Technology Transfer Office "ICT for Energy Efficiency": A Factor for Open Innovations

Rumen Andreev, Jordan Doshev and Ilko Stoyanov[1]

Abstract – **Open innovation is a concept that focuses on the importance of external knowledge and collaboration between research organization and firms in enhancing firms' innovation performance. In SME it is a complementary innovation activity to firms' absorptive capacity. Its realization requires innovation agents like technology transfer offices fasten to research organizations. The paper presents the functions of such an office that works in the field of ICT and energy efficiency and is known as technology transfer offices "Information and Communication Technologies (ICT) for Energy Efficiency".**

Keywords – **Open Innovation, Technology Transfer, ICT, Energy Efficiency**

I. INTRODUCTION

Open innovation is defined as an act of systematically encouraging and exploring a wide range of internal and external sources for innovation opportunities, consciously integrating that exploration with organization's capabilities and resources, and broadly exploiting those opportunities through multiple channels [1]. It is considered as a new conceptual framework in innovation literature that includes two different types of innovation activities [2], [3]. The first of them is known as *inbound open innovation* – technology exploration or acquisition. It concerns innovation activities, which base on external sources of knowledge and enhance internal technological capabilities of Small and Medium Enterprises (SME). The group of these activities covers technology scouting, external networking and participation, outsourcing research and development, customer involvement and inward licensing of Intellectual Property. The innovation activities of the second type are associated with the commercialization phase of an innovation process. They are named outbound open innovations that are carried out by external organizations, which are more suitable for commercialization of an innovative product. Outbound open innovation refers to such practices as venturing and outward licensing of intellectual property [4], [5].

The realization of an innovation process depends on the innovation system, in which it is carried out. The construction of a National Innovation System relates to the national innovation strategy. Bulgaria has such strategy that determines the National Innovation System, which simplified model is presented on Fig.1 [6]. The main components of this system are Companies, Research and Education Organizations, Market demands and an innovation infrastructure that has to provide an environment, which ensures suitable conditions for starting, development and successful completion of an innovation process. Since the relationships between these components are complex, it is very difficult an organization that represents one of these components to support all relations in this complex system. But the successful work of the system is possible, if all its relations are available. That is why, it is appeared the component *Intermediary* that is responsible for the existence of all relationships, which sustains the system as a whole. The entities that represent this component are Technology Transfer Office (TTO), Innovation Centres, Agencies for Regional Development and others. They exist independently as agents, but they could be a result of their separation of representatives of other system's components mainly Companies or Research and Education Organizations, or building up as an entirely new agent.

The purpose of this paper is to present a type of intermediary agents known as Technology Transfer Office. It is an element of innovation strategy of a research institute that is a member of Bulgarian Academy of Science – Institute of Information and Communication Technologies. The section two presents the function and role of the TTO "Information and Communication Technologies for Energy Efficiency". Since the activities of a TTO concerns innovation activities that are regards as inbound open innovation, we could argument why it is more suitable to construct such an innovation agent in the framework of a research organization. The section three describes the main components of an innovation agent like Technology Transfer Office.

II. FUNCTION AND ROLES OF THE TTO "ICT FOR EE"

The function of the Technology Transfer Office is to support the establishment of a pro-innovation infrastructure in Bulgarian Academy of Sciences, to provide successful interaction between researchers and the industry and implementation of the national innovation strategy in the sectors of Energy Efficiency (EE) and Information and Communication Technologies (ICT). It has to be a factor for the development and enhancement of the 'science to business' relation, promotion of new knowledge and technologies transfer towards Bulgarian enterprises in support of their competitiveness and sustainable development.

