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## Analysis of Technology Management Using the Example of the Production Enterprise from the SME Sector

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### Abstract

The method of managing technologies in manufacturing enterprises depends primarily on the size of the company and its organisational structure. Not without significance is also a way of understanding the definition of technology. The main purpose of this paper is the identification and analysis of the factors influencing the manner in which technologies are managed in small production enterprises within the metalworking industry. The research process is based on a case study of an enterprise. The received results will help to enhance knowledge related to the development of methods used for technology management in production enterprises.

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### 1. Introduction

The development of manufacturing enterprises depends on their level of competitiveness on world markets. That level is largely conditioned by the access to technology and the ability to introduce innovative solutions. The correct integration of technologies in the enterprise should, therefore, be a source of a sustainable competitive advantage [3, 11]. For this purpose, it is necessary both to understand the nature of technology as well as to determine the mechanisms shaping the process of technology management [5, 7, 13–15].

Technology is a component of general knowledge about the types of techniques, methods of their formation and implementation in practice. It leads to gaining knowledge (often hidden or forbidden) and skills related to solving

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specific technological problems. In the literature, there are many different definitions of technology relating to both its scientific significance and practical application. Cornwall defines technology as a resource of knowledge relating principally to the production of goods and services [1]. Rosenberg, in turn, talks about the understanding and implementation of previously acquired scientific knowledge about the types of techniques, methods and structures [9]. Dosi combines these two definitions and defines technology as a set of elements of practical and theoretical knowledge, skills of its application (know-how), methods, procedures and physical devices that use this knowledge [2]. The publications of Polish authors are dominated by definition of technology as knowledge about methods of manufacture of a given product. Łunarski, in his work, defines technology as „a directed process of producing the necessary products and services, implemented in a hierarchical production system with identified elements and their relationships, built for the realization of this process on the basis of the available theoretical and practical knowledge” [6]. The process approach to the subject is also presented by Santarek, who claims that technology is „a process consisting of many activities carried out in a strictly defined manner and sequence, resulting in the processing of input goods (raw materials, semi-finished products) into finished products having certain features and meeting customer needs” [10].

From the definitions present in the literature, as well as the amount and variety of technology existing on the market, as well as the role that it fulfils in the modern economy, stems the need to develop mechanisms for technology management. The term technology management has been defined, among others by a team of researchers from the US National Research Council, which concluded that Technology Management (TM) combines the disciplines of engineering sciences and management sciences with the purpose of planning, development and implementation of technological capabilities which will enable the implementation of strategic and operational objectives of the organization [12]. The NRC team has also defined the key elements of technology management, which served other researchers to build the models of technology management. These are:

- identification and evaluation of technological options
- R&D management of and the determination of the feasibility of the project
- integration of technologies into the organization’s activities
- implementation of new technologies in products and/or services
- obsolescence and replacement of technology.

One of the first authors carrying out research on the formulation of the model of technology management was Gregory. He proposed a general model, including five major activities in the field of technology management of in an enterprise, among which it is possible to distinguish identification, selection, acquisition, operation and protection of technology [4]. Within each of the five activities it is possible to extract a number of additional elements that, depending on the industry, will be subject to change. Within the framework of the technology identification process it is important to conduct a market analysis of the available technologies and find those that could have a significant impact on the development of the company. The next step is the selection of the appropriate technology and acquiring it. All the activities related to the identification, selection and acquisition of technology may take place inside or outside the company. The essential role is played by the human, technological and financial potential, at the disposal of a given entity. The other two activities (exploitation and protection of technology) are dependent solely on the conditions within the company and have a huge impact on the generation of enterprise competitiveness.

The Gregory’s model was supplemented, or modified multiple times by other researchers. In most of the models the differences are slight and limited to the change in classification and the recognition of the scope of individual activities. The differences also stem from the different understanding of some of the definitions. This indicates a lack of ability to accurately classify concepts in the field of innovation management, knowledge management and technology management. The common feature of all the described in the literature models is the determination of the general framework of technology management.

New insights bring researchers Pelsler and Prinsloo, who noted, that technology plays an important role in the interaction between entities (companies, research and development units), society and nature [8]. Thus, they concluded that the current technological advances in the world can have serious implications for each of these entities and also depend on their impact. Therefore, they agreed that technology management should be based on developing

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