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PhD thesis abstract

„Research cooperation with companies and universities’ development in the Silesian
Voivodeship”

advised by

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Technological development resulting in shortening products’ lifecycle motivates companies to conduct research and development works. R and D processes create a chance to reach a technological and competitive advantage over other market participants. However, companies’ own R and D departments involve high level of investment during their initialisation as well as operation phases. The vital question also concerns availability of qualified research staff, prepared to do research. Taking the mentioned conditions into consideration cooperation with universities’ research and development units could provide transfer of: knowledge, research results and modern technologies. Due to their research and development potential as well as access to laboratory infrastructure such units may play a vital role in R and D cooperation projects.

In scientific publications, studying the area of R and D cooperation between universities and companies in Poland, there is a dominating question of transferring technological solutions and research ideas to companies. However, scientific publications in their research process often miss the question of cooperation effectiveness for universities as project partners. R and D cooperation creates for them a chance to develop as for research staff, research system, scientific publications, research infrastructure and education programs. Such development may take place through transformation of universities from research units focused on education function into scientific-research centres, delivering solutions and technologies applicable in practice as well as in commercial environment.

In the light of the above considerations, the crucial matter is to make and verify the following research hypothesis: “Research cooperation projects may contribute not only to transferring technologies into companies but also to the development of universities.”

Regarding the research on the influence of research cooperation projects on universities’ development the following cognitive objectives have been suggested:

- identification of universities development indicators,
- evaluation of significance of chosen projects of cooperation with companies for universities development,

- analysis of limits and threats related to R and D cooperation projects between universities and companies.

The research process of the thesis also allowed to realise the following utilitarian objectives:

- mapping of the key areas of R and D cooperation with business zone from a university development perspective
- recommendations on directions and suggested future forms of cooperation between universities and companies in the Silesian Voivodeship.

The period of the research analysis of R and D projects in this thesis concerns the period between 2009 - 2015. The data regarding realisation of R and D cooperation projects in this period had been being delivered by research units until 2017. Recommendations on mapping the key areas of R and D cooperation as well as directions and suggested future forms of cooperation between universities and companies were prepared between 2021-2022. The most recent economic conditions, development priorities and geopolitical situation factors have been considered.

In the research area of the thesis there have been involved the research units of universities from the Silesian Voivodeship, which achieved the highest scientific categories A or A+ in the parametric evaluation of the Ministry of Science and Higher Education (MNiSW) of 2013.

The PhD thesis has been divided into four sections. The first section is of a theoretical nature and is a review of scientific publications, legal regulations as well as strategy documents related to the aspect of partnership between universities and business as far as research cooperation. The second section is of a theoretical-empirical nature and presents the characteristics of the Silesian Voivodeship as an area of R and D cooperation. This section contains the analysis of strengths and weaknesses of universities as potential partners in R and D cooperation as well as opportunities and threats arising from realisation of research cooperation projects. The second section also presents the results analysis of the parametric evaluation of universities' organisational units, conducted by the Ministry of Science and Higher Education (MNiSW) and representing a scientific-research recommendation for these units.

The third section presents an analysis of objectives and priorities of universities development, based on the strategies for universities' development as well as strategy documents in the regional, national and European Union aspects.

The fourth section contains identification of indicators of universities' development and presents the results of empirical research on the influence of R and D cooperation projects on universities' development. Recommendations on mapping the key areas of R and D cooperation and

suggested directions as well as future research cooperation forms between universities and companies in the Silesian Voivodeship have been presented in this section.

The research hypothesis of the thesis has been verified by the analysis of the direct data concerning R and D cooperation projects obtained from the Ministry of Science and Higher Education (MNiSW), from universities' scientific units as well as through the analysis of the research survey results conducted among universities' research staff.

During the analysis of the correlation between research cooperation projects and the effects on universities' development, conducted and based on the aforementioned data, the statistics method of R. Pearson's correlation has been deployed. The research analysis has led to the positive verification of the main hypothesis. However, it is important to emphasise that the analysis shows the level of dependence between R and D cooperation projects and universities development is different for certain projects as for: the domain, scientific area of the research, the period of realisation, the amount of subsidies and the scientific unit by which the project has been implemented.

