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Covid-19 Accelerates Digital Transformation in Industries: Challenges, Issues, Barriers and Problems in Transformation

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ABSTRACT Market emphasizes the need for a strategic view of the digital transformation of business, where transformation signifies a trend that allows changes in the core business processes and contributes to the development of sustainable business models. Complexity of the business transformation process affects the emergence of certain challenges and problems that need to be overcome on the way to creating innovative business models that will enable the use of full organizational potential. Purpose of this research is to delineate the various difficulties in digital transformation and determine what are the challenges, issues, barriers and problems that organizations face in the desire to transform business. Paper presents a review of the literature of relevant research bases, where a qualitative and quantitative analysis of the results was made. Results show the frequency of occurrence of certain difficulties in DT within four categories - challenges, issues, barriers and problems, but also the occurrence of difficulties in the inevitable transformation due to the Covid-19 pandemic. It can be said that the pandemic has affected rapid adjustments, but also changes in the business models of organizations and that it has indirectly initiated digital transformation projects within organizations accompanied by various challenges, issues, barriers and problems.

INDEX TERMS Barriers, challenges, Covid-19, digital transformation, issues, pandemic, problems.

I. INTRODUCTION

Currently, the world is facing a crisis caused by the Covid-19 pandemic. Crisis sudden appearance, which certainly marks one of the most critical social and economic crises, has affected the reduction of the activities of all humanity, but also the conduct of business activities in the normal conditions to which we have been accustomed so far. Reduced social interaction, social distancing, lockdown, restrictions on movement and restructuring of business are disturbances caused by the pandemic that has significantly transformed our daily lives and set requirements for accepting and getting used to the "new normal" way of life of all humanity. In such social and business conditions, information and communication technologies (ICT) have shown their importance and become crucial for the continuation of personal and business services and interactions [1]. Pandemic has affected the assessment of the use of ICT, but also the adoption of ICT in those segments where their potential has not yet been discovered in order to mitigate the social and economic effects of the spread of the virus [2]. These technologies can provide a lifeline in communication, information exchange, strategic decision making, training, but also the supervision of business activities [3] and thus reduce the burden imposed by the pandemic on employers in various industrial areas.

Governments of many countries are taking unprecedented measures, which in turn affects the entire business sector and the transition of millions of workers around the world to remote work [4]. Although the digital transformation of the work environment is in the announcement, and is a trend that organizations began to face even before the Covid-19 pandemic, employers did not expect such a rapid confrontation with the digital age affecting the personal, professional, social and financial aspects of human capital [5]. When we talk about digital transformation (DT), it is important to emphasize that it brings with it a wide range of changes: changes in business models and business core, changes in culture within organizations, changes in work

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habits and activities of employees, changes in the delivery of products or services to customers, and all with the full support of digital technologies. One of the comprehensive definitions that defines DT says that "*Digital transformation is the profound transformation of business and organizational activities, processes, competencies and models to fully leverage the changes and opportunities of a mix of digital technologies and their accelerating impact across society in a strategic and prioritized way, with present and future shifts in mind*" [6]. There are more and more organizations investing in digital technology implementations that contribute to experimenting and changing their business models [7]. Big data, artificial intelligence (AI), Internet of Things (IoT), advanced manufacturing, robotics, blockchain technology, etc., herald the emergence of a new era in the IT sector. It can be said that digital transformation is changing the face of the industries, the structure of the economy [8], but also the way of work and life of individuals. It is everywhere, and no industry can remain immune to the benefits that DT brings.

When implementing digital transformation within organizations, it is important to develop an adequate digital strategy that will include the engagement of all organizational resources and will contribute to the creation of value proposals fully aimed at the end user. Some of the digital transformation strategies emphasize two key dimensions - the use of digital technologies in business areas and the readiness of the business model for adequate digital work [7]. Digital initiatives must have strategic pillars to address the challenges of digital transformation [9] with an emphasis on exploiting the potential of new technologies. A clear path of digital transformation, which marks one lasting journey, is defined within the DT strategy and includes various stakeholders guided by predefined holistic goals [6]. In this way of doing business, the emphasis shifts from traditional strategies, which focus on the product, to strategies whose approach is focused entirely on users [10]. Accordingly, there is a need to adapt existing business models and create a new technological ecosystem [11].

Mentioned radical changes within the business that occurs due to the digital transformation affect the complexity of the DT process and organizations face various challenges, issues, barriers and problems. With the advent of the Covid-19 pandemic, digital transformation gained importance precisely because organizations were faced with changes and adjustments to their own business models, but also with the inevitable use of technological solutions to continue their business. This paper presents an extension of research published in October 2019 by the authors [10] who looked at challenges, issues, barriers and problems related to digital transformation in 25 relevant papers. Current literature does not provide a systematic review of the literature in relation to the aforementioned four terms (challenges, issues, barriers, problems), with the authors most often dealing with only one term that refers to difficulties in transformation in the industry. This paper classifies difficulties into one of four categories (according to the severity of the difficulties and the time required to resolve the difficulties), and specifically looks at whether there are new difficulties encountered by organizations in doing business due to the Covid-19 pandemic.

The **objectives** of this paper are: **(1)** to determine the systematized result of the most common challenges, issues, barriers and problems in digital transformation of business, and **(2)** to determine the challenges posed by the Covid-19 pandemic to organizations that under the new conditions had to continue their own business and thus transform key business activities. Given the defined research goals and the growing importance of the topic of digital transformation in challenging economic conditions, the following research questions were set up in this paper:

- **RQ1**: Which challenges, issues, barriers and problems are preventing organizations from implementing digital transformation?
- **RQ2**: Which challenges, issues, barriers and problems are organizations facing in unavoidable conditions of the Covid-19 pandemic when trying to digitally transform?

The paper is structured as follows. In the beginning, the methodological framework is set followed by results based on literature review. Results are divided into few sections. First, concepts of research and research keywords are defined and delimited: challenges, issues, barriers and problems. Second, possible difficulties related to DT are extracted. Third, difficulties are classified into four categories: challenges, issues, barriers and problems. Fourth, a common denominator is set and similar difficulties in each individual category are grouped. Fifth, systematization of results is done. After that, a discussion and conclusion were made to describe the scientific contribution of a paper and to summarize the research results. Research implications, as well as limitations of the research and recommendations for future work, are presented at the end.

