Do the Owners and Managers of Polish MSME's Recognize and Understand Properly the Challenges of "Industry 4.0"?

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Jan Kaźmierczak
ORCID ID: 0000-0002-2459-470X
Silesian University of Technology, **Poland**

INTRODUCTION

The idea of the fourth industrial revolution, usually called Industry 4.0 (I4.0), has been formulated and developed – approximately – since the first decade of the 21st century. The term Industry 4.0 (in the original wording Industrie 4.0) comes from the German government's high-tech strategy design to promote the computerization of production processes and was used for the first time at the Hanover Fair in 2011. Despite the relatively short time of their development, the problems of Industry 4.0 have become, on the one hand, an area for undertaking interesting and multi-faceted scientific research, on the other hand, implementing very numerous practical solutions in contemporary industry.

The authors of publications from the mentioned area are touching problems of defining the Industry 4.0 paradigm (for example (Erboz 2017)), discuss factors that should make the modern industry 'tangible' in I4.0 meaning (Erol et al. 2016) or discuss possibilities to imply in the I4.0 formula the 'fashionable' approaches like the Lean Management (Sanders, Elangeswaran, and Wulfsberg 2016) or Sustainable approach (Stock and Seliger 2016).

Step by step, researchers are also beginning to notice that many important problems associated with the implementation of the I4.0 model in practice can be affected (or already are affected) by specific characteristics of enterprises when the implementation is to be put into practice.

In this paper, the size of the enterprise was treated as an especially important feature, affecting the susceptibility of the enterprise to implementing the I4.0 model. In particular, the impact of the I4.0 on micro, small and medium size enterprises (MSME's) is considered in more detail. The literature of the subject offers us a wide variety of presenting various aspects in implementing I4.0 in MSME sector. We can find presentations and discussions of logistic problems (Bär, Herbert-Hansen, and Khalid 2018, Schiffer, Wiendahl, and Saretz 2019), of regional (Faller and Feldmúller 2015) up to global aspects (Peukert et al. 2020, Sommer 2010), of relationship between maturity of MSME's and their vulnerability to implement modern solutions (Ganzarain and Errasti 2016, Mittal et al. 2018).

Contact address: jan.kazmierczak@polsl.pl

Some publications, focused on the interactions between I4.0 model and SMEs, presents the authors' expectations (and fears) regarding the possibility of micro, small and medium enterprises of finding themselves in a new reality (Müller, Buliga, and Voigt 2018, Sommer 2015, Stentoft et al. 2019).

BRIEF PRESENTATION OF SURVEYS FOCUSED ON I4.0 PROBLEMS AND DEDICATED TO OWNERS AND TOP MANAGERS OF MSME'S IN UPPER SILESIA REGION (POLAND)

The initial (first-round) survey was carried out in the Region (Voivodeship) of Upper Silesia (more precisely: in the area of GZM Metropolis) between October 2018 and January 2019 and described in (Kaźmierczak 2019).

As explained in a previous publication, the decision to limit the research area was based – first – on the substantive representativeness of the Upper Silesian Voivodeship in the structure of the Polish economy. Admittedly, comparing administrative areas one can state that the Silesian Voivodship covers only 4% of Poland's area, and the GZM area of the metropolis is only 21% of the area of the voivodship but, because of the heavy urbanization and industrialization of the area of the GZM Metropolis, in the opinion of the author of this paper, this is an excellent field for studying various problems of the contemporary economy.

The Metropolis area is very heavily saturated with manufacturing and service companies, especially micro, small and medium. Since it was assumed that the survey would be based on the interviewer's direct contact with the entrepreneur and on the conversation about the content of the survey form, such a strong saturation of a small area with potential respondents undoubtedly facilitated the task of interviewers, especially since they were (in relation to the number of potential respondents) relatively few.