For the cognitive objectives of the thesis, in the third section universities development indicators have been identified, based on: universities development strategies, the Higher Education Development Strategy, the Silesian Voivodeship Development Strategy and the Act on Higher Education. It has been acknowledged that among the most important indicators there are those related to the following areas: scientific publications, scientific conferences and popularisation activities, research staff development and promotion, facilitation of universities' educational processes, research infrastructure development, research results commercialisation as well as the area of law on copyright and patents resulting from research work.

The research analysis enabled to define the meaning of the chosen R and D projects for the effects on universities' development as the cognitive objective of this thesis. The analysis of the correlation between the projects confirmed by research units and the effects of universities' development in various areas enabled to define the influence of the research cooperation on the aforementioned effects. Due to the confidentiality of the data on the analytical level, guaranteed in the application stage of obtaining them, the following aspects could not be revealed: project names, personal data of the research staff involved in the projects, names of scientific publications, remuneration amounts as well as contractual fees related to selling or hiring rights to the inventions, patents or technologies.

Within the research process of the thesis the analysis of limits and threats related to R and D cooperation projects between universities and companies has been conducted, which was one of the

cognitive objectives of the thesis. The meaning of legal conditions, in which research units operate, the specifics of universities' organisational structures, flexibility of scientific-research staff, effectiveness of conducted research and the level of research infrastructure availability have been emphasised.

As for the presented recommendations, the key areas of research cooperation of universities' research units with companies, crucial also from the perspective of universities development, have been suggested. Among the key research areas the following have been distinguished: biocybernetics and biomedical engineering, environmental engineering, energy technology, automatics and materials engineering. The meaning of interdisciplinary nature of research cooperation areas, which combine various research disciplines, has been emphasised. The suggested areas of R and D cooperation with business are crucial as for the possibilities of universities' development and their adaptation to the changing research demands of the market. The recommendations have been based on the analysis of, including: trends in economic development, implemented and planned regulations in energy technology and environment protection as well as priorities in the European Union development. For defining the key areas of R and D cooperation the current phenomenon of the dynamic changes in the economic environment of companies, connected with the recent geopolitical events of 2021 and 2022, has been considered. It has been emphasised that searching for models of investment cost optimisation, methods of limiting the risk related to investment projects management might become the key research challenges in the economics area. In the context of the foreseen changes, R and D projects of interdisciplinary nature, realised basing on economics, finance and management disciplines are going to play a vital role.

The fourth section of the thesis another utilitarian objective has been achieved – recommendations on trends as well as future forms of cooperation between universities and companies in the Silesian Voivodeship have been presented. In this matter, the role of intermediary institutions in initiation and coordination of R and D cooperation for technology parks, business incubators and tech clusters has been discussed. The role of intermediary institutions in realisation of R and D cooperation with universities for Small and Medium Enterprises sector has been emphasised. The importance of recommendations from companies already implementing such projects for further popularisation of research cooperation projects has been indicated. Promotional activities for R and D projects organised by scientific units as conferences, symposiums in the direct environment of companies, e.g. in technology parks, business incubators or business centres have been suggested.

Due to the lack of access to the necessary data concerning the research units of the Kraków agglomeration, which in the parametric evaluation of the Ministry of Science and Higher Education

(MNiSW) of 2013 achieved the highest scientific categories A or A+¹, the final utilitarian objective has not been realised. The objective was to evaluate the development of certain university faculties of the Silesian Voivodeship as a result of R and D cooperation comparing to the results achieved by equivalent university faculties in the Kraków agglomeration. However, it needs to be emphasised that the aforementioned objective might create a separate interesting research area for prospective research continuation. The results analysis of development of universities' faculties in the interregional context (conducted for Katowice and Kraków agglomerations) should deliver an answer to the question about the effectiveness of using the research work subsidies by research units and taking advantage of potential development opportunities by universities' faculties, arising from R and D cooperation projects.

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¹The parametric evaluation was conducted in 2013 by the Committee for Evaluation of Research Units, empanelled by the Ministry of Science and Higher Education (MNiSW). It concerned the evaluation of research units in the area of their scientific and R and D activity. The comparative analysis of the effect of research units would refer to the universities' faculties in the Katowice and Kraków agglomerations, which in the aforementioned evaluation achieved categories A or A+.