II. RESEARCH METHODOLOGY

Extension of the previous research [10] from October 2019, started with a search performed in the relevant database Scopus and platform Web of Science (WoS). In ac-accordance with the set goals and research questions, the search in the databases was performed based on the following complex queries (Qu):

- **Qu1**: "digital transformation" AND ("problems" OR "issue" OR "barriers" OR "challenges"), in the title of the paper, with a time limit from 2016 until 2021 as a continuation of the research [10] from 2019;
- **Qu2**: "digital transformation" AND ("problems" OR "issue" OR "barriers" OR "challenges") AND ("pandemic" OR "covid 19"), in the title of the paper, abstract and keywords, without a time limit for the year of publication in the databases.

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The first search (Qu1) resulted in 77 papers in Scopus and 57 papers in WoS, while the number of results obtained in the second search (Qu2) in Scopus was 61, and in WoS 16 papers. A basic comparison of the sets of results showed that there are overlaps in the obtained results in the databases. Relevant papers for this study were selected as follows. At the very beginning, an analysis of the abstract, introduction and conclusion was made. If those parts of the analyzed papers pointed out the connection with the research topic, papers were included in the analysis and further processing. After the selection, an in-depth analysis of each paper was made in order to investigate the qualitative results and their contribution to the researched topic. Since the idea of the study is to systematize difficulties in DT and to include in research as many relevant papers as possible, the citation of papers and the impact factor was not used as the exclusive criterion in their selection. The search for papers in the first query (Qu1) was limited to the title of papers because the search in a wider set of data (abstract, keywords) resulted in a large number of results that were not directly related to the research topic. The second query (Qu2) was not limited only to the title of the papers, as such resulted in one paper in Scopus and one paper in WoS, so it was necessary to expand the set of research to title, abstract and keywords.

This search was done to gain insight into the research area, which includes challenges, issues, barriers, problems, digital transformation and currently relevant topic Covid-19 pandemic. The research was conducted in several phases previously defined by the authors [10], and some phases were adapted or added as new in this research. The research phases are shown and briefly explained in Fig. 1. First, concepts of research are defined and search keywords are delimited. Second, a detailed literature analysis was made, after which the difficulties were classified into challenges, issues, barriers and problems, as the third phase of research. Fourth, a search for a common denominator of similar difficulties was performed. In the last phase, the systematization of results was made.

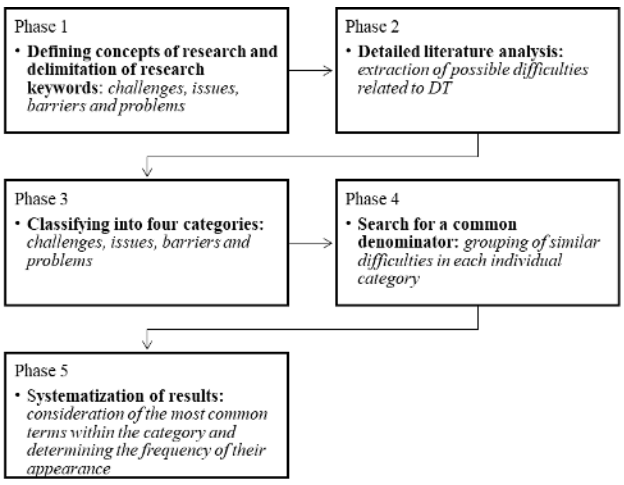

FIGURE 1. A review of the phases used in this research.

By adapting to different market conditions and challenges, such as the current Covid-19 pandemic, organizations face key questions about how to successfully approach digital transformation and achieve results appropriate to best business practices. Given that in the digital transformation it is important to look at real organizational possibilities and include a wide range of resources, there is a need to clearly define a digital strategy that will not be based only on the adoption of new technology [10] but will include a broad, holistic view of such a complex topic.

III. RESULTS BASED ON LITERATURE REVIEW

Given that the objectives of this paper are to identify challenges, issues, barriers and problems in the implementation of digital business transformation in general and to identify challenges or other obstacles posed by the Covid-19 pandemic for organizations, a qualitative literature review was performed in order to obtain detailed data on the mentioned research topic. A literature review for this paper was conducted in January 2021, as an extension of a previously published research in October 2019 [10]. In October 2019, a literature review was performed on 25 papers, while in January 2021 a literature review was performed on 68 papers as a result of the first complex query, Qu1, and on 51 papers as a result of the second complex query, Qu2 (final number of papers after removing duplicate and unrelated papers with a research idea). Qu1 refers to difficulties in digital transformation in general, while Qu2 refers to difficulties in digital transformation due to the Covid-19 pandemic.

At the beginning of the literature analysis, the representation of papers in certain industrial areas was determined, based on the industrial classification NACE Rev. 2 [12]. Table 1 shows the classification of scientific papers by industries, with regard to the research questions RQ1 and RQ2. The table shows that the papers are from several industrial areas and their representation was determined in 16 different industries (one paper is classified in two industries, so the total number of papers by industry in column RQ1 in the table is 69). Visual representation in Fig. 2 shows that the largest number of papers dealing with the issue of digital transformation was identified in the education industry (P) (30 papers in total), followed by public administration and defence, compulsory social security (O) with 19 papers. A slightly smaller number of papers, 8 of them, were identified in the industry of human health and social work activities (Q), while 7 papers on challenges, issues, barriers or problems in digital transformation were identified in the transportation and storage industry (H) and information and communication (J).

If we look at the representation of papers in accordance with research questions, in RQ1, which refers to problems and barriers in digital transformation in general and papers are in the range from 2016 to 2021, the highest representation of papers is in public administration and defence, compulsory

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social security (O) with 16 papers, followed by education industry (P) with 8 papers and transportation and storage (H) with 6 papers. In RQ2, which refers to the difficulties of digital transformation in the Covid-19 pandemic, the highest industrial representation was found in the education industry (P) with 22 papers and in human health and social work activities (Q) with 6 papers. A large number of papers, about 30 of them, are classified as "other" because the papers describe difficulties in digital transformation in general, without being closely related to an industrial area, but providing general knowledge on the research topic.

TABLE I.
REPRESENTATION OF PAPERS BY INDUSTRIES - AN OVERVIEW BY RESEARCH QUESTIONS

	Papers			
Industry (NACE)	**RQ1**	**Number of Papers**	**RQ2**	**Number of Papers**
A	[13]	1	/	/
B	[14]	1	/	/
C	[15], [16], [17], [18], [19]	5	/	/
D	[20]	1	/	/
F	[21]	1	/	/
G	[22]	1	/	/
H	[23], [24], [25], [26], [27],[28]	6	[29]	1
J	[30], [31], [32], [33]	4	[1], [34], [35]	3
K	[36]	1	[37]	1
M	[38]	1	[39]	1
N	/	/	[40]	1
O	[8], [7], [41], [42], [43], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54]	16	[55], [56], [57]	3
P	[7], [58], [59], [60], [61], [62], [63], [64]	8	[65], [66], [67], [68], [4], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83], [84], [85]	22
Q	[86], [87]	2	[3], [88], [89], [90], [91], [92]	6
R	[93]	1	[94], [95]	2
S	[96]	1	/	/
Other	[9], [97], [98], [99], [100], [11], [101], [102], [103], [104], [105], [106], [107], [108], [109], [110], [111], [112], [113]	19	[5], [114], [2], [115], [116], [117], [118], [119], [120], [121], [122]	11
In total		**69**		**51**

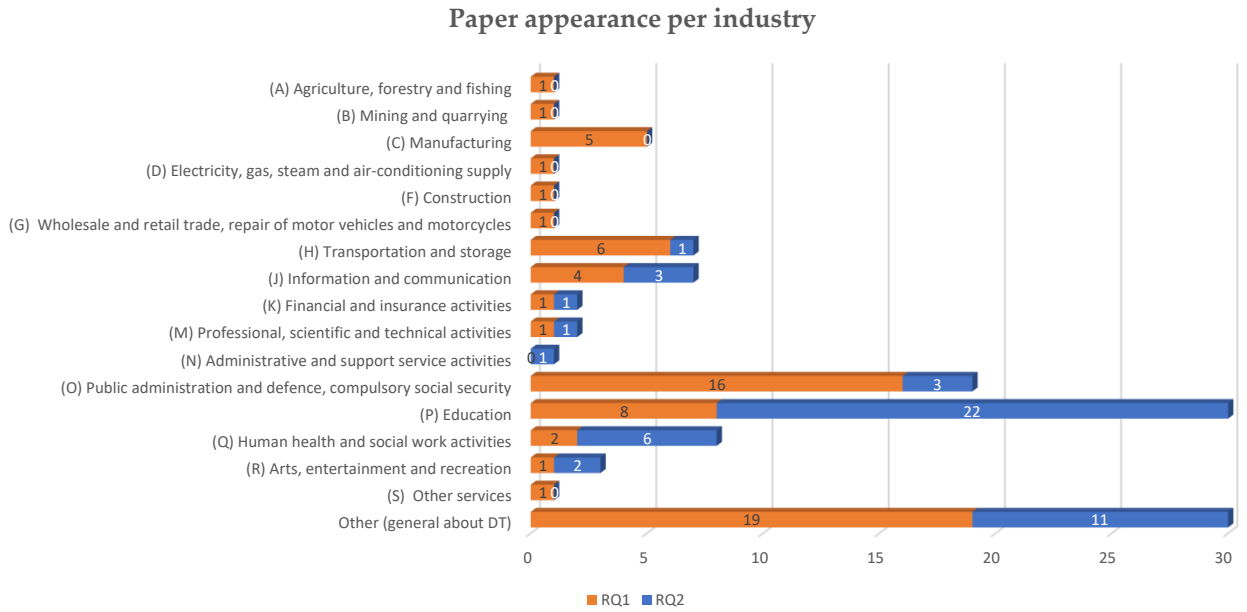

FIGURE 2. Paper appearance per industry according to NACE classification Rev. 2.

Since this research is a continuation and extension of the previous research of the author [10], a literature review was conducted in similar steps which are explained in detail later in this paper. In the first step, an analysis of each of the four terms of difficulties (challenges, issues, barriers, problems) was made and a distinction was made between the mentioned terms according to the weight and time dimension. In the second step, based on the conducted qualitative analysis of

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the literature, possible difficulties related to the implementation of digital transformation were identified. After identifying possible difficulties, they are classified according to the author opinion in one of four categories (challenges, issues, barriers or problems), which is the third step in the analysis of the literature. After the classification of terms, they were placed under a common denominator, since the authors in the analyzed papers (N=119) used close but not uniform terminology in defining the problems of transformation. The last, fifth step of the analysis enables the systematization and unification of all results and the identification of the most common challenges, issues, barriers and problems related to digital transformation and its implementation in the business of organizations. Accordingly, in the last research step, the frequency of occurrence of individual difficulties within challenges, issues, barriers and problems was identified by quantitative analysis.

A. PHASE 1. DEFINING CONCEPTS OF RESEARCH AND DELIMITATION OF RESEARCH KEYWORDS: CHALLENGES, ISSUES, BARRIERS AND PROBLEMS

In the first research phase and literature analysis, it is necessary to define research concepts and differentiate search keywords. Such differentiation enables further processing of results and classification of identified difficulties in published scientific papers into one of the categories - challenges, issues, barriers or problems, and the differentiation of concepts is presented in a self-created matrix for easier visualization (Fig. 3). Additional analysis of terms through online dictionaries and the author's experience led to a clearer demarcation of the previously mentioned four categories.

When we talk about **challenges**, according to the authors [10], [123], they represent a condition that requires great physical or mental effort to overcome them. Matrix on Fig. 3 [10] showing the time dimension (time required to solve) and the weight dimension (amount of resources required to solve), says that *challenge (position on the matrix: long-term, easy) is solvable although it requires a lot of effort and strains resources. Its solution is easy but requires innovation* [10]. Challenge is a new situation that requires great effort and determination in overcoming it [124], whereby the ability of people is examined [125]. **Issues** are an interesting topic that a group of people tries to solve and define their own agreement or disagreement with it [126]. It is an important topic that needs to be further discussed [127]. *Issue (position on the matrix: short-term, easy) hampers work, but does not interrupt it, with his existence business can normally be performed* [10]. **Barriers** are a phenomenon that prevents the occurrence of certain situations [128], i.e. hinders the actions of individuals and the achievement of goals - they can be rules, laws or political regulations that make it difficult to achieve goals [129]. *Barriers (position on the matrix: long-term, hard) are often caused by external factors (e.g. state regulations, client attitudes), it may be possible to bypass it, while their solution is not easy and requires a longer period of time* [10]. **Problems** are a negative phenomenon whose solution must be initiated as soon as possible. There is a close connection between the problem and the solution, i.e. its occurrence requires an urgent solution. *Problems (position on the matrix: short-term, hard) endanger the process and work and are harder to deal with. They take more time, and its existence endangers business survival* [10]. It is an unsatisfactory situation that creates certain difficulties [130], and it needs to be resolved as soon as possible [131].

