

BENEFITS AND BARRIERS OF PARTICIPATION IN PRODUCTION NETWORKS IN A METALLURGICAL CLUSTER - RESEARCH RESULTS

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In this paper, the research results of surveys which were conducted in a Polish metallurgical cluster and among enterprises which are potential members of such production networks are presented. These results show that there is a high level of free capacity that can be used in the formation of production networks. The idea of the creation of long term clusters of industry or service enterprises give new possibilities to increase performance and productivity and seek higher levels of innovation. Through exploitation of the synergy effect, such concepts allow better economic results and a competitive advantage over other market players to be obtained. The key concerns about the functioning of enterprises in production networks within a cluster are following: a lack of confidence in potential partners, loss of data and concerns about the division of costs and revenues.

Key words: metallurgical industry, metallurgical cluster, production network, Poland

INTRODUCTION

Strong competition has increased requirements for businesses and led to high pressure to increase productivity and reduce costs. For these reasons the lean methods are often used in contemporary companies [1, 2]. Small and medium enterprises in the metallurgical sector face a particularly difficult situation due to development constraints resulting from low levels of capital, high maintenance costs, lack of access to modern technology and lack of modern, computer-aided management systems [3]. As a result, there is a need for new methods focused on growth of performance and productivity [4], increased levels of innovation and quality [5, 6], and reduced costs. An opportunity for development arises in forming the industrial clusters.

This article presents the results of studies conducted in one of the Polish metallurgical clusters, the aim of which was to evaluate the possibility of the formation of production networks in regional clusters and to identify opportunities and concerns of companies that were already organized within the framework of the metallurgical cluster.

THEORETICAL BASIS

Despite the concept of clusters being relatively new, already A. Marshall pointed out the role of the spatial concentration of economic activity which relates the

diffusion of knowledge, advantage created by the local labour market focusing people with appropriate skills, and networks within large regional markets [7].

The cluster is characterized by geographical closeness, a shared industrial branch and working relationships which can support the exploitation of local competencies and resources through the agile and fast configuration of a set of partners for each business opportunity (e.g. new production order-project) [8]. They can achieve better economic results and a competitive advantage over other market players, using the synergy effect, through mutual cooperation and close geographical concentration of small and medium enterprises [9].

THE QUESTIONNAIRE SURVEY

Surveys were carried out within a selected group of small and medium enterprises in the metallurgical sector of a regional cluster comprised of potential members of production networks. The study involved 100 manufacturing and transport companies, of which 69 responded. Most of the surveyed companies declared manufacturing as the basic type of business - (63 companies); 6 companies indicated transport activities (including 4 who declared solely transport activities).

The survey questions were mainly related to the characteristics of production capacity, the possibility of cooperation and related concerns, ways of searching for customers and readiness for forming a production network. The purpose of the survey was firstly to check if there was a need to create production networks and also to identify expectations and concerns associated with this form of cooperation.

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RESULTS AND DISCUSSION

One important reason for cooperation between enterprises is an excess of production capacity. The sale of spare capacity is conducive to productivity growth and increased company profit. This is significant in a situation characterised by rapidly growing, unused production capacity due to lower demand resulting from the global economic crisis. Polish small and medium enterprises, which have recently benefited from the help of European funds, often have specialized machinery and equipment, which is used in a very limited manner. This is due to the small size and the local nature of these enterprises, the lack of managerial skills, lack of effective advertising and lack of skills to effectively search for customers.

The level of unused capacity was confirmed by observations of the surveyed enterprises. Research shows that up to 48 % of the respondents indicated the use of machinery and equipment possessed was only at the level of 25 % - 50 %, whereas 37 % of companies surveyed indicated a usage level of 50 % - 80 %. Only 5 % of the respondents indicated resource utilization above 80 %. Figure 1 illustrates the average level of utilization of machinery and equipment in the surveyed enterprises.

Similarly, the surveyed enterprises indicated the degree of utilization of staff. The research focused on companies with a narrow specialization, in which employee turnover often means a loss of competence. The process of training employees is often long and expensive. Figure 2 shows the average level of staff utilization in the calendar year.