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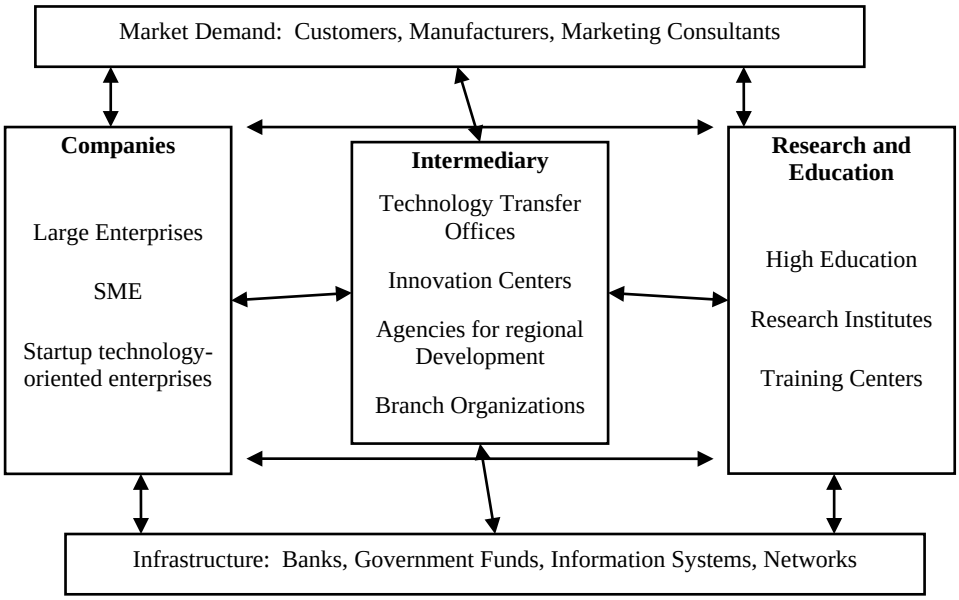

Fig.1. National Innovation System

To perform its function the TTO has to play roles, which realize the following specific goals and activities:

- Provision of information access to representatives of various professional groups to the TTO, and building a network of offices as a part of the European and national networks for technology transfer;
- Encouragement of research and development activities aimed at the development of innovative products, providing ICT-based energy efficiency, and introduction of novel technologies in enterprises with the purpose of achieving energy efficiency;
- Protection of intellectual property over the innovative products of RTD organizations, intended for Bulgarian private enterprises, municipal and state organizations;
- Being a coordinator and an intermediary in the field of energy efficiency innovations through ICT – this activity targets research organizations or individual researchers and inventors;
- Providing consulting and expert services in the field of technology transfer, intellectual property and financial management of innovation projects by engaging representatives of trade associations, non-governmental and intermediary organizations.

The main objectives and activities of the TTO "ICT for Energy Efficiency" (TTO "ICTEE") require the performance of tasks that can be divided in the following four groups of services:

1. *Information Services:*

- Development of a database of energy efficiency related micro-, small and medium-sized enterprises;
- Constant networking with other Technology Transfer Offices from the National Innovation System of Bulgaria;
- Advancement of novel technological and scientific achievements in the field of energy efficiency and implementation of ICT;

Support in promoting companies and their products;

- Establishment of contacts with research and development organizations and enterprises (foreign ones included); assistance with the establishment of collaborations between local and foreign companies;
- Organization of workshops, seminars, exhibitions, etc.

2. *Consultancy Services:*

- Evaluation and assistance in the protection of intellectual property and patent rights, legal support;
- Development, consultancy and coordination of new project proposals concerning the usage of ICT in the area of energy efficiency;
- Documentation development, certification and registration of new products;
- Market analysis of the market of ICT based energy efficiency innovation products.

3. *Financial Services:*

- Facilitation of easier access to external funding and support;
- Access to finance schemes;
- Promotion of energy efficiency related developments towards investment funds.

4. *Technological Services:*

- Transfer of technologies, innovations and know-how, scientific solutions to particular problems, related to the usage of ICT for energy efficiency;
- Technology valuation and technology audits;
- Pilot testing of energy efficiency technologies;
- Experts and consultants services, related to technology transfer.

