

## Drivers: Industry 4.0 Identify the Views

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### ABSTRACT

The purpose of this paper is to review the literature and to identify the views and perceptions of SME managers in Romania on the factors and barriers to the implementation of Industry 4.0 technology for business development. Given the extent of the implementation of Industry 4.0 and a number of important socio-demographic criteria (such as: Enterprise size, sector of activity, economic development context of the country) that affect the efforts of managers, this study aims to fill the lack of information and decisions on the level of preparation of Romanian SMEs for the implementation of the new technology. Following the analysis of the specialized literature, the empirical research was carried out between October 15 and December 15, 2018 among several Romanian companies that carry out activities in fields such as: Automotive, pharmaceutical, industrial, IT, chemical, consulting, electronics etc. The analysis of descriptive statistics indicators and the analysis of the main components are used to discover the degree of knowledge of the industry 4.0 concept among enterprise management, to identify the level of involvement in new partnerships for implementing specific technologies, the typology of technologies to be implemented by enterprises, finding company drivers and barriers arising from the use and connection between employees and the development of new technologies to provide a more detailed understanding of the perceptions and behavior of Romanian managers. The research method used in the study was the sample survey using the questionnaire as a tool to collect data from a sample of 176 SME managers in Romania. The major contributions from the research highlighted the fact that Romania is in full process of transition from industry 2.0 to industry 4.0. There was also a high level of knowledge of the new Industry 4.0 technology and the desire to implement it in SMEs in Romania, as well as the low level of resources required for its implementation.

**Keywords:** Industry 4.0; SMEs; Business; Drivers; Barriers; Managers

## INTRODUCTION

IT integration through cyber systems known as Industry 4.0 can be the answer to the problems of addressing the increasing complexity of products and supply chains [1], providing greater efficiency to the production systems used by SMEs.

Familiarization with this concept involves understanding and accepting holistic and interdisciplinary interpretations or approaches

approaches, and many SMEs face certain difficulties.

Previous studies focus on the practices and innovations brought by the Industry 4.0 concept, the expected advantages [2], and the difficulties encountered in some industries, on the digitization of supply chain processes on the application of the best strategies for Industry 4.0 [3], on the interconnection of logistics services and the promotion of transport cooperation [4] and others.

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SMEs play an important role in the development of the circular economy [5] due to the influences of technology and automation in the competitive business environment. For many of them, implementing strategies and planning activities that should be incorporated alongside their own technological processes is a major challenge. In this context, previous studies show that the biggest problem for SMEs is the financial resources needed to make new investments in technology and/or to renew the range of products and services to meet the current and future needs of consumers.

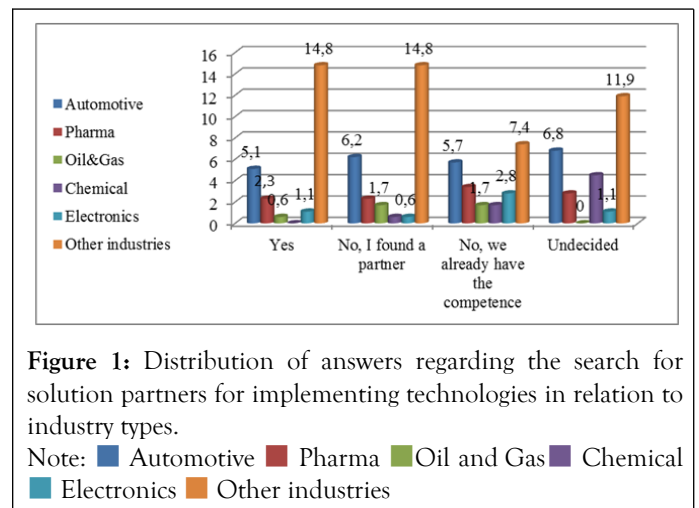
## MATERIALS AND METHODS

Considering the above, a study was conducted to know the perceptions of managers regarding the advantages and limitations of the possibilities of implementing Industry 4.0 in SMEs in Romania. The objectives of the marketing research were the following: Knowing the Industry 4.0 concept and identifying the need for partnerships to implement specific technologies. Identification of types of technologies to be implemented by enterprises and their level of training. Assessing enterprise drivers following the use of Industry 4.0 Technology. Determining the barriers that businesses might encounter in implementing Industry 4.0 technologies. The link between employees and developing Industry 4.0 technologies [6-9].

In order to achieve the objectives, a survey was conducted between October 15 and December 15, 2018 among Romanian enterprises. Data were collected using a questionnaire from a sample of 176 SME managers in Romania, with a response rate of 29.1%. The collected data were analyzed with the SPSS package using different bivariate methods of analysis (analysis of descriptive statistics and analysis of main components).

