Aspects of the technological transfer management for capitalizing on the results obtained through scientific research

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Abstract. This paper attempts to provide answers to the problems currently facing higher technical education and research, focusing on technology transfer system. To this end, is defined the concept of innovation and technology transfer and are presented some aspects of the technology transfer mechanisms. Some visions on transfer management are detailed, and several procedures are propose to improve technology transfer between educational institutions and socio-economic environments. It should be borne in mind that there are problems with the students' novelty, diploma and dissertation papers. Therefore, university policies on intellectual property knowledge should include the acquisition of knowledge in the last years of study.

1. Introduction

The paper attempts to provide an answer regarding the amount of the results obtained from scientific research, except for those from the Research Centres. Those results stemming from the "creative fruit" of students who receive various topics and projects to solve during the study years, especially the results of the final years, these being on the studied or researched specialty. Depending on the theme received or chosen by the students themselves, in most cases, their results may have a market applicability, more or less with a major impact on the studied / researched field.

Often, the creator of this result is not aware of or knows the value that those results might give it by implementing the solution or idea in everyday life.

Therefore, the present paper tries to find an answer in capitalizing these results, focusing on the technology transfer system.

2. Technology transfer (TT)

People with innovative spirit are the determining factor in hiring technology for development. They are the ones who can facilitate both technical and social development, are those who can provide the relation between research and development, industry and governmental decision makers. Engineers, as well as engineering research, can make a significant contribution to providing benefits, assume and address development risks, design technological solutions to support public policy oriented to general development.

Innovation is the process of creation (generating new ideas) followed by making changes generated by it [1].

Innovation is define almost uniquely by literature [2] as an idea, a concept, a process for designing, operationalizing and experimenting with a new product model, process or new functional structure for
industrial application. So, innovation compared with the invention, is not necessarily an absolute novelty, but the scope and speed of implementation are more accessible.

TT is the introduction or acquisition in the economic circuit of specific technologies and equipment, equipment and facilities resulting from research, in order to obtain new or improved processes, products or services demanded by the market, or by adopting innovative behaviour, to disseminate information, to explain, to transfer knowledge, to advise and to communicate with people who are not experts on the fundamental, applicative and pre-competitive research results, provided there is an owner of the results [1].

It can be said that the technological transfer under the transfer of manufacturing technology involves a series of formal and informal relations between R & D units and public and private economic sectors.

Thus, we can mention two general acceptance of this technology transfer:

- The assignment of an intellectual property that has been generated and developed in one place by legal means such as licensing technology;
- The process by which scientific and technological breakthroughs are converted into marketable goods and services;

The purpose of technology transfer is to strengthen the economy on a territory by accelerating the application of new technologies and resources to meet the needs and opportunities of the public and private sector.

Technology transfer is the process by which knowledge, facility or capacity of existing publicly funded research - development, are use in order to meet the needs of public and private [2].

In general, the technology transfer process involves three entities (Figure 1), which may be in a cooperative relationship.

**Figure 1.** Process of technology transfer

These three entities involved in technology transfer have as their primary objective the acceleration of the economic use of research results, involving the conversion from invention to innovation and successful dissemination on the market, adding value.

### 3. Mechanisms of technology transfer

These technology transfer mechanisms are those operations that ensure the dissemination of a particular technology from a supplier to a beneficiary. Typically, these processes can be in various forms, such as financial, technological or human, and consist of various procedures, ranging from active forms to passive forms.

These technological transfer mechanisms can be divided in different categories, as shown in Table 1.

**Table 1.** Technology transfer mechanisms

| No. | Category                  | Subcategory                                      |
|-----|--------------------------|--------------------------------------------------|
| 1   | Consultancy groups       | Review groups of the end user                     |
|     |                          | Technical review groups                          |
| 2   | Collaboration with participation for costs | Industrial consortium                           |
|     |                          | Research – Development in partnership             |
|     |                          | Demonstration projects                           |
|     |                          | User facilities                                  |
4. The vision of technology transfer management

Technologies are moving and evolving continuously in a wide variety of ways. A "steady" technology is worthless. Unused technologies cannot meet needs and cannot produce benefits. Technological transfer is fundamental to the maturation and growth of many types of social institutions, including business, academia, military, government, etc. Without the technological transfer, any institution would not be able to sustain the pace of change.

A broader vision of technology transfer is based on seven analysis directions [3].

In this sense, each analysis directive can be associated with a question:
- Why technology transfer?

As with any other investment in the economic environment, the transfer must meet corporate objectives.

Lundquist has identified a number of technological transfer motives [4], among which we can mention: setting up new companies, new products, leadership, advanced technology, economic development, new business promotion, reputation/image, risk reduction, etc.

From a practical perspective, technologies are being transferred to solve some problems and to create well-being.
- Who are transferring?

The source and the adapter are the ones who carry out the transfer, sometimes the sources call the transfer offices to facilitate the process, sometimes adopters designate a specialist to look for useful
technologies. The efficiency of technology transfer is determined by the abilities of change agents and staff.

