research and it has as main object the accomplishment of both of the products and new production procedures for the consumer's satisfaction. The domains of the industrial automatics, of the fine mechanics, of the micro electrics or of the communications are relevant to quantitative qualitative growth of the technological transfers. At the present moment, the applications or/and the services technology gains a big importance for the technological innovation process.

VI the environment

VII the social systems

VIII the consuming society

The presented levels are "ordered" within the main scheme of the technological transfer, as it is shown in figure 2 [5], [9], as vertical and horizontal technology transfers.

The levels representing the applications or/and services technologies, the environment, the social systems and the consuming society are defined [5] as "levels of the effects of the technology transfer accomplishment.

The levels representing "technological systems and punctual technologies", "individual technologies", "scientific resources", "technological resources" are "the levels of the technical development".

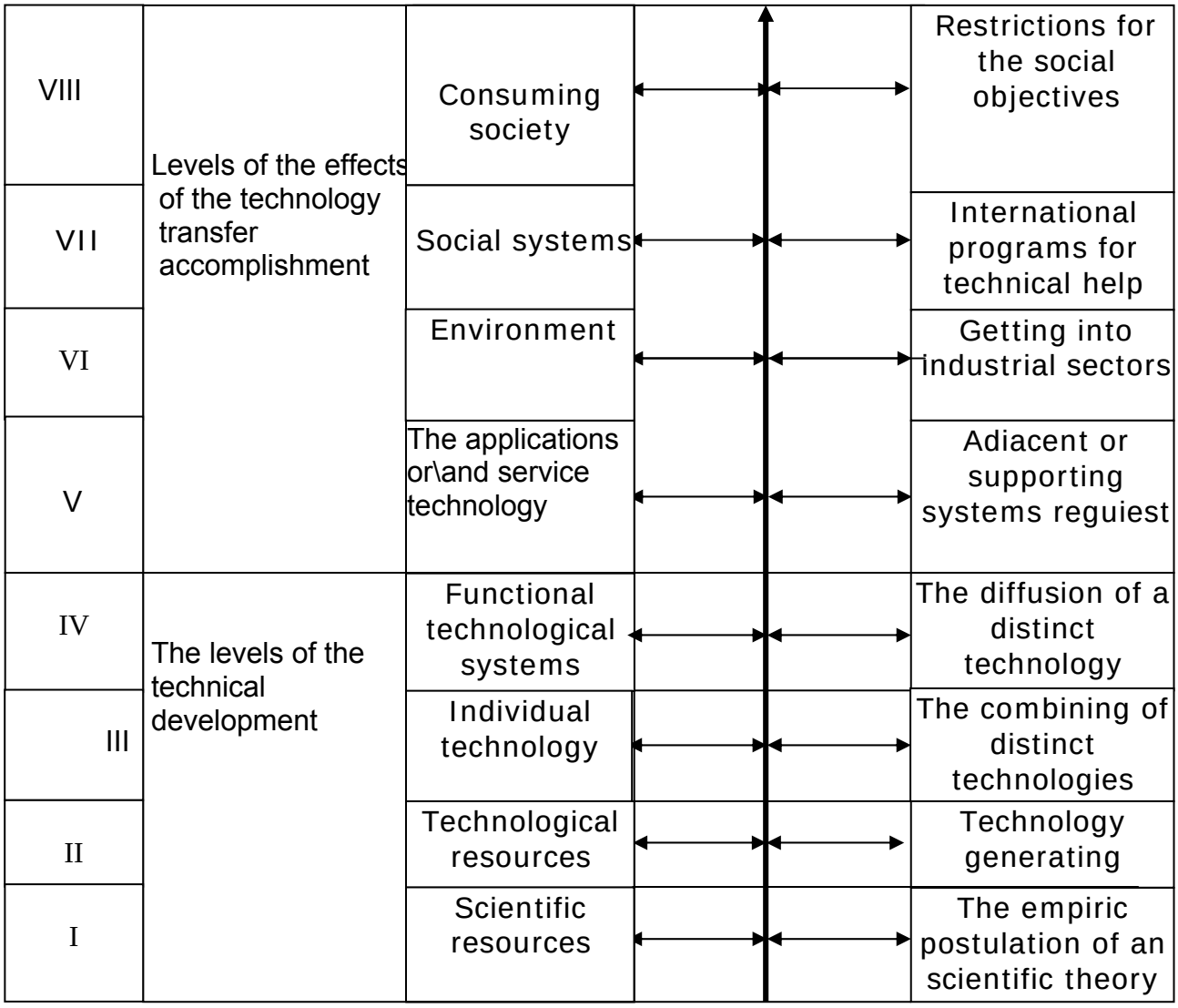

Fig. 2. The main scheme of technological transfer

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The authenticity of the technological transfer mechanism may be described in three main coordinates (Fig.3) [13]:

- *the technological coordinate, mainly represented by three percentage indicators, namely, the enterprises that make a new product, the enterprises that use a new production method (procedure) and the technological objects that include a new technology;*
- *the time coordinate, defined by the time period between a new product (technology) gets sailed on the market and the time when the market becomes mature;*
- *the comercial coordinate*, defined by the saling volume of a new product raported the maximum absortion potential a the internal and external markets.