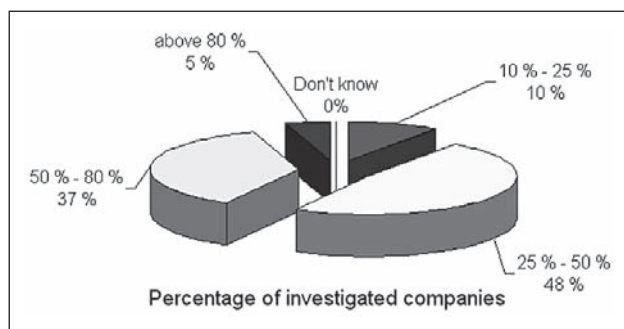


Figure 1 Average level of utilization of machinery and equipment in the surveyed enterprises

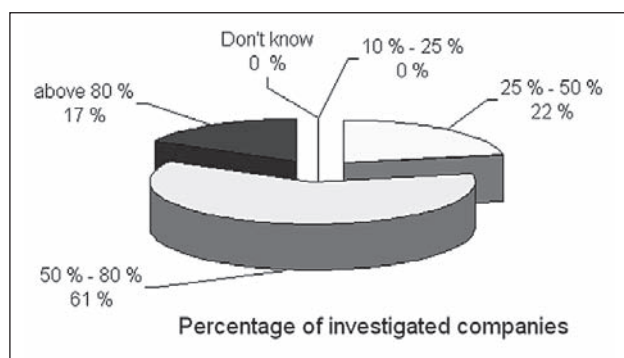


Figure 2 Average level of use of staff

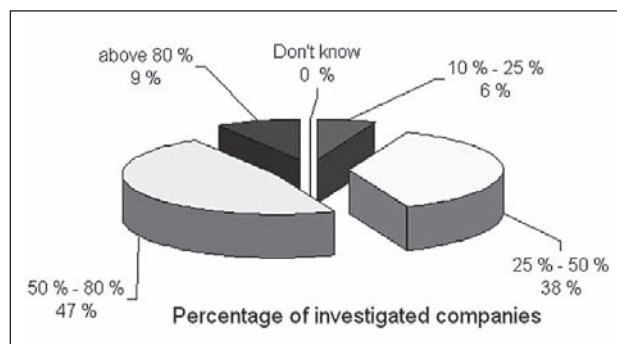


Figure 3 Average level of use of materials in the calendar year

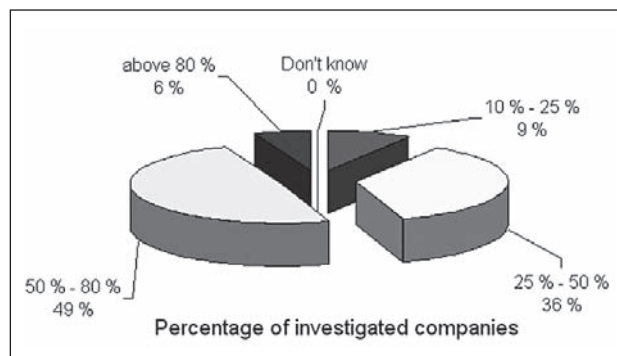


Figure 4 Average level of use of vehicles in the calendar year

Companies declared a fairly high level of unused materials remaining in stock, the use of which could be possible for the rapid implementation of new orders in the cluster (see Figure 3).

In respect of use of transport (only vehicles for transporting cargo) 45 % of companies do not use transport to even 50 %. 49 % of respondents indicated an average utilization rate of 50 % - 80 %. Only 6 % indicated a level of vehicle utilization above 80 %. Figure 4 shows the average level of use of vehicles.

Research shows that there is a significant amount of potential unused production capacity declared by the respondents, which could be used in the joint implementation of production projects implemented within manufacturing networks. The major problems faced by Polish companies are presented in Table 1.

Table 1 Problems in determining spare capacity

Problem	Share %
Lack of detailed production schedule	52
Non-standard technological operations	38
No data on the performance of machines and equipment	38
No registration of technological operations	29
No planned time of operation	10
Lack of supporting computer systems	24
Other	19

These difficulties generally arise from a lack of detailed records and planning with the use of a suitable computer system, with only 48 % of companies declaring that they have a system. In other cases, production planning takes place outside the computer system, making it difficult to obtain information about the current

state of the resource load. This demonstrates a lack of low-cost systems dedicated to small and medium enterprises for the good management of production capacity, which are essential for the development of cooperation in the framework of cooperation and production networks.