- Where does the technology transfer happen?
  Technological transfer takes place across the value chain of product development.
- When does the transfer take place?
  Transfer takes place when the technology moves along the steps in the value chain direction. In terms of source adopter, transfer takes place when certain conditions are met such as property supply, preparation adopter connection, agreement, trust, etc.
- What is the significance of technology?
  The integrative vision is grounded in a collaborative process involving decisions on operations, product development, brand development and sales.
- What is the justification for the costs of technology development and technology transfer?
  For and between each stage of the value chain, analysis of opportunities for investment in technology. The management of companies, laboratories and funding organizations has financial responsibilities for the use of resources in accordance with the intended purposes.
- How does technology transfer work?
  The transfer can take place at the moment of its justification, being involved in three distinct stages: contacting the relationship between the source and the adopter, the agreement documented through a contract that ensures reciprocal gains and the effective movement of technology from source to adopter.

5. Technological transfer, from research institutions to socio-economic environments

Universities, colleges and vocational training centres are key points in the innovation system to attract and produce the human capital needed for innovation. Barriers and regulations that would limit effective interaction between universities and firms should be improved as collaborative arrangements that facilitate networking. It is essential to ensure that higher education institutions offer opportunities and incentives to collaborate with each other and later with industry.

Criteria for the assessment of the performance of the study should be adjusted to reflect the multiple missions of the educational institutions, including the transfer of knowledge. To achieve this goal are essential expectations well defined and highly qualified personnel for technology transfer.

It can be said that there is an openness and a proactive attitude with concrete positive results in the development and enhancement of partnerships between universities, research and decision-making environment. At the same time, the results obtained are relatively few, compared with the needs and especially the existing opportunities [6].

There is an increase in the number of higher education graduates in Romania, but it has failed to generate a significant difference in innovation among the local economic agents. This can lead us to the conclusion that higher education in our country suffers from several fundamental chapters.

One of the key issues in this direction is the absence of extensive and profound collaboration between academia and industry.

Developing partnerships with external partners, professionalizing knowledge transfer processes and seeking synergies between regional, national, and European policy initiatives lead to promoting the capacity of universities to innovate and to improve research and learning within them.

Also, education and training play a very important role in innovation, helping companies to make various changes in production processes and adopt new technologies by improving their innovation capacity. Skills acquisition is a long process that does not end with formal education. Educational institutions provide the basis for continuous learning, but continuing skills acquisition must be encouraged, and this may involve the recognition of all forms of learning, including those through workplace qualification systems [7]. Therefore, rewarding lifelong learning and its attractiveness can help increase participation, with entrepreneurs playing an important role in innovation by helping them to transform ideas into commercial applications.
Should be implemented and carried out, both by researchers and teachers from universities, as many activities start-up and spin-off, the idea of ensuring access to research equipment in environments assistance and support with specialized staff, their partnerships with the university, in order to determine and capitalize on know-how.

We must put more emphasis on developing entrepreneurial skills and technology transfer of educational institutions have in defining their purpose in the near future as entrepreneurial universities.

It should be taken into account that to construct and operationalize a communication platform between the two areas, namely academic economics, which accelerate interaction between the two areas, including the establishment of joint teams for research, development, innovation and technology transfer [8].

The challenge for Romania is that universities and research and development units to act as key generators of IP assets.

Factors involved in this IP activity:
- Teachers and researchers;
- Doctoral students, students in their final years;
- Intellectual property offices, regional offices/area;
- National Council of Small and Medium Enterprises (CNIMMC) and businesses;
- Chambers of Commerce and Industry;
- Units of technology transfer (TT);
- Sponsors etc.

To achieve the purpose of creating capitalization should its updated operating systems, such as:
- Systems that provide industrial property culture (education, best practices etc)
- Evaluation systems (attributions, licenses, procedures, methods etc)
- Capitalization systems (rules, patent department etc) etc.

6. Conclusions

Can be considered that the relationship between the university and the socio-economic environment should be closely correlated so that the valorisation of the results obtained by the students has a maximum percentage, and the applicability of these results contributes to the improvement and evolution of the society. The interface between the university and the socio-economic environment needs to be updated periodically, so that this technology transfer process is known and understood by those who bring the results.

Increasing product competitiveness can be achieved by:
- Transferable technologies.
- Promoting innovation culture.
- Patents.
- Research results transferred to industry.
- Personnel trained and accredited (TT and innovation, technology broker).
- Innovative SMEs.
- Promoting an innovation culture etc.

Universities need to become more active actors in the knowledge economy, capable of responding effectively to market demands. The themes and topics discussed within these projects must be topical, so that the applicability percentage is as large as possible later.

The proposal to invite students to take part in the problems encountered in industrial environments, would make them look for and create solutions to solve those problems they have noticed, then having a fascinating result of the project, worthy to be rewarded and redeemed much easier.

The research is a priority for universities and the innovative research and development institutions, therefore, the human factor in these organizations should be trainee in knowing how to capitalize on the results obtained through scientific research.

To improve the education, stimulation and awareness of university studies, on the IP area, more
emphasis should be placed on seminars, courses, IP-themes, invitations of recognized personalities, etc.

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