III. A MODEL OF A TTO AGENT

The main characteristics of an agent are the followings [8, 9]:

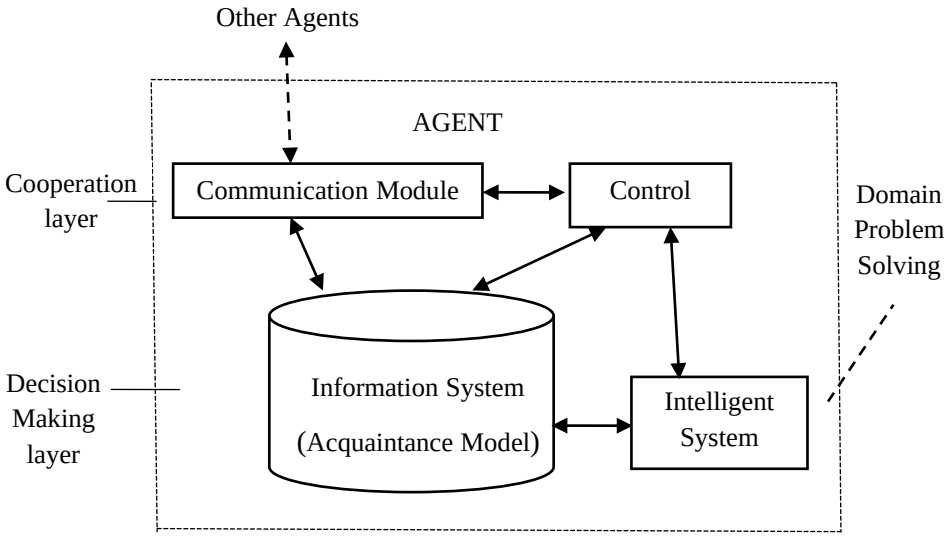

Fig. 2 Model of a TTO agent

- It is an entity with well-defined boundaries and interfaces, i.e. clearly identifiable;
- It solves problems and could be considered as an expert (problem solver);
- It is autonomous, i.e. self-controlled, self-organized;
- It performs a specific role (specific tasks);
- It exists (embedded) in particular environment, which is shared out among several agents;

The innovation environment that has to ensure the occurrence of an innovation process can adopt an agent-oriented view, since it has decentralized nature. The realization of an innovation depends on actors-mediators that work autonomously. Moreover, these agents need to interact, in order to either to achieve their individual objectives or to manage the dependencies that ensure from being situated in a common environment. In a specific innovation environment the main actors (technology transfer offices, innovation centres and others) participate in mini-societies devoted to specific objectives. The creation, operation and dissolutions of such societies are achieved by agents acting autonomously.

The description of the TTO "ICTEE" presents a conceptual model of a TTO agent that can serve for construction of its representation. It has to consist of components that are intended to realize the conceptual models in whole or partially. Figure 2 presents such a model. According to it an agent consists of two layers – *Decision Making Layer* and *Cooperation Layer*. The Decision Making Layer has two components: an intelligent system and information system. The intelligent system performs domain problem solving tasks. Some of them concern decision making. Their execution bases on information availability. The latter is provided by an information system that stores all necessary data and knowledge get by the agent. The Cooperation Layer is presented by a Communication Module and agent's control.

The control module directs the intelligent system in such a way that the individual agent provides the necessary services, which it is responsible to provide in accordance with its objective and role. As a part of the cooperation layer it controls the individual agent in such a way that it demonstrates co-ordinate behaviour towards the other agents and contributes to the integration of its intelligent system in the multi-agent environment. In other words, the cooperation layer manages interaction with the other agents and relates the local activity of the intelligent system to the global problem solving. This achieved through a control mechanism, which uses a set of data structures modelling the agent's acquaintances (acquaintance models). Information (knowledge) contained in the Information system is used for planning co-ordinate activity and other social interaction. The interaction with the other agents is done by the communication module, which performs intelligent filtering and massage routing.

IV. Conclusion

The activities that have to carry out a Technology Transfer Office concern not only inbound open innovation activities, but outbound open innovation activities, as well. The listed services that a TTO is necessary to provide are responsible for realization of technology scouting, external networking and participation, outsourcing research and development, customer involvement, inward and outward licensing of Intellectual Property.

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