The first-round survey was carried out in the Region of Upper Silesia in Poland between October 2018 and January 2019. Some results of this survey were presented in detail in (Kaźmierczak 2019). It was assumed, that the results of this survey, dedicated to the selected category of respondents and selected class of units, will be treated as partially representative on the initial stage of the research. Anyway, the formal representativeness was not a key criterion in the reported survey. It was assumed to be rather a pilot research and give a solid background for further, more complex and more formally established research. The basic assumptions of the survey are presented in Table 1.

During the first-round survey, two hundred questionnaires were distributed. In the end, seventy-four answers were obtained (37%). In (Kaźmierczak, 2019) only a part of results was detailly analyzed and discussed. The full-dimensional presentation of these results is presented in the next chapter of this paper.

The survey questionnaire was preceded by a short (1 page) introduction, aimed at supporting the volunteers in carrying out the study, as well as respondents, in order to get to know and understand key-points of the Industry 4.0 paradigm. Apart of the possibility of answering the questions by ticking the chosen one, the

questionnaire was also offering respondents the place for their own written comments to the given answers.

Table 1 Basic assumptions of the survey of MSME class enterprises

1	The questionnaire was addressed exclusively to micro-, small- and medium-sized enterprises,
2	The group of respondents was limited to owners and/or managers of the investigated enterprises,
3	The area of activity (range of activities/services, branch of industry etc.) was not considered,
4	The questionnaire was designed to be as simple as possible, to be filled in by respondents,
5	Each of the questions gave the respondent the opportunity to choose a single answer,
6	Every answer could be provided with a comment; however, it was not obligatory,
7	All of the respondents could provide information in the survey about their company or they could remain anonymous,
8	The questionnaire was exclusively distributed by volunteers who were pre-trained to help respondents fill in the questionnaire,
9	The (subjective) choice of respondents was exclusively made by the volunteers

According to the decision adopted by the author of the research project on the stage of preparing the survey, the questionnaire did not contain a typical 'informational' fiche. Instead, the respondents were asked to consent to the use of the company name and address data for use in publications and for making contact to further cooperate with the Silesian University of Technology. Options for answering the question of such consent included three options: (YES), (YES, subject to acceptance of the material to be published) and (NO).

The second-round survey was planned to be carried out also in the Region of Upper Silesia, around GZM Metropolis between October 2019 and March 2020. Probably because of problems caused by the 'appearing on a horizon' pandemic of COVID-19, volunteers conducting the survey reported a constantly growing reluctance of potential respondents to participate in the survey.

Finally, even though the number of distributed questionnaires was the same as in the first-round survey (two hundred), only twenty (10%) answers were obtained. This amount is clearly too small to obtain statistically valid results, however – thanks to the presence of descriptive part of the survey form – in the opinion of the author of this article these results can be used quite effectively for comparative purposes. Their comparison with the results of the first-round survey should allow, on the one hand, to make (perhaps incomplete and not perfect) assessment of the tendency occurring in the subject of the study after the end of the test. On the other hand: together with the results of the first round of research, the results of the second round may be a better starting point for modifications and additions to the plan of further research.

The list of questions is introduced in Table 2.

Next tables, contained in Chapter 4, presents the comparisons of answer obtained in both the rounds of the survey. The share of answers for each malicious choice and no answer to the question is expressed as a percentage of the total number of completed survey questionnaires.

Table 2 Questions asked to respondents of the survey

	The content of the question	Answer 1	Answer 2	Answer 3	Answer 4	Answer 5
1	Have you already heard about the idea of the "fourth industrial revolution INDUSTRY 4.0"?	Yes	No	-	-	-
2	Do you think that INDUSTRY 4.0 is already affecting/will affect the functioning of your company in the nearest future?	Yes	No	-	-	-
3	If the answer to question 2 is yes: the impact of "INDUSTRY 4.0" on the functioning of your company is/will be:	Significant	Negligible	-	-	-
4	If the impact of "INDUSTRY 4.0" on the functioning of your company is/will be significant, then this applies to:	Internal organization and functioning of the company	Co-operation of the company with external partners	Both mentioned factors	-	-
5	Does the impact of "INDUSTRY 4.0" on the functioning of your company require/will require taking by you (by your company) any measures or adjustments?	Yes	No	-	-	-
6	If the answer to question 5 is yes: Will the necessary measures/adjustments to be undertaken primarily include – in your opinion – reinforcement (development, extension):	Knowledge and competences of the company management	Knowledge and competencies of all employees	Technical and/or ICT equipment	Two of the mentioned factors (which ones and why)	All mentioned factors
7	Is it necessary for your company – in your opinion – to initiate and carry out some measures focused on the activities/adjustments related to "INDUSTRY 4.0":	By the company in your own range (utilizing your "own forces")	With the use of external support to the full extent of previously identified needs	With the use of external support in a selected scope of needs	Other solution: …….	-
8	Will the detailed recognition (inventory) of your company's needs in the implementation of solutions related to the "INDUSTRY 4.0" model – in your opinion – be carried out:	By the company in your own range (utilizing your "own forces")	With the use of external support	By a combined team of company staff and external experts or advisors	Other solution: …….	-

BRIEF DISCUSSION OF RESULTS OF THE SURVEY

This part of the article presents, in the form of tables, containing information on the structure of responses given by respondents to subsequent questions contained in the survey form (in percentage terms, taking into account the lack of answers to subsequent questions), the results of both rounds of research. In addition, a list of selected respondent comments on individual questions was presented under each pair of tables. These comments are quoted in their original wording (they are transcribed from survey forms and translated into English).

The first question asked to respondents was: "**Have you already heard about the idea of the "fourth industrial revolution INDUSTRY 4.0**"?

Table 3 Variants (choices) offered to answer the question 1

Survey 2018/2019	
YES	55%
NO	45%

Survey 2019/2020	
YES	60%
NO	40%

Comments to the question 1:

In the case of the answer 'YES':

⊕ During business meetings I had the opportunity to learn about the idea of the fourth industrial revolution I4.0

⊕ Purchasing platforms, where large companies announce their needs through tenders and auctions. It is necessary to log in to the appropriate system and submit an offer

⊕ Fairs of Robotics and IT

⊕ More and more enterprises are using their own WMS systems

⊕ The company sells electronics on foreign market

⊕ Knowledge from industry portals, specialist press, training, and media

⊕ I am connected to the CSA system (readings from analytical companies based on my sales)

In the case of the answer 'NO':

⊗ This concept I have met only in this survey

⊗ I know the idea, but I did not know the concept of I4.0 (x2)

⊗ The respondent has not heard of I4.0, the company is not prepared for this type of revolution

⊗ I did not know the term "I 4.0"

It is worth to be noted that the tendency is very similar in the first and second round of the survey: the majority of respondents declares to did hear ('something'?) about the concept of Industry 4.0, but this majority is not impressive. Perhaps in the plan of further research is worth to consider the

detailing of this question to recognize the amount as well as quality of knowledge of respondents concerning the I4.0?

The second question asked to respondents was: **"Do you think that INDUSTRY 4.0 is already affecting/will affect the functioning of your company in the nearest future?"**

Table 4 Variants (choices) offered to answer the question 2

Survey 2018/2019	
YES	64%
NO	36%

Survey 2019/2020	
YES	60%
NO	40%

Comments to the question 2:

In the case of the answer 'YES':

- ⊕ For today, to an exceedingly small extent, the technology that I use is cloud computing
- ⊕ Shopping platforms
- ⊕ *Currently I 4.0 does not function in my company, but the future, may be important for my company*
- ⊕ *Yes, although because my company does not deal directly with production but services, I do not have direct contact with this wave of changes*
- ⊕ Computer programs on which we work observing relevant products are systematically improved, which is helpful for us. However, we mainly rely on direct customer service
- ⊕ Systems integration will be indispensable
- ⊕ The scope of activity requires it
- ⊕ Because we are a trading company, we most often meet with purchasing systems of companies, where it is now often necessary to send electronic documents
- ⊕ We use systems that improve the exchange of information between organizational units
- ⊕ Planned introduction of a fully automated production line soon
- ⊕ *In the future yes, no now*
- ⊕ *But for MSMEs this will take place in a longer period rather than a short time*
- ⊕ Even small enterprises wishing to cooperate with larger entities, must or will have to integrate with modern systems via the network
- ⊕ Evidently yes, my company has sales to 37 countries, 10 sales platforms, all operations via API systems, automatic invoice printing and sending final documents to the customer, approx. 6000 transactions per month
- ⊕ Already felt because of the implementation of the 'IPO system' production management model in the company

⊕ An ADS class production management system has been implemented in the enterprise, flexible in terms of implementation into an existing ERP class system
⊕ In my company, and we are talking about banking and payment systems, it works today. We are constantly looking for new, faster, and safe solutions in this market segment.

In the case of the answer 'NO':

⊗ We are a medium-sized company in the field of fire protection
⊗ Mine not, but it will affect everyone
⊗ We are a "manufacture", we produce individual, individualized products for the final recipient

It is interesting, that some part of respondents who declare their ignorance about the idea (and the term) Industry 4.0, at the same time are declaring that I4.0 will affect on their companies in the nearest future. If we see the list of comments to the answers "YES", it can be easy stated (see the phrases signed by italic letters) that some of respondents are not quite consequent in their answers. The I4.0 will certainly affect on everybody, but not on me (!).

The third question asked to respondents was: **"If the answer to question 2 is yes: the impact of "INDUSTRY 4.0" on the functioning of your company is/will be significant or negligible?"**

Table 5 Variants (choices) offered to answer the question 3

Survey 2018/2019	
SIGNIFICANT	47%
NEGLIGIBLE	26%
NO ANSWER	27%

Survey 2019/2020	
SIGNIFICANT	40%
NEGLIGIBLE	25%
NO ANSWER	30%

Comments to the question 3:

In the case of the answer 'SIGNIFICANT':

⊕ *In the future, certainly incredibly significant, more and more devices for selling companies appear on the market using machine-to-machine communication, control via e.g. telephone*
⊕ Bookkeeping, online classifieds
⊕ The I4.0 impact is crucial
⊕ The scope of activity requires it
⊕ There is no escape from development and progress. Everyone must participate in this or disappear from the market in the long run
⊕ A fully integrated IT system in the future
⊕ This turns off human error slowly

⊕ The result of increased production flexibility will be a larger number of accounting operations (resp. Accounting Office)
⊕ An integrated system is the basis for proper management of the company's work
⊕ Significant time savings, fewer 'human' errors
⊕ Analysis of customer behavior in the e-store, abandoned baskets in the e-store, personalizing the offer based on viewed products
⊕ Monitoring, process optimization, analysis of production status and needs, production planning, optimization of inventory levels, support of maintenance, intelligent supply networks, robotics (ultimately)
⊕ Without this, the company would sooner or later be degraded by companies that implement innovations

In the case of the answer 'NEGLIGIBLE':

⊗ *Too small company and specificity of its activity*
⊗ *The company's scope of activity is slightly related to I4.0*
⊗ *I4.0 will simplify the operation of the company, but nothing will replace manual workers*
⊗ *Since my company deals with services, I will not use I4.0 changes in my current work*
⊗ *Because we are an intermediary in the field of insurance services and our main task is direct and individual customer service, in our operation such innovative solutions will not be helpful*
⊗ *Currently, I provide renovation and construction services that are exceedingly difficult to mechanize and computerize. However, I think that you can to some extent create a system in which, for example, employees will control the network of air dryers, air conditioners, etc.*
⊗ *There is a need for companies with an ISO profile, unnecessary for micro companies*
⊗ *Too little activity for this type of revolution (machine mechanics workshop) and too little knowledge of I4.0 assumptions*
⊗ *In the future, still distant*
⊗ *Initially negligibly small to check its effects*

The answers for this question are also very symptomatic, especially in the case of the answer 'NEGLIGIBLE'. Respondents who believe that the impact of I4.0 on their company is or will be negligibly small (or none) are most often convinced that: I4.0 does not concern, for example, the service sector, that it does not apply to small companies ("my company is too small") or that the problem may affect them in the distant future ("In the future, still distant"). Quite specific is the opinion that the impact of the fourth industrial revolution applies only to entities with implemented ISO quality standards.

The fourth question asked to respondents was: **If the impact of "INDUSTRY 4.0" on the functioning of your company is/will be significant, then this applies to:**

Table 6 Variants (choices) offered to answer the question 4

Var	**Survey 2018/2019**	
1	INTERNAL ORGANIZATION AND FUNCTIONING OF THE COMPANY	15%
2	CO-OPERATION OF THE COMPANY WITH EXTERNAL PARTNERS	16%
3	BOTH MENTIONED FACTORS	42%
4	NO ANSWER	37%

Var	**Survey 2019/2020**	
1	INTERNAL ORGANIZATION AND FUNCTIONING OF THE COMPANY	25%
2	CO-OPERATION OF THE COMPANY WITH EXTERNAL PARTNERS	15%
3	BOTH MENTIONED FACTORS	40%
4	NO ANSWER	20%

Comments to the question 4:

In the case of the choosing of the variant 1 of the answer:

- Newer and more efficient equipment, production more based on technology
- Thanks to continuous monitoring of production, we shorten non-production time and response time to resulting problems
- The company's functioning will then be easier
- One must adapt to the market
- Optimization of production processes
- It improves the quality of the product

In the case of the choosing of the variant 3 of the answer:

- The activity is mainly service based, based on the I4.0 model
- The services performed require it
- Model 4.0 will significantly affect the functioning of the company from the inside, will facilitate work by reducing employee costs, and when interacting with external partners will facilitate communication and increase the scope of services rendered.
- Both, but it is more about the internal organization of the company
- The scope of activity requires
- Trading with external partners via API, loading inventory, descriptions, photos, product demand analysis based on historical data (i.e. forecast-no / prediction)
- Effectiveness of cooperation with suppliers and customers
- Enforcing good cooperation with business partners as well as improving productivity and making better use of employee time

Most respondents chose the answer option (option 3), according to which the I4.0 model will force enterprises to adapt to the requirements arising from the implementation of this model, which of course takes place and will take place inside and around the company, both through changes in internal structure elements and by changing the means and forms of cooperation with external partners. However, it seems symptomatic that quite a significant proportion of respondents were convinced that the problem concerns only the "interior" of the company (answer from option 1) or only its environment (option 2). Comments on individual responses are interesting, depending on the option selected.

However, it is difficult to explain why the respondents choosing option 2 did not comment on this choice (both in the first and second round of the survey). According to the author, this result also confirms the thesis that the basic problem of small and medium-sized enterprises in contact with the fourth industrial revolution are deficiencies in understanding the elements of this revolution, especially its impact on the cooperation of various economic entities. Such understanding, based on appropriate knowledge, must take into account both the technical conditions of such cooperation (such as global 'networking' of the economy or the Internet of Things (IoT)) as well as the conditions related to the human factor. It is probably good that – which results from the comments in the surveys presented – a growing number of entrepreneurs can already see and understand these conditions.

The fifth question asked to respondents was: **Does the impact of "INDUSTRY 4.0" on the functioning of your company require/will require taking by you (by your company) any measures or adjustments?**

Table 7 Variants (choices) offered to answer the question 5

Survey 2018/2019	
YES	80%
NO	16%
No answer	4%

Survey 2019/2020	
YES	70%
NO	25%
No answer	5%

Comments to the question 5:

In the case of the answer 'YES':

- ⊕ It will be the purchase of uniform software for all company departments and for work stands, followed by employee training
- ⊕ Training for employees, change of habits
- ⊕ Investments in programmers and IT equipment
- ⊕ Mainly adaptation of logistics processes and changes in the organization of production
- ⊕ Need to adapt positions in IT
- ⊕ The company needs modernization and digitalization
- ⊕ It will be necessary to expand the IT network and integrate into production sockets to improve data collection
- ⊕ Purchase of the system and creation of a network inside the company
- ⊕ Appropriate training in action I 4.0
- ⊕ Purchase of a computer, accounting program
- ⊕ This is related to the area of activity, i.e. universally understood services
- ⊕ Training in computer programs

⊕ Replacement of parts of the machinery park, expansion of production / storage rooms, personnel changes
⊕ Definitely yes, financial resources are needed to adapt the equipment and train employees
⊕ *Mainly hardware investments*
⊕ Ongoing adaptation activities aimed at eliminating wastage of resources, optimizing their use, constantly improving production and logistics processes

In the case of the answer 'NO':

⊗ Now, the company is not prepared for such a revolution and will need tailored actions and undertakings, such as training in the knowledge of introducing specialized equipment
⊗ A sole proprietorship with sufficient equipment
⊗ Actions such as investment in knowledge and necessary computer hardware and software were taken with the establishment of the company
⊗ Soon no, but it is not known how quickly it will develop
⊗ For now, the company is not prepared in any way, nor does it take any steps towards preparations
⊗ The company complements the requirements on an ongoing basis
⊗ The company has adequate human and hardware resources
⊗ The current system in the company works well and efficiently

According to the respondents, the need to use additional supporting resources and tools in the process of adapting the audited entity to the requirements of Industry 4.0 is (almost) common. It is interesting that the quite significant number of respondents answering positively the question 5 declared previously (question 1) a general lack of their knowledge about the idea of I4.0 itself. Probably, this effect indices that after answering the firs four question respondents have known more about I4.0 the before starting to fulfil the survey questionnaire.

Probably, this effect indices that after answering the first four question respondents have known more about I4.0 the before starting to fulfil the survey questionnaire. The direct contact of respondents with volunteers and a possibility to discuss arising doubts can be probably treated as an additional positive factor.

The sixth question asked to respondents was: **"If the answer to question 5 is in the affirmative: Will the necessary adaptation measures/actions include – in your opinion – mainly strengthening:"**

Table 8 Variants (choices) offered to answer the question 6

Var	**Survey 2018/2019**	
1	KNOWLEDGE AND COMPETENCES OF THE COMPANY MANAGEMENT	1%
2	KNOWLEDGE AND COMPETENCE OF ALL EMPLOYEES	8%
3	TECHNICAL AND / OR ICT EQUIPMENT	7%
4	TWO OF THE FACTORS LISTED ABOVE (which ones and why?)	14%
5	ALL FACTORS MENTIONED ABOVE	45%

6	No answer	25%

Var	**Survey 2019/2020**	
1	KNOWLEDGE AND COMPETENCES OF THE COMPANY MANAGEMENT	0%
2	KNOWLEDGE AND COMPETENCE OF ALL EMPLOYEES	10%
3	TECHNICAL AND / OR IT EQUIPMENT	10%
4	TWO OF THE FACTORS LISTED ABOVE (which ones and why?)	10%
5	ALL FACTORS MENTIONED ABOVE	40%
6	No answer	30%

Comments to the question 6:

In the case of the choosing of the variant 4 of the answer:

- (Indicated variants 1 and 3) This will depend on the solution being implemented
- (Indicated variants 2 and 3) Each employee should be appropriately trained so that the company can develop further

The respondents choosing variant 4 of the answer have indicated only two possible pairs of factors:

1) 1 and 3 (60% indications in the first round and 50/50 in the second round of the survey)
2) 2 and 3 (40% indications in the first round and 50/50 in the second round of the survey).

Nobody has chosen the pair 1 and 2.

In the case of the choosing of the variant 5 of the answer:

- A complete change in the vision of running a business
- A dynamic process that requires the involvement of all employees and the continuous development of IT infrastructure plus employee training (x2)
- Everything requires going a few levels up

The seventh question asked to respondents was: **“Will the adaptation actions/undertakings necessary to implement the 'INDUSTRY 4.0' model be able to be implemented in your opinion:”**

Table 9 Variants (choices) offered to answer the question 7

Var	**Survey 2018/2019**	
1	BY THE COMPANY IN YOUR OWN RANGE (UTILIZING YOUR ‘OWN FORCES’)	27%
2	WITH THE USE OF EXTERNAL SUPPORT TO THE FULL EXTENT OF PREVIOUSLY IDENTIFIED NEEDS	19%
3	WITH THE USE OF EXTERNAL SUPPORT IN A SELECTED SCOPE OF NEEDS	39%
4	OTHER SOLUTION:	3%
5	No answer	12%

Var	**Survey 2019/2020**	
1	BY THE COMPANY IN YOUR OWN RANGE (UTILIZING YOUR ‘OWN FORCES’)	30%
2	WITH THE USE OF EXTERNAL SUPPORT TO THE FULL EXTENT OF PREVIOUSLY IDENTIFIED NEEDS	0%
3	WITH THE USE OF EXTERNAL SUPPORT IN A SELECTED SCOPE OF NEEDS	65%

4	OTHER SOLUTION:	0%
5	No answer	5%

Comments to the question 7:

In the case of the choosing of the variant 1 of the answer:

- Model I4.0 is evolving, which is associated with its continuous implementation, updating and modernization of what is being done by our own resources and by cooperating companies
- Possessed qualifications require it
- In a family company of 2-3 people, one person is enough to manage
- A sole proprietorship with sufficient equipment
- The companies we work with guarantee us systematic training in connection with introduced changes or new products
- implemented using their own resources because the company is a micro-sized enterprise

In the case of the choosing of the variant 3 of the answer:

- Appropriate training
- The company is totally unadjusted
- It is difficult to define the scope now, but we certainly cannot cope with it alone
- The task is too complicated to be carried out on its own, but the external entity does not know the specifics of the company (x3)
- We need to change the approach of IT suppliers, instead of off-the-shelf solutions dedicated solutions, e.g. including technologically advanced AI solutions or artificial neural networks

In the case of the choosing of the variant 4 of the answer:

- They should be implemented in any way under one condition - they are to be effective or should not be undertaken at all

Another solution: 1.

1. Meetings with IT solution providers,
2. Summary of knowledge gained,
3. Decision about which solutions best meet the needs.

The respondents who have chosen the variant 3 (nobody indicated variant 2!) are arguing this answer reasonably. It is well-seen that they understand the advantages but also limitations of cooperating with external experts/advisors.

It is interesting that a relatively large proportion of respondents are deeply convinced of the possibilities of "doing everything" on their own (variant 1 of the answer). In some cases, such an answer is certainly justified, e.g. if, due to me, the nature of its business, the company is heavily involved in the implementation of the processes that make up I4.0. However, in the remaining notes, according to the author of this study, such an answer is still a sign of ignorance about the fourth revolution.

The eighth question asked to respondents was: **"Will the detailed recognition (inventory) of your company's needs in the implementation of solutions related to the "INDUSTRY 4.0" model – in your opinion – be carried out:"**

Table 10 Answers to the question 8

Var	Survey 2018/2019	
1	BY THE COMPANY IN YOUR OWN RANGE (UTILIZING YOUR 'OWN FORCES')	31%
2	WITH THE USE OF EXTERNAL SUPPORT	18%
3	BY A COMBINED TEAM OF COMPANY STAFF AND EXTERNAL EXPERTS OR ADVISORS	35%
4	OTHER SOLUTION:	4%
5	No answer	12%

Var	Survey 2019/2020	
1	BY THE COMPANY IN YOUR OWN RANGE (UTILIZING YOUR 'OWN FORCES')	30%
2	WITH THE USE OF EXTERNAL SUPPORT	15%
3	BY A COMBINED TEAM OF COMPANY STAFF AND EXTERNAL EXPERTS OR ADVISORS	45%
4	OTHER SOLUTION:	0%
5	No answer	10%

Comments to the question 8:

In the case of the choosing of the variant 1 of the answer:

- By the company on its own, and in the event of problems with implementation, the company should use external support and create a joint team to carry out the task
- Implemented by own means because the company is a micro enterprise
- Inventory - recognition is nothing but continuous adjustment of needs as the company grows to the I4.0 model
- At the current stage: on your own

In the case of the choosing of the variant 3 of the answer:

- The task is too complicated to be carried out on its own, but the external entity does not know the specifics of the company (repeated in three comments)
- Lack of required human and hardware resources for implementation
- The company is totally unadjusted

The respondents who have chosen the variant 3 answering the eighth question argue this answer reasonably. By their comments they proved that understand the advantages but also limitations of cooperating with external experts/advisors. It is worth to note the repeating comment concerning the completing of knowledge and competencies in mixed (internal plus external experts) teams.

The last point of the survey questionnaire contains a request to respondents to agree to use the results of the survey in publications and to use the name of the surveyed company for the same purpose. The answers of respondents are presented in Table 11.

Table 11 Permission to use the data on the responding company

Var	Survey 2018/2019	
1	I AGREE (Name and seat of my company)	38%
2	I AGREE CONDITIONALLY: BEFORE PUBLISHING, I HAVE TO BE DECLARED OF THE POSSIBILITY OF REVIEWING THE CONTENT OF THE STUDY	19%
3	I DO NOT ALLOW	43%

Var	Survey 2019/2020	
1	I AGREE (Name and seat of my company)	30%
2	I AGREE CONDITIONALLY: BEFORE PUBLISHING, I HAVE TO BE DECLARED OF THE POSSIBILITY OF REVIEWING THE CONTENT OF THE STUDY	5%
3	I DO NOT ALLOW	65%

Although the request also included the possibility of expressing consent conditionally (after getting acquainted with the materials to be published), only 38% of respondents in the first and 30% of respondents in the second survey gave their consent, and the conditional consent gave 19% and 5% of respondents, respectively. Most of the respondents did not agree to be mentioned (43% in the first and 65% in the second survey, respectively).
The author of this study is of the opinion that a high percentage of respondents wishing to remain anonymous is associated with a high level of ignorance of these respondents about the main subject of the survey (Industry 4.0), and also with concerns about revolutionary changes.

CONCLUSIONS

In the opinion of the author of this study, the results of the survey presented and discussed above allow the formulation of the following general conclusions:

- Survey in the current substantive scope should be continued in subsequent years, which should allow to identify trends (tendencies) in the recorded basic indicators that are the subject of this survey,
- The intended identification of trends requires retaining the set of queries used so far in subsequent research rounds,
- The possibility of extending the set of respondents covered by the survey and the need to diversify forms of reaching them with a set of survey questions should be considered.

Because it can be suspected that some of questions in previously used the survey questionnaire are not interpreted by respondents in the way expected by researchers, carrying on the survey, it is worth to consider the making of some slight modifications in the existing set of questions (not changing its structure and meaning) and the adding of some supplementary questions which should precise the sense contained in the plan of survey.
In addition, the results presented above are somewhat burdened by the lack of space in the survey questionnaire for information on the size and basic area of respondent activity. This could have been justified at the initial stage of research, but if this problem is taken into account when planning subsequent rounds of

research, their results should open new perspectives in their processing and interpretation.

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Abstract: In the article, the author presents in an expanded approach the results of previously conducted research, described in his previous publications and aimed at understanding the needs and capabilities of Polish micro, small and medium sized enterprises (MSMEs) in recognizing challenges and implementing practical solutions from the area fitted to of the Industry 4.0 paradigm. In addition to the detailed and based on selected examples discussion of the results of the first round of surveys conducted among the owners and management staff of this category of enterprises operating in the area of the Upper Silesian – Zagłębie Metropolis in the Upper Silesian Voivodship, the results obtained in the second round of research were also shown and compared with first-round results. The results obtained are the basis for the plan of further, extended research. The author presents the elements of such research plan in the last part of this article.

Keywords: MSME's, Industry 4.0 focused challenges, expectations and needs, consultancy and support