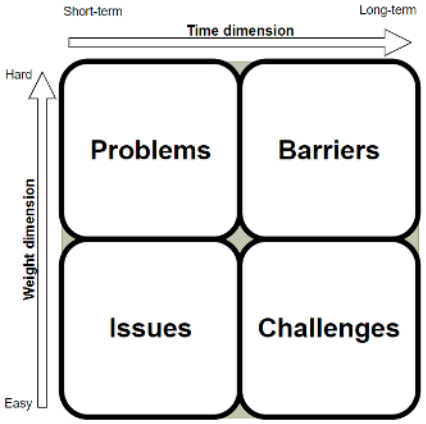

FIGURE 3. Difficulties diversification matrix based on time and weight dimensions.

B. PHASE 2. DETAILED LITERATURE ANALYSIS: EXTRACTION OF POSSIBLE DIFFICULTIES RELATED TO DT

The first research, conducted in October 2019 [10], resulted in the identification of the most common difficulties faced by organizations in different industries in carrying out digital transformation. Extension of the research in this paper, conducted in January 2021, allows a deeper understanding of the mentioned topic, which expanded the set of analyzed papers (considering the first research of the author from 2019 [10], on a set of 25 papers). In addition to the above, the research related to the first research query (Qu1) seeks to identify new knowledge related to issues in the digital transformation of business, but also to identify overlaps with previously established research results. The second research query (Qu2) explores difficulties in digital transformation, which have arisen due to the forced transformation of certain industries during the Covid-19 pandemic.

After identifying research concepts and defining the boundaries between challenges, issues, barriers and problems, the next phase (phase number 2) of this research included an in-depth analysis of the literature. For the first research query, N = 68 relevant papers were identified that can provide an answer to the first research question (Table 2). Furthermore, the second research query resulted in N = 51 relevant papers that analyze the topic of transformation at the time of the Covid-19 pandemic, and provide an answer to the second research question posed (Table 3). This literature

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analysis is based on the detailed processing of each scientific paper and the extraction of potential difficulties in the digital transformation of business. An example of the extraction of potential difficulties is given in Table 2 and Table 3, whereby it is identified a total of 440 potential difficulties (in a total of 119 analyzed papers) associated with digital transformation adoption in general or in transformation during the Covid-19 pandemic. Additionally, each paper is classified in the corresponding industry according to the NACE (Rev. 2) classification [12].

TABLE II.
EXTRACTION OF POSSIBLE DIFFICULTIES RELATED TO DT – RQ1

PAPER	INDUSTRY (NACE)	CHALLENGES, ISSUES, BARRIERS AND PROBLEMS RELATED TO DT
[8]	O	country's weakness in skills; weakness in venture capital; weakness in innovation
[23]	H	complexity of the logistics system and core processes; lack of digitally skilled employees; adoption of technology; resistance to change; data protection
[7]	P/O	need to develop and update digital skills within companies, public administrations and organizations in the education industry; need for continuous adaptation to new digital technologies with state-of-the-art infrastructure and services; need to develop synergies between medium and long-term and innovative technological solutions by involving different stakeholders in public and private industry
…	…	…
[113]	/	changing business models; changing the environment in which the organization operates
"paper number 68"	…	…

TABLE III.
EXTRACTION OF POSSIBLE DIFFICULTIES RELATED TO DT – RQ2

PAPER	INDUSTRY (NACE)	CHALLENGES, ISSUES, BARRIERS AND PROBLEMS RELATED TO DIGITAL TRANSFORMATION IN A TIME OF COVID-19 PANDEMIC
[3]	Q	questionable acceptability of the use of digital tools in the health sector; lack of training on new digital tools; poor technical support; internet connection problems
[65]	P	a stressful new online environment; universities do not provide conditions for continuous learning and training of employees; inadequate physical infrastructure; problems in disseminating new knowledge; problems of measuring university performance
[66]	P	students' unwillingness to learn online; need for digital and methodological skills of students; increasing need for pedagogical and didactic skills of teachers; problem of student assessment; need to meet technical prerequisites (difficulties in accessing the Internet, cost of Internet traffic); psychosocial impact (isolation and loneliness of students leading to demotivation); problem of students not having a computer or Internet; turning the home into a virtual learning environment
…	…	…
[84]	P	technical problems in distance learning (lack of necessary equipment for home teaching, insufficient quality of the Internet); organizational problems in distance learning (lack of a unified methodology for conducting online learning, increased workload of teachers); socio-cultural (reduced motivation of students to learn)
"paper number 51"	…	…

C. PHASE 3. Classifying into four categories: challenges, issues, barriers and problems

In-depth analysis of the content of selected papers enabled the identification of 440 potential difficulties in digital transformation, and the method of their extraction was defined and presented in the previous research phase. This phase enabled the process of classifying all identified difficulties into one of the four categories mentioned at the beginning - challenges (abbreviation C), issues (abbreviation I), barriers (abbreviation B) or problems (abbreviation P). The process of classification of difficulties was carried out in accordance with the author's assessment of the extent to which a particular difficulty corresponds to the weight and time dimension, i.e. how much time is needed to solve a particular difficulty and how many resources are needed to overcome it. Consequently, the identified difficulties (N = 440) in the set of papers (N = 119) are positioned in the matrix as one of the four terms - challenge (C), issue (I), barrier (B) or problem (P). An overview of the classification is given below in Table 4.

TABLE IV.
CLASSIFICATION OF EACH DIFFICULTY INTO ONE CATEGORY

IDENTIFIED DIFFICULTIES IN PAPERS RELATED TO DT	CLASSIFICATION			
	C	I	B	P
country's weakness in skills;				X
weakness in venture capital;				X

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weakness in innovation;			X
complexity of the logistics system and core processes;	X		
lack of digitally skilled employees;			X
…		…	
there is a lack of industry-specific transformation guidelines;		X	
…		…	
questionable acceptability of the use of digital tools in the health sector;			X
lack of training on new digital tools;			X
poor technical support;			X
…		…	
inadequate legislation for digitization;		X	
…		…	
"difficulty number 440"		…	

One of the difficulties identified was "country's weakness in skills". It is classified as a problem because it is considered a negative situation that needs to be resolved as soon as possible for the continuation and sustainability of the business in which the possession of digital skills as such is inevitable. Given the time dimension in the matrix, i.e. the time required to solve the problem related to skills, it can be classified as solved in the short term but requires some effort and engagement of resources in solving it (weight dimension in the matrix) and implementing digital transformation. The difficulty as "complexity of the logistics system and core processes" is classified as a challenge because the complexity of the business system and core business processes require a large commitment of resources in their digital transformation and requires new, innovative ways to transform it - the process is long but easy to address. "Lack of industry-specific transformation guidelines" represents a difficulty that is being considered and which needs to be addressed. The lack of guidelines for transformation complicates the transformative process for organizations but does not interrupt the business of organizations because they can develop their own expertise for transformation. For this reason, the difficulty is classified as an issue (short-term, easy). "Inadequate legislation for digitization" is a barrier that prevents the transformation in a particular industry and individual organization from happening. Poor legal frameworks are external factors that make it difficult to achieve the goals of transformation, they are not easy to solve, and they require a longer period of solving (long-term, hard). In the manner shown in the previous examples, a classification of all 440 identified difficulties was made.

D. PHASE 4. Search for a common denominator: grouping of similar difficulties in each individual category

After the classification of difficulties into one of the four categories (C, I, B, P), a re-examination of the identified difficulties within each category was performed. In each category, a similar set of difficulties was found that perceive the same or similar difficulties in digital transformation, and between them, there is only a difference in sentence formulations. For this reason, such overlapping difficulties have been placed under a common denominator, allowing for a clearer overview of each category and the difficulties represented within it. An overview of grouping similar difficulties and searching for a common denominator for the same is given in Table 5. The table shows one example of searching for a common denominator of a certain set of difficulties within the processed categories - challenges, issues, barriers and problems.

TABLE V.
SEARCH FOR A COMMON DENOMINATOR PER DIFFICULTIES IN ALL CATEGORIES (C, I, B, P)

CHALLENGES	COMMON DENOMINATOR
complexity of the logistics system and core processes; introduction of a new, modernized way of placing information determined in medicine (the authors suggest the placement of information through social media, applications,..); adoption of new business models; need to develop new business models; adaptation of curriculum according to the needs of the market (inadequate curriculum); need to adapt existing business models; need to transform business models; need to define new approaches to learning; need for new ways of delivering value to customers; creating new business models and processes; changing business models; adaptation of studies to students with special educational needs; leveraging existing business models and creating new ones; rapid creation of new business models and innovations; creating new processes, services, knowledge and research; need to implement new business models and innovation processes; need to change internal systems; adoption of remote work; need for new ways of organizing conferences; the need to implement new ways of working	need to adapt existing business models and creating new ones
…	…
ISSUES	**COMMON DENOMINATOR**
lack of understanding of appropriate terminology related to DT; mistrust in transformation in general; misunderstanding of the DT process; misunderstanding of the need to increase the number of IT specialists; misunderstanding of DT; unidentified benefit from the introduction of DT	misunderstanding and mistrust in DT
…	…
BARRIERS	**COMMON DENOMINATOR**
lack of national standards for curriculum design and development; defining clear standards for electronic signature methodology; lack of standards; lack of standardization of e-health interventions (improving the quality of	lack of clear national standards

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intervention studies)	
…	…
PROBLEMS	**COMMON DENOMINATOR**
unclear strategy; negligent manner of introduction and use of digitalization in construction; lack of a coordinated digital strategy; lack of awareness of medium and small entrepreneurs about modern tools and the benefits that DT brings; management does not think strategically about digital technologies (leadership that has no vision of DT); lack of clear vision; inadequate strategic vision of top management	lack of a coordinated digital strategy
…	…

E. PHASE 5. Systematization of results: consideration of the most common terms within the category and determining the frequency of their appearance

The last, fifth step of this analysis, is based on the systematization of all collected knowledge of the conducted research. The grouping in the previous step allows a clear view of the occurrence of certain difficulties within categories (C, I, B, P) and therefore the fourth step is a clear basis for determining the frequencies of occurrence of difficulties within a particular category. An overview of the identified most common challenges, issues, barriers and problems, and determined based on an in-depth analysis of the literature, follows in the next few paragraphs of this paper (shown in Fig. 4 to 7).

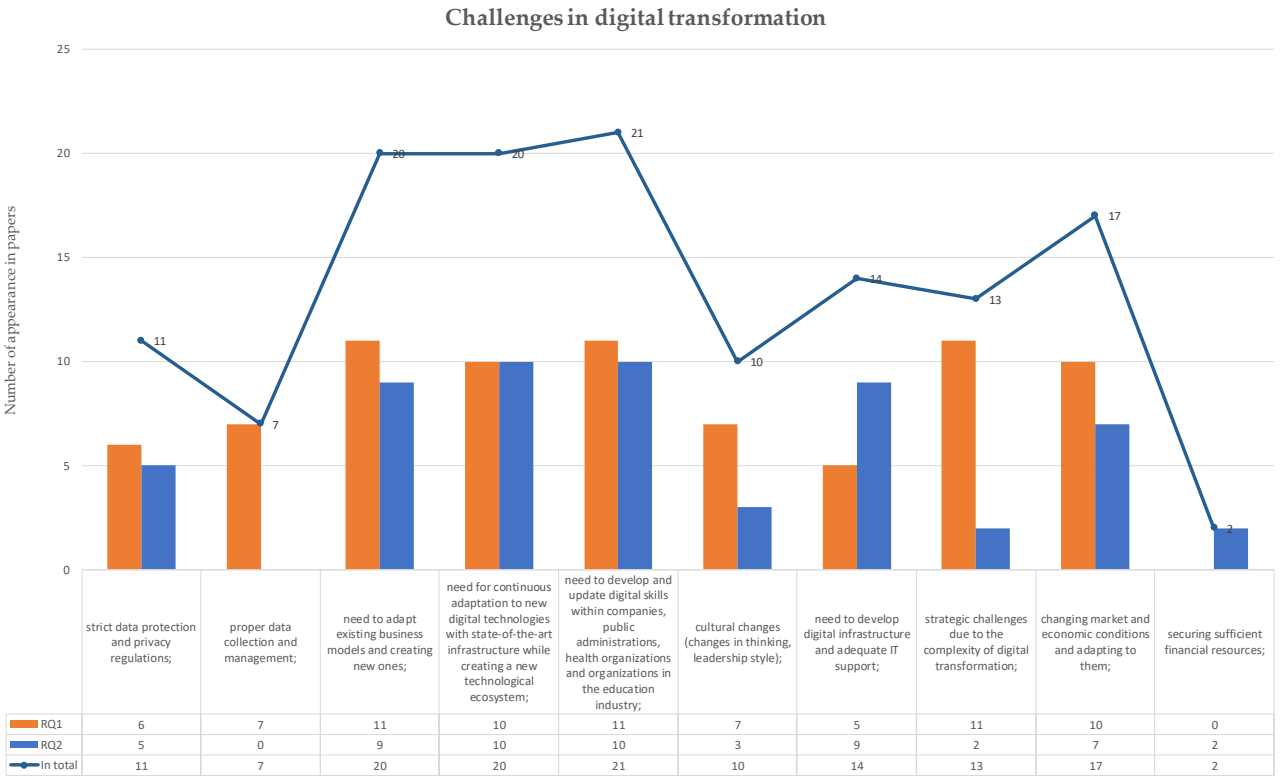

FIGURE 4. **Frequencies of occurrence of difficulties within category *challenges*.**

Fig. 4 above presents the most common **challenges** in digital transformation. The fig. shows an overview of the challenges posed by the research questions - RQ1 and RQ2, but also their total number. Out of a total of 440 identified difficulties, 135 were challenges related to digital transformation, and they were grouped into 10 groups of the most important ones. The graph shows that the biggest challenges in the DT of business are the development of digital skills within organizations operating in various industries, changes in business models of organizations and the need to implement and accept new digital technologies within organizations. An overview of the remaining identified challenges and their frequency in the overall set of papers is available in Fig. 4.

If we look at the challenges related to facing organizations with the Covid-19 pandemic, it is clear that this set highlights the challenges related to the development of adequate digital infrastructure without which organizations in the Covid-19 pandemic would certainly find it difficult to function. Furthermore, in a pandemic, the challenge is to provide

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adequate support from IT professionals for the smooth running of all business processes, and there are challenges associated with providing sufficient funds to move to, mostly, "online" ways of doing business.

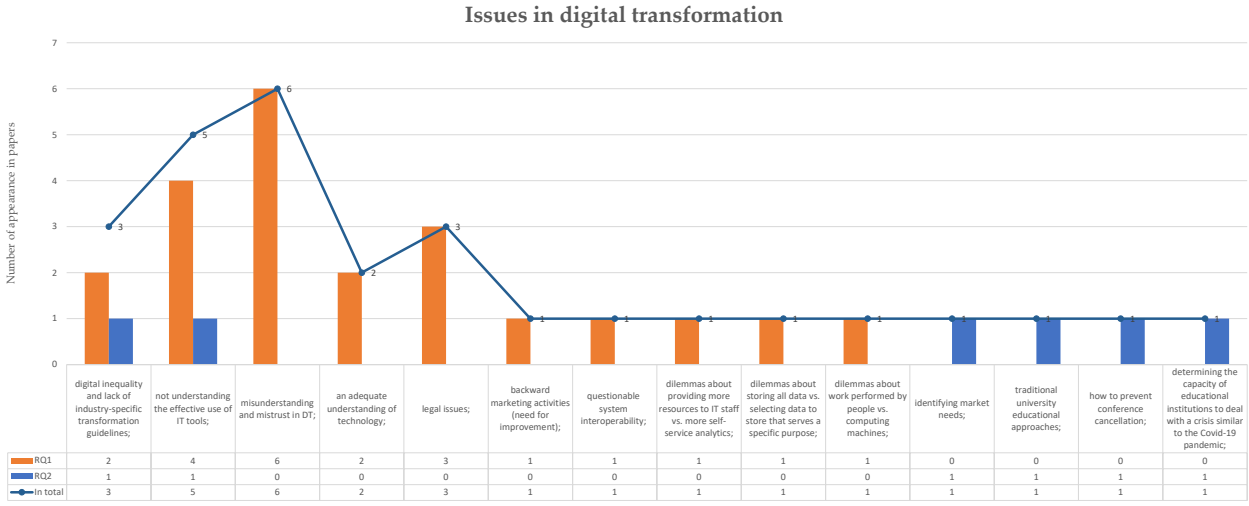

FIGURE 5. **Frequencies of occurrence of difficulties within category *issues*.**

Issues were recognized 28 times in the total number of difficulties. They are classified into 14 groups, of which 9 groups contain only one specific issue. The most significant issues in digital transformation are the lack of understanding and distrust in digital transformation in general, not understanding the effective use of IT tools, legal issues, digital inequality and lack of industry-specific digital transformation guidelines. The remaining identified issues related to digital transformation are visible in Fig. 5 above, and certainly represent important topics that need to be discussed for a successful transformation. Fig. 5 shows the division of results according to two different research questions and at the same time the research results in total.

When we talk about the results related to the Covid-19 pandemic (RQ2), for organizations the said pandemic has brought some new issues. For example, there was a need to discuss and make decisions about new market trends (online business of organizations, changing consumer needs, the purchasing power of users are endangered,…) where traditional approaches to business (usually) are no longer possible and as such are not sustainable. There is also a need to discuss the capacity to deal with Covid-19-like pandemics and to establish all that has been learned from a pandemic that still has an uncertain duration.

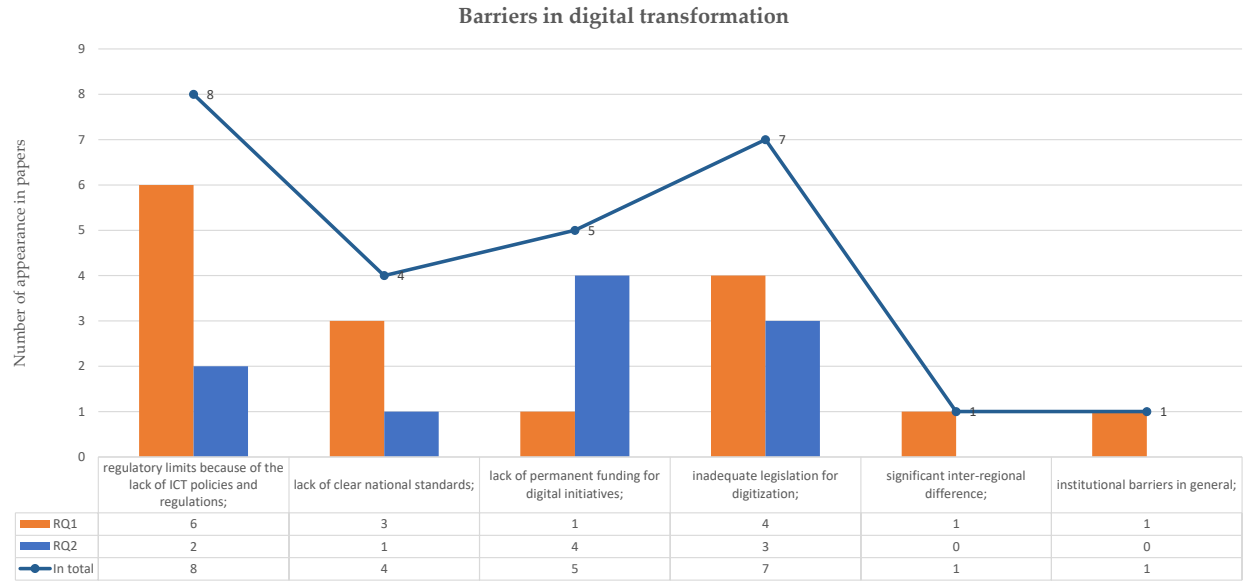

FIGURE 6. **Frequencies of occurrence of difficulties within category *barriers*.**

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National policies and regulations are an aggravating factor in the adoption of digital transformation. The results of the research show that regulatory limits are mentioned as the biggest **barrier** because of the lack of ICT policies and regulations (this barrier appears 8 times in the processed set of papers) and inadequate legislation for digitalization (shown in Fig. 6 above). Also, one of the barriers to digital transformation is the lack of permanent funding for digital initiatives by national governments. An overview of the remaining identified barriers, which are mentioned 26 times in the total number of identified difficulties, is presented in Fig. 6. The second research question (RQ2) confirms the existence of barriers related to national policies and standards that limit digital transformation and highlights the barrier of lack of permanent national funding for digital initiatives, which was especially evident in the changing business environment due to the Covid-19 pandemic.

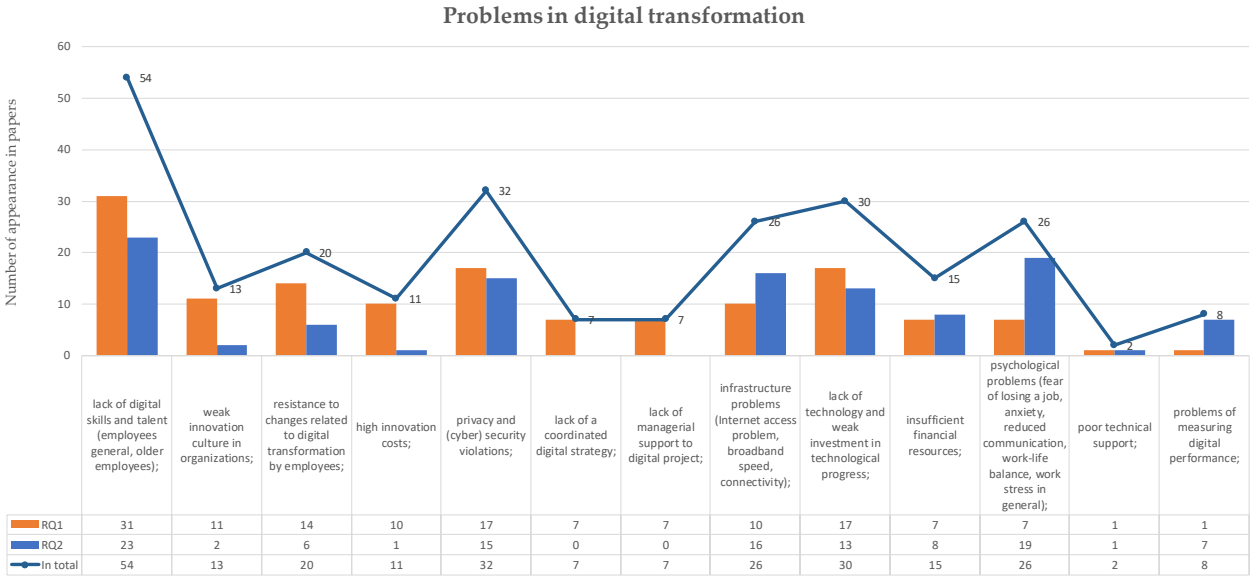

FIGURE 7. **Frequencies of occurrence of difficulties within category *problems*.**

The last observed category are the **problems** in digital transformation, and they are shown in Fig. 7 above. It is the category that most often appears in the research set and it has a total of 251 identified terms (difficulties). The research showed that the most common problem in the implementation of digital transformation is the lack of digital skills and talent of employees, which is mentioned in the results of the research as many as 54 times. Furthermore, privacy and security violations are problems that jeopardize the processes within the organization and prevent the adequate implementation of the transformation process. Also, aggravating factors in DT are lack of technology, weak investment in the technological progress of organizations, psychological problems (such as anxiety, fear of losing a job, etc.), and also problems with inadequate infrastructure. As the most numerous category, problems are divided into 13 groups of problems that are most often mentioned as the most prominent in the transformation process.

In an overview of the most significant problems faced by organizations in the transformation due to the Covid-19 pandemic (RQ2), highlighted are those related to remote work or adaptation to new ways of doing business - anxiety, stress related to change, fear of losing a job, balancing private and business life, etc. The next highlighted problem is related to infrastructure problems (given the pandemic and new business conditions, weakened infrastructure is a problem that can jeopardize certain business segments), and insufficient financial resources generally limit the new investment within organizations and therefore make it difficult for adjustments to new market conditions. The pandemic also pointed to the problems of measuring the digital performance of new ways of doing business in organizations in certain industrial segments.

IV. DISCUSSION

The research results differentiate between the initially set research concepts and defined categories - challenges, issues, barriers and problems. Although they are important separately, it is also important to see the categories as interconnected, for the sake of a comprehensive view of the issue of transformation. Given that DT of business is not a simple project and requires the engagement of different resources, it is important to identify a number of internal (organizational) and external (organizational environment) factors that have a direct impact on the success or failure and feasibility of the digital transformation. For example, external influences such as government policies, legal frameworks that do not aim to create the necessary national

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standards or policies to fund digital initiatives, as well as national interregional inequality, affect digital transformation initiatives of organizations operating in such an environment. Thus, such inadequate policies hinder and discourage organizations and constitute a barrier to taking digital transformation initiatives. If the organization does not understand the digital transformation and the benefits it brings, such a project will certainly not be initiated for some time. Additionally, mistrust, questionable interoperability of the current business system, efficient use of IT tools and technology in general, are certain topics that need to be discussed within organizations. Although such topics are related to difficult decision-making (for example, decisions on providing more resources to IT staff or directing funds to more self-service analytics), they are issues that hinder the fluid execution of business processes and requires a thorough discussion which will enable further direction of the organization in conducting a digital transformation and changes it requires. If we "add" to the previous issues problems such as weak innovation culture in organizations, lack of knowledge and (digital) skills of employees, resistance to change, concerns about privacy and security, infrastructure problems or lack of initiatives to invest in technological progress, the transformation is certainly difficult. Given that they threaten the existence and competitiveness of organizations, these problems need to be addressed as soon as possible. When issues and problems within an organization are resolved (or well on their way to resolution), organizations can tackle the challenges that digital transformation brings. There is a need to change business models, invest and implement new technologies, adequately collect and manage business data, improve the knowledge and skills of employees and develop a strategic transformation plan.

If we compare the results of the research conducted in October 2019 [10] and the results of this research, it can be concluded that they overlap in certain parts. The main difficulties in DT, which were then identified, are lack of knowledge and skills of employees, need to develop a new organizational culture that will accept change, high costs of implementing of DT project, lack of understanding digital transformation in general, privacy and security issues, etc. With the extension of this research, it was possible to see a wide range of difficulties that organizations face in digital transformation, and the analysis revealed some new challenges, issues, barriers and problems that differ from the research in 2019. As a scientific contribution, the classification of the mentioned difficulties into one of the four categories was made (C, I, B, P), then the frequency of difficulties within each category was determined, and also the frequency of individual categories within the whole set of analyzed papers. Furthermore, the boundaries between the mentioned four terms and the conditions for belonging to each category are defined in more detail. According to the results, a total of 43 groups of difficulties that organizations face in the digital transformation of business have been identified. From these groups, 10 are related to transformation challenges, while 14 difficulties are categorized as issues that need to be discussed in order to initiate transformation processes. A total of 6 groups of external barriers to digital transformation initiatives have been identified, and the number of problems that organizations face in transformation amount 13. Within the analyzed set of papers, problems are most often mentioned (251 of them were identified), followed by challenges with 135 mentions. Issues are mentioned 28 times within a set of papers, while barriers are mentioned 26 times. If we look at the appearance of papers per industry, the analysis indicates the diversity of launching a digital transformation project through industries, which suggests that organizations have begun to reconsider their own capabilities to deal with challenges, issues, barriers and problems in transforming their own business. With regard to the Covid-19 pandemic, the research has been expanded in this sense, identifying the challenges, issues, barriers and problems that organizations have faced in the forced transformation of business due to the pandemic. The results show that the biggest “shock” and shift was experienced by the education industry in which 22 papers were identified. Education industry, due to the demands of the pandemic (reduction of social interaction and contacts, keeping distance, lockdown, etc.), was forced to change its own business models and in some way was forced to start the digital transformation of its business. This of course required a review of a range of available resources (infrastructure, technology, knowledge and skills of employees, technical support, etc.) in order for the transformation to be successful but also sustainable given the course and duration of the pandemic. Accordingly, it can be said that DT is a very demanding process that requires organizations to determine their real capacities in a timely manner and to see how and with what resources they will face challenges, problems, barriers or issues in the digital transformation of their business.

V. CONCLUSION

Organizations operate in a high-frequency market and are affected by external changes due to the emergence of various trends. That digital transformation is a trend is shown by the fact that transformation initiatives have been initiated in various industrial sectors. Given that transformation requires a wide range of resources (including human, financial, etc.), and organizational change becomes inevitable, it is in itself considered a challenge. The complexity of the transformation is seen in the changes of business models and rooted ways of working where is a need for adjustment of the value that is delivered to users of certain products or services. Transformative activities require a new way of thinking by organizations and bring with them challenges, issues, barriers and problems. This paper identifies challenges, issues, barriers, and problems that organizations are facing when

they try to digitally transform their business under normal market conditions, but also in the current market conditions caused by the Covid-19 pandemic.

Since current research topics do not offer a systematic overview of challenges, issues, barriers and problems related to the digital transformation, this study sought to address mentioned gap. Current research topics offer a different classification of challenges, issues, barriers and problems, where the demarcation of the mentioned terms is not clearly indicated by the authors, or the terms are even often confused - challenges are equated with barriers, problems with issues, and similar. Consistent with the identified gap, this study sought to address it. The contribution of the research is seen in the classification of difficulties in digital transformation, in general, or due to the Covid-19 pandemic, into one of four categories (challenges, issues, barriers and problems), based on the previous delineation of C, I, B, P. These four concepts are delimited according to the weight and time dimension needed to deal with them, and the conditions of belonging to a particular category are more clearly defined. After the classification of the whole set of difficulties (N=440), their occurrence within all four categories was considered, as well as the frequency of occurrence of categories in the analyzed papers (N=119).

According to the results of the research, it can be concluded that Covid-19 disease has certainly "pushed" digital transformation into certain industries. New business models and new business practices in this pandemic time will result in one of two situations - either it will prove its justification or it will indicate that current business practices with new ways of working and adoption of technologies are only temporary state. Certainly, organizations should take advantage of the opportunities and power brought to them by the digital world with all the technology that facilitates and enables the execution of work processes, which is very evident in current pandemic conditions. Covid-19 pandemic is a challenge that many organizations, but also society as a whole, have had to face, and as such could represent a turning point in the future business of organizations and taking steps towards the digital transformation of business.

VI. RESEARCH IMPLICATIONS

The findings of this research can be important for the academic community, but also for the practical implications. As far as the academic community is concerned, (i) the most common challenges, issues, barriers and problems have been presented. They can be the basis for further upgrading research related to digital transformation but also for different research areas. The terms challenges, issues, barriers and problems are delimited in detail, thus further allowing an (ii) easy classification of all difficulties in general, regardless of the research topic. The practical implications of the paper are seen in (i) identifying the most common challenges, issues, barriers and problems, based on which organizations can create planning activities for the successful DT project, knowing what are the difficulties they may encounter.

VII. LIMITATIONS AND FUTURE WORK

There are certain limitations in this research that can be explored in future work. First, since the research is based on the results of two scientific platforms and databases, it may be expanded in the future to several more relevant platforms or databases (such as IEEE Explore, ScienceDirect) in order to obtain a large scope for conducting analysis and identifying challenges, issues, barriers and problems in digital business transformation. Secondly, there is a possibility of including experts in the analysis of results and their classification, given that one author performed the analysis in this paper. Furthermore, in future research and future work, an analysis by industry can be performed to determine which challenges, issues, barriers and problems each industry faces (qualitative analysis) and what their frequency of occurrence (quantitative analysis) is.

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