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Abstract

Application of the Theory of Inventive Problem Solving in commercialisation activities

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With technological development, the issue of innovation is gaining importance both in terms of individual companies and state policy. Familiar methods of production, service provision, and process implementation are not sufficient for further economic development and achieving the wage levels characteristic of the richest countries. According to all rankings, Poland is not a leader in innovation, which is linked to the issue of commercialization, i.e., the implementation of scientific knowledge into the economy. One way to streamline and systematize the process of innovation is to use the tools of the Theory of Inventive Problem Solving. However, TRIZ tools are limited to creating new solutions, ignoring the issue of commercialization.

The aim of this work is to extend the application of TRIZ to issues related to the commercialization process. The research objectives of the dissertation include both an analysis of the commercialization process and of TRIZ itself. The thesis aims to answer the question of how TRIZ can help scientists create innovations, identify the conditions for the effective implementation of TRIZ in scientific units, and present how TRIZ is used in management issues. Due to the implementation component of the work at Łukasiewicz – IMIF, it is also necessary to answer the question about the conditions for commercialization in relation to the production of electronic systems. The practical objectives of the work included the formulation of an algorithm and tools for solving management problems in the commercialization process and the verification of their usefulness.

The research methods used included a critical review of the literature on the commercialization process, in particular a review of the literature in the Harvard Business Review and MIT Sloan Review journals, qualitative research in the form of in-depth interviews on commercialization and TRIZ, a case study of commercialization at Ł-IMIF, including one of the scientific projects, and a comparative analysis of the Łukasiewicz Center and the Fraunhofer Society. The concept of the study was implemented in the form of workshops conducted at Ł-IMIF. Quantitative research was auxiliary in nature and included the presentation of statistics describing Ł-IMIF and the application of artificial intelligence algorithms to determine the use of graphene.

The overall objective of the work, namely to extend the application of TRIZ to commercialization issues, was achieved firstly by identifying and pointing out existing extensions of TRIZ (so-called TRIZ-business). These include technology transfer, solving sales process problems, identifying promising patents in terms of technology development stage, and improving processes within the company. In addition, a table of solutions to commercialization problems was developed based on a review of the scientific literature.

The research objectives were achieved by presenting the economic, legal, and cultural conditions for commercialization. The economic factors determining commercialization are access to capital, the coherence and complementarity of the grant system, the proximity of

technology companies, and a favorable tax system. Legal factors can be barriers that slow down the transfer of intellectual property or act as an accelerator for commercialization if they force a departure from existing technologies. Cultural conditions relate to differences between the culture and values of companies, scientific institutions, and public agencies. At the individual level, this is the difference between the role of an entrepreneur and that of a scientist.

The research also sought to answer the question of how TRIZ can help scientists create innovations. Possible applications generally relate to planning and solving problems that arise during the implementation of scientific projects. TRIZ is also helpful in the collaboration between science and industry. Additional conditions for the implementation of TRIZ in scientific units were also identified, in the form of organizing group activities after training and the role of promoters of TRIZ application.

The work also indicates how TRIZ can be used in management, mainly by modifying the basic tools and combining them with other methods. TRIZ can be useful for managers in the decision-making process regarding the choice of market for innovation, as well as for strategic management. Functional analysis and modified versions of the defect cause chain have been applied to the analysis of problems/contradictions in the functioning of enterprises. Inventive principles are a good way to break mental inertia.

The analyses also present the conditions for commercialization of electronic system production at Łukasiewicz-IMIF. The potential for commercialization is mainly shaped by political decisions, in particular those concerning the allocation of public funds. The costs of electronic production have exceeded the capabilities of the state or the company, which means that action is needed at the European Union level. The potential of research centers is mainly shaped by cooperation with a few domestic companies in the industry. The analyses confirmed the possibilities of using graphene in industry, which is worth emphasizing due to the research and production potential of Ł-IMIF.

Keywords: TRIZ, commercialization, research networks, contradictions in management, innovations.