In order to accomplish technological transfer projects, three complex sector strategies at local, regional, or/and international levels are required. They must be elaborated by groups of specialists with multiple competences [14]:

- strict scientific, technical and technological knowledge;

- the systemic evaluation capacity of the objectives and of the optimal models of technological transfer;
- the systemic evaluation of the technological, financial, political risks and benefits that are generated by the initiating and finalization of the technological transfer.
- the systemic evaluation and carrying out capacity of intellectual property within the technological transfer project.
- the identifying and ordering of the economic open and competitive markets for the technological transfer accomplishment.

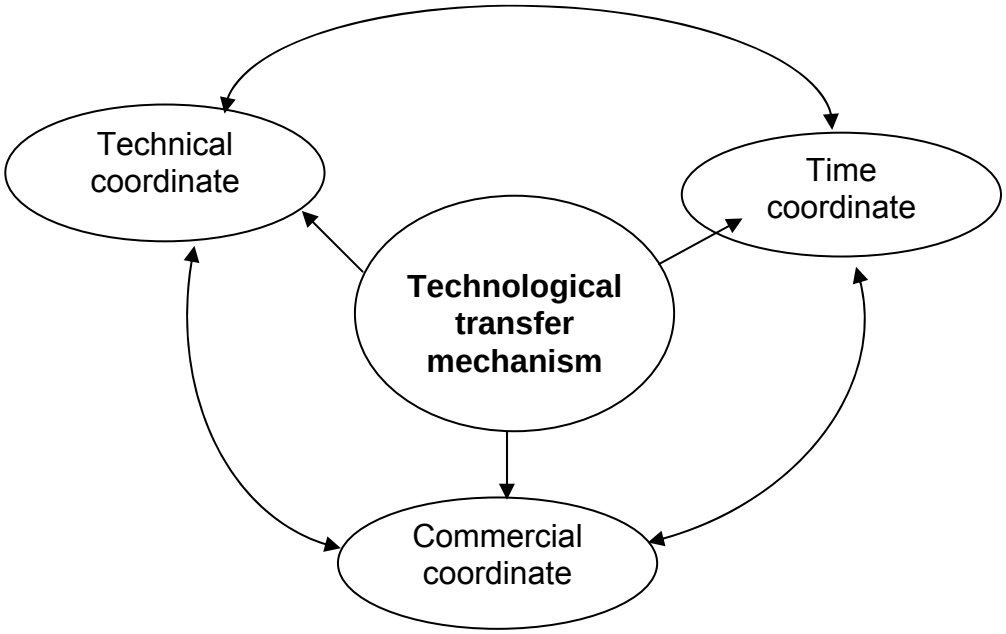

Fig. 3 The main coordinates of technological transfer

- the financial, technological and organizing strategies that are necessary in order to transmit the technological transfer to beneficiaries, namely to persons, enterprises or organizations.

The technological transfer mechanism has at its' bases periods of time structured and obtained from the characteristics of the research and development stages of a product, procedure etc, namely [15]::

- the period of time corresponding to the scientific or technological discovering stage
- the period of time corresponding to the technical or technological creating stage
- the period of time necessary to the founding of the created solution
- the development period or the development period stage
- the periods of time that characterizes the specific cycles of the major technological innovation in a certain domain of scientific, technical activity, etc. For example, [15], in the electronic and space activities the specific cycle for the technical innovation has a 5 years time

- the periods of time necessary to commercialization of the product, service, etc. mainly, they are the periods of time between the product or the service gets to market and the commercial success and also between the commercial success and its' utilization at a large scale.

It may be noticed that the periods of time, mentioned above, are distinct and reciprocally interact. This is way the problem of the technological transfer is extremely complex involving matters of politics, security of the commercial society or even the country security, etc.

3. CONCLUSIONS

At this stage of the technical progress, the technological transfer represents the main key for the development of industry, trade and finances at regional, national and international level. The implications of technology transfer are of extremely importance for the technical, economic progress, namely for the improvement of life standards.

It must be said, that the notion of technological transfer also includes an easy understood asymmetry from "superior to inferior" [16]. Because this problem is complex as far as politics, military, technological etc, a punctual approach is necessary benefic to all those involved in the technological transfer.

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