

# IDENTIFICATION AND ASSESSMENT OF THE NEED TO IMPROVE THE OPERATION OF PRODUCTION SYSTEMS IN THE METAL SECTOR ENTERPRISES

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In this paper an attempt was made to identify the areas of metal products manufacturing processes that require improvement. Determination of such areas may become a source of a lot of valuable information for the enterprise, enabling the development of its improvement directions. The results of survey allowed also to define a model of implementation importance for tasks contributing to the metal sector enterprises improvement.

*Keywords:* enterprises, metal sector, production system, improvement

## INTRODUCTION

The contemporary market sets more and more specialised requirements to enterprises, forcing greater competitiveness. A properly developed and implemented strategy, aimed at permanent improving of all processes proceeding in the enterprise, to a large extent is responsible for achieving a competitive advantage [1]. The production systems improvement processes, due to a wide, frequently innovative and unique, impact on enterprises operation should be considered among key determinants for the effectiveness of manufacturing enterprises operations. Continuous searching, implementing and disseminating new solutions should have a priority nature in planning the production processes of such enterprises [2]. In this paper an attempt was made to distinguish areas, which - in the opinion of surveyed enterprises stakeholders - show a need to improve. Moreover, actions were started to identify factors and barriers affecting the improvement level with respect to processes proceeding in the production system. The survey group comprised 90 enterprises from the Polish metal sector.

## IDENTIFICATION AND ASSESSMENT OF FACTORS DECIDING ABOUT THE NEED TO IMPROVE ENTERPRISES

The assessment process of the needs to improve the production system required specifying its survey areas. In this field the areas of research and development (comprising the manufacturing preparation, supplies of productive factors and training), manufacturing (includ-

ing manufacturing, assembling and service operations) and distribution have been indicated. The preliminary stage of survey consisted in specifying the assessment criteria for each area. Results related to the area, in which - acc. to the respondents opinion - there is the greatest need for improvement actions in the manufacturing system of surveyed enterprises are presented in Table 1.

It should be stated that the supplies of productive factors is the area requiring improvement in micro and small enterprises. In this case as many as 45 % respondents indicated the need for change - mainly in the field of supplies quality and suppliers choice. A thorough analysis has shown that in this area for 68,5 % of cases the scope of required changes was assessed as great and very great. Moreover, in the respondents opinion the supplies quality and suppliers choice is the element that should be analysed in detail. The survey has shown that the suppliers selection policy adopted by the enterprises is based mainly on the economic aspect (the raw material price). In this context the care of good quality materials by choosing the right supplier, establishment of individual terms and conditions of cooperation with each of them as well as designing and implementing an additional control of supplied raw materials can provide measurable benefits both for the surveyed enterprises and for their environment.

Table 1 **Cumulative specification / %- the areas that require improvement in the manufacturing process of surveyed metal sector enterprises in Poland**

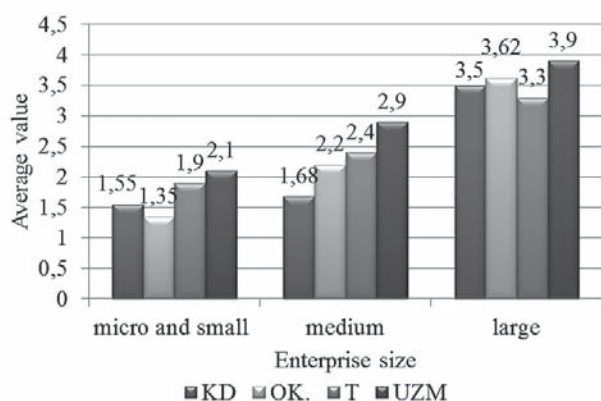
Areas that require improvement	Enterprises		
	micro and small / %	Medium / %	Large / %
Research and Development	45	19	10
Manufacturing	35	70	50
Distribution	20	19	40

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The research on the manufacturing preparation is crucially important in the development activity of the analysed enterprises. From this point of view the R&D activity is developed especially in great corporations (11 %) and is related with investing in appropriate scientific establishments, which specialise in creating new and in developing the already existing solutions. In the case of the remaining group of surveyed enterprises (89 %) the methods for acquiring new technologies are most often limited to the purchase of licenses and technical-technological solutions in the field of manufacturing.

When starting business activities, the metal sector enterprises face among others a decision related to the choice of distribution channels (KD) types and number. Issues related to the physical distribution, i.e. determination of rules and conditions for: customer service (OK), transport (T), stock maintenance and warehouse use (UZM) are equally important. Those issues constituted a significant element of the started survey. Among the enterprises participating in the survey the large enterprises (40 %) have shown the greatest need for improving actions in this field. The underestimation of those elements by micro and small enterprises may have a strategically adverse impact on their current and future situation in the market. Importance for the factors from the distribution area is presented in Figure 1, and Table 2.

