

Managing Business Processes in the Age of Digital Transformation: A Literature Review

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Abstract—Today, digital transformation is one of the leading topics that occupy the attention of scientific circles and business experts. Organizational success is most often reflected through the successful managing of business processes. Given the growing market for digital innovations and its ever-increasing impact on business, organizations need to be prepared for organizational changes that come with the digital era. In order to maintain their competitive advantage in the global market, organizations must adapt their processes to new digitalization conditions. The main goal of this study is to point out the link between the digital transformation and the business process management concept. Therefore, in order to contribute to the scientific field that explores the potential relation between business process management concept and digital transformation, a literature review has been conducted. Papers have been searched within the Business Process Management Journal by keywords related to the term digital transformation. Selected papers have been analyzed according to the topic, type of publication, year of publication, keywords, etc. The results reveal a growing number of papers published on the topic of digital transformation to the Business Process Management Journal, but the lack of case studies. This paper contributes to the extension of academic literature in this important, yet insufficiently researched, scientific field that creates the bond between two strong concepts of digital transformation and business process management.

Keywords—Business process management, digital transformation, digitalization, process change.

I. INTRODUCTION

NOWADAYS, in the age of digital business, more and more questions are being asked about the linkage between the changes in business caused by digitization. Such questions and the potential answers provided on this subject result in an increasing number of papers, mostly appearing in scientific literature in the field of economics and information technology (IT).

Continuous technological development and organizational changes that occur as a result of the implementation of new technological achievements bring benefits at the same time, but also the challenges and the risks on which organizations need to be prepared to react in due time.

Today's business is impossible to imagine without computers, internal and external networking, access to social networks for advertising purposes, use of IT that supports fast and efficient storage, