# Abstract

Manufacturing Companies can be competitive on the market, not only because of high quality of their products and services, but also through implementation of new solutions and technologies, such as robotisation, Artificial Augmented Reality or intelligent technologies in the context of Industry 4.0 concept. The implementation of IT technologies in companies can be considered an investment, and in such scope the analysis had been conducted of the efficiency of implemented solutions in the measured companies' maintenance departments.

The analysis of data from CSO, IFR and Eurostat identifies the need in their strive to maintain competitive position on the internal, European and Global market, for Polish manufacturing companies to adapt to the concept of Industry 4.0.

Managers are seeking solutions that can be helpful in decision making applied to buying new technologies, with aim to adapt their companies to the concept of Industry 4.0. Currently, many approaches applying to manufacturing systems involving technical support are based on Artificial Neural Networks (ANN).

The main aim of this body of work was to build a **evalution model of the efficiency of the maintenance department in scope of the concept of Industry 4.0.** The manufacturing companies' maintenance departments seek modern and innovative solutions to align their function in line with the company's development strategy. For many manufacturing companies it can mean implementation of MES (Manufacturing Execution Systems) type IT systems on the operational, as well as tactical and strategic levels. The functional complexity of processes applied by the employees of the maintenance department requires implementation and investment in ever-so more specialised IT systems and technologies and software that can provide competitive advantage to their users.

The following research tasks had been conducted:

- Development of own tools measuring efficiency/level of automation of the maintenance department
- Development of of the maintenance department's efficiency grading model by:
    - Identification of business processes

- Identification of efficiency markers
- Identification of automation levels
- Creation of efficiency markers database
- Defining the reference values of markers
- Choice of Artificial Neural Network

- Creation of the efficiency of the maintenance department gradation procedure in scope of implementation of Industry 4.0 concept.

The questionnaire based research took place at three manufacturing companies from the automotive industry, based in two districts of Lubuskie Voivodeship, Poland, among employees of three tiers: strategic, tactical and operational. The database of efficiency markers forms of 121 questionnaire answers and defines levels of automation for given types of manufacturing companies. Next, to build the model and procedure of gradation of efficiency of the maintenance department in scope of implementation of Industry 4.0 concept applied was an Artificial Neural Network. The proposed model and research method have been verified in a manufacturing company from the automotive industry.

The subject of this work is aligned with production engineering, especially in areas of ‘efficiency, productivity and organisation of companies’ and ‘Systems supporting decision making. Production knowledge management’.