The fact that more than 55 % of all surveyed enterprises considered the area of manufacturing a priority one made that it was subject to more thorough analyses. The following factors were distinguished within them, which contribute to this area improvement: the cooperation with scientific centres, scientists, inventors (WN),



**Figure 1** The structure of assessment importance for factors from the distribution area: KD, OK, T, UZM

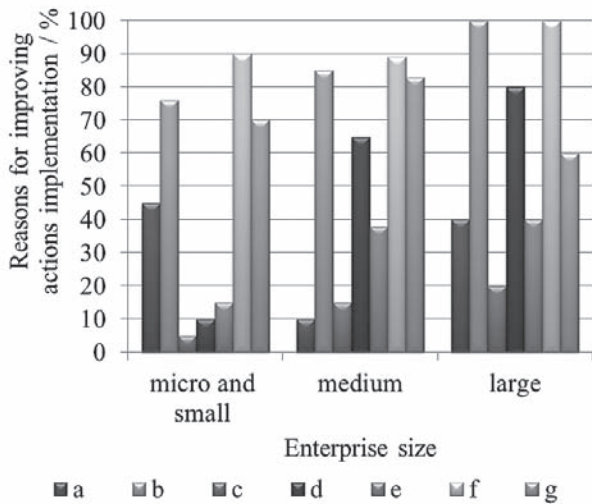
**Table 2** Specification of assessment results for the manufacturing area of surveyed enterprises

Assessment	Enterprises			
	WT	T	KP	WN
1	5	25	10	60
2	20	15	35	30
3	65	20	5	10
4	10	40	50	0

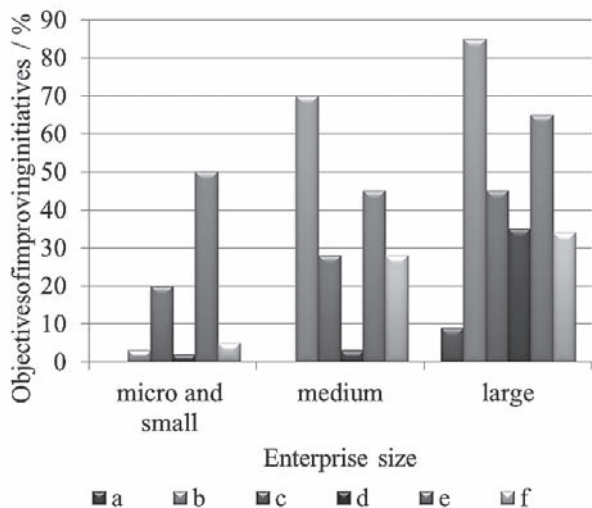
the manufacturing technology used (T), the technical equipment (WT), and the personnel skills/involvement (KP). These factors were assessed from the most to the least important, in accordance with the adopted 1 - 4 scale. In the surveyed enterprises, irrespective of their size, the technical equipment was indicated as the basic factor contributing to the improvement (approx. 75 % respondents assessed it as good and very good). In the case of (technology used) criterion the answers were highly diversified. Around 50 % of respondents evaluated the employees skills very well. Unfortunately, in the case of most enterprises (90 %) the lack of cooperation with scientific centres was found. This criterion had the poorest assessment (marks 1 and 2), which shows the need to start corrective actions. The carried out survey has shown the lack of information and direct cooperation between the manufacturing personnel and scientists and inventors. While analysing the reasons for introduction of improving actions in the manufacturing system it is possible to notice that raising the products quality parallel to striving for profits increasing and cost cutting has a huge impact on further development of the surveyed enterprises (Figure 2). Almost all large and medium enterprises try to introduce changes in the area of manufacturing, featuring an improvement nature (in the areas of control, quality as well as recruitment and personnel management processes). In the case of micro and small enterprises the improving actions consist mainly in improving the already existing product (Figure 3). Moreover, the survey has shown that 62 % of suggested improvements referred to the work of the manufacturing area personnel. The suggested changes were mainly related to the elimination of inconsistencies caused by the human factor, which to a large extent requires improving the working place safety as well as improving the efficiency of operations in the entire manufacturing area. In turn, 35 % of improvement suggestions covered methods/procedures related to the information and documentation flows. A significant piece of information related to the performed survey is the fact that 32 % from all the improvement suggestions during the survey period were developed and implemented in enterprises.

The implemented projects were mainly related to “people: (57 %) and “methods/procedures” (36 %) areas. Only 7 % of implemented projects were related to “machines” group. In the context of the carried out survey the identification of basic barriers making difficult the implementation of improving solutions in the manufacturing area was an important aspect. The obtained results are presented in Figure 4.

The costs and difficulties in access to external financing sources were the most frequently indicated problem in the initiation and implementation of improving actions among the set of answers presented in the survey. Also a limited access to information on the organisational-technical solutions is very important. The information exchange between competitor enterprises



**Figure 2** Reasons for improving actions implementation  
 a - Willingness to implement an own strategy for the company development, b - Striving for profit increasing, c - Realisation of own professional ambitions, d - Necessity to adapt to regulations, e - Need to increase productivity, f - Need to cut costs, g - Improving the products quality.

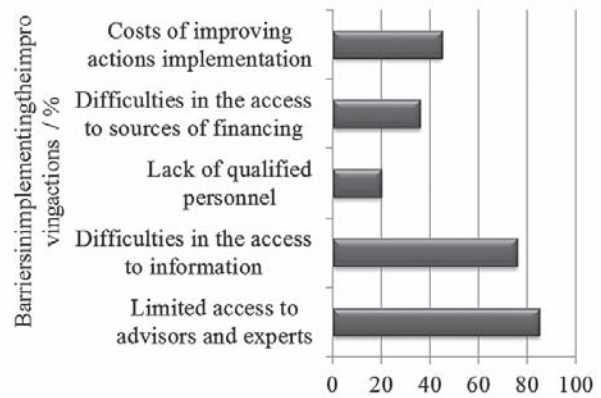


**Figure 3** Objectives of improving initiatives  
 a - Solutions related to improvement in internal and external cooperation relations, b - Improvement initiatives from the field of logistics, quality control, personnel recruitment and management, c - Solutions related to improvement in the machinery maintenance, depreciation and improvement method, d - New product concepts, e - Product improvement concepts, f - Scope and breakdown of duties

within the surveyed sample is practically impossible due to the protection of own solutions.

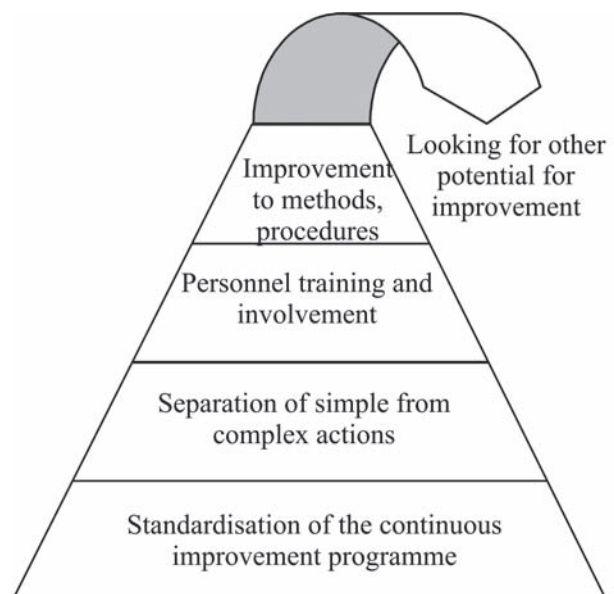
**SUMMARY**

Based on the obtained results it is possible to conclude that now each surveyed enterprise generates needs and introduces changes irrespective of the fact,



**Figure 4** Barriers in implementing the improving actions in the metal sector enterprises

whether it is large or small. Only the area and the reach of change may differ depending on the advancement degree of introduced improving (innovative) solutions. In the analysed case - referring to the surveyed entities - the areas that show a great and very great need to introduce improvements are: in micro and small enterprises - supplies (45 % of responses) of productive factors, mainly their supplies quality (50 %) as well as suppliers selection procedures (33 %); in large enterprises - distribution (40 %), in particular stock maintenance and warehouse use (62 %); and in medium enterprises manufacturing (70 % of responses), mainly problems related to the lack of cooperation with scientists and scientific centres in resolving the studied area problems (41 %). The carried out survey has proven a high activity of people involved in improvement, which may be presented in an improvement model for the manufacturing process, peculiar for the metal sector. Its structure comprises 4 levels of advancement presented in Fig. 5. Moreover, each enterprise - irrespective of its size - indicated the legiti-



**Figure 5** Four levels of advancement in the improvement model for the metal sector enterprises.

macy of introducing the standardisation of continuous improvement programme. According to their opinion the preparation, implementation and standardisation of continuous improvement programme is the very element in the manufacturing process, which to a large extent can contribute to increase in the innovation and thereby to increased added value for the customer and to increased enterprise competitiveness in the market. This provides the foundation for improving and building a learning, knowledge-based organisation.

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**Note:** The professional translator for English language is Jerzy Wróblewski, Usługi językowe, Poland