Establishing a cooperative relationship between enterprises is one of the first steps in preparing companies to cooperate in production networks. In cases where the production capacity is offered for sale within production networks, the ability to rapidly assess the availability of resources and the costs of their use is of great importance. Most of the respondents indicated a fairly short period of time to determine the availability of the machine/device. That is, the ability to quickly answer requests; in most cases less than one day (81 % of respondents).

Similarly, the survey results are satisfactory in terms of the possibility of determining the costs of resource use. The majority of surveyed companies (66 %) say that they are able to accurately determine the cost of resource utilization offered in cooperation.

With regard to offers to perform a production order in the audited company, the response time for the duration and cost of the order, in most cases, does not exceed 16 hours.

Companies that cooperate with others indicate a number of problems such as: disruption of own production; billing problems; timely execution of orders and retooling of machines and equipment.

Companies appear to be interested in outsourcing part of the production process due to the problem of a critical resource (bottleneck) occurring. Research shows that 72 % of surveyed companies identified a critical resource that limits the volume of production (see Figure 5).

In contrast, 60 % of respondents stated the need to have some operations outsourced in order to solve the bottleneck problem. Finding the right co-operator for outsourcing often involves a need to solve a number of problems associated with both the risk of co-operation with an unknown company and the approach to finding a co-operator. According to the respondents, the key issues with commissioned companies are: untimely performance of the commissioned task (76 % of respondents);

disloyalty of co-operators (48 %); difficulties in seeking partner (38 %); high cost of the co-operator's service (42 %); low quality of services (products) (31 %); lack of companies with the required specialties (17 %).

From the analysis conducted that there is a high potential level of free capacity that can be used in the formation of production networks and simultaneously it is the low level of preparedness of companies to operate within the production network. Despite declarations of cooperation, the surveyed companies within the cluster often show a strong reluctance to participate in joint implementation projects. 59 % of investigated companies showed a lack of any cooperation within networks.

The declaration of a need for cooperation within production networks by the companies within the cluster, especially in terms of available free capacity, deserves attention. The need to adopt such cooperation was declared by 59 % of the respondents; 19 % did not give a clear answer. Only 22 % of companies were not interested in such cooperation.

The most important concerns regarding the formation of production networks within the cluster are: limited trust, loss of data (unfair competition), lack of information about partners, financial settlement and the loss of know-how. Most of the surveyed companies are willing to enter the production network by answering the inquiry of a reliable broker who will take over the role of the organizer of the network (58 % of respondents). A large number of companies are convinced of the rightness of the potential limitations of companies creating production networks to a limited group of affiliated e.g. regional clusters and/or industry - 37 % of companies.

CONCLUSION

This study helped identify key concerns about the functioning of enterprises in production networks within a cluster: a lack of confidence in potential partners, loss of data, concerns about the division of costs and revenues, etc. Therefore, the idea of the creation of long term clusters of industry or service enterprises represents an approach to overcoming these obstacles in a manner which can support the rapid formation of production networks inspired by business opportunities.

An important problem indicated in this study is the lack of tools supporting the process of forming a production network dedicated to small and medium enterprises. This implies the need to develop procedures that will facilitate the evaluation of the feasibility of a new product given the available production capacity of potential partners, and the selection of a set of companies that can guarantee its implementation.

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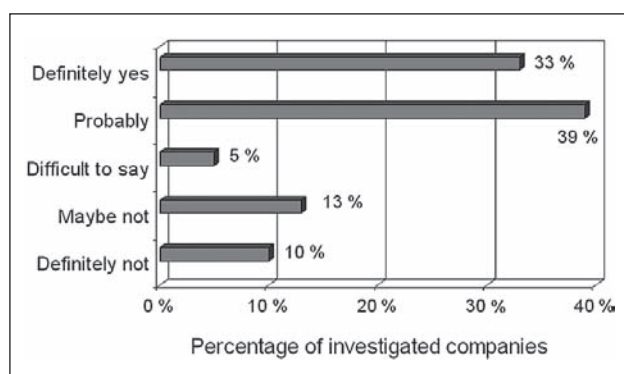


Figure 5 The problem of bottlenecks limiting the volume of production

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Note: The responsible translator for English language is J. Allan Longshadow (Trinity CertTESOL); specialist in academic texts at Longshadow House Sp. z o.o.