## RESULTS AND DISCUSSION

The results of the study indicate that 8 out of 10 SME managers have knowledge of the fourth industrial revolution, while 15.9% of them say that this concept has been launched in Romania only at the declarative level. Research results indicate that 23.9% of SME managers are looking for partners to: Implement information and communications technology to digitize information and integrate systems into product conception, development, manufacturing and use; adopt new software technologies for modeling, simulation, virtualization and digital manufacturing, and for the development of cyber-physical systems to monitor and control physical processes, 26.1% of SMEs already have partnerships with specialists to use Cloud, Big Data or to design some types of autonomous robots that will contribute to product development, from prototype and zero series to serial production (Figure 1).



**Figure 1:** Distribution of answers regarding the search for solution partners for implementing technologies in relation to industry types.

Note: ■ Automotive ■ Pharma ■ Oil and Gas ■ Chemical ■ Electronics ■ Other industries

The Figure 1 shows that the managers of the 176 SMEs indicated 352 responses. The modal value was recorded for the "Autonomous Robots" technology, with 62 responses, representing 17.6% of the total responses. This technology is to be implemented in the future by 35.2% of SMEs responding to this question. Other technologies indicated by SMEs as necessary to be implemented for product and product development were: "Horizontal and Vertical System Integration" (27.8%), "Big Data and Analytics" (27.3%), "Simulation" of Things (IoT) "(21.6%) and" Cyber-Security "(17.6%). The least responses were obtained by Artificial Intelligence (1.7%) technology, to be implemented in the future by only (3.4%) SMEs (Table 1).

Correlation matrix	Mean	Media	Mode	Std. Deviation	Analysis N
Lack of knowledge about Industry 4.0	3.55	3	3	1.304	176
Lack of standards	2.94	2	2	1.177	176
More focus on operation at the expense of developing the company	3.34	3	3	1.093	176
Lack of understanding of the strategic importance of Industry 4.0	3.27	3	3	1.225	176

Too few human resources (man power)	3.19	3	3	1.158	176
Requires continued education of angajați	3.03	3	3	1.11	176

**Table 1:** Matrix of correlation coefficients between the 6 variables analyzed.

As can be seen in Table 1, there are three small correlations between "Lack of knowledge about Industry 4.0" and "Too few human resources" (0.117), "Lack of knowledge about Industry 4.0" and "Lack of understanding of the strategic importance of Industry 4.0" (0.094), and between "More focus on operating costs and the need for continuing education of employees" (0.085). In addition to the above, the lowest correlation encountered was the appreciation of "More focus on the operation of the company" and "Lack of understanding of the strategic importance of Industry 4.0" (0.001).

Table 2 shows the extent to which SMEs have built digitization expert teams with company-level responsibilities for strategy and industry-specific implementation of Industry 4.0 technology. Out of the 176 respondents SMEs, only 30.7% of entities have organized expert teams for business digitization, while the remaining 122 enterprises have not done so. Two-thirds (2/3) of businesses with between 50-249 employees have already formed expert teams on digitization, while 8 out of 9 micro-enterprises (between 10-49 employees) have not built such a team (Table 2).

Cross tabulation			Number of employees			Total
			Between 0-9 employees	Between 10-49 employees	Between 50-249 employees	
Have you built a team of experts in the enterprise to implement Industry 4.0 technologies?	No	Count	82	29	11	122
		% of Total	46.60%	16.50%	6.20%	69.30%
	Yes	Count	10	19	25	54
		Total % of	5.70%	10.80%	14.20%	30.70%
Total		Count	92	48	36	176
		% of Total	52.30%	27.30%	20.50%	100.00%

**Table 2:** Table of contingency on the extent to which SMEs have built digitization expert teams in relation to the size of the enterprise.

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## CONCLUSION

Over 84% of SME managers have knowledge of the fourth industrial revolution. The results of the analyzes further indicate that: A significant part of SME managers are looking for partners to implement new technologies, as they have the necessary skills to use them in their own field of activity; Among the first technologies to be implemented in the future are: Autonomous robots, horizontal and/or integration systems, Big Data and Analytics, and Cyber-Security and the main problems they face are: Lack of knowledge about Industry 4.0 solutions and processes and how to focus on operating at the company's development costs.

This study has two limitations. The first is related to the size of the sample, reduced in size and due to a low response rate, which leads to a process of self-selection of respondents. The second limit refers to the data on the surveyed population that were obtained from the metadata database of the National Institute of Statistics.

The paper is one of the first studies in the literature to assess the opinions and perceptions of managers in Romania on the factors and barriers to the implementation of Industry 4.0 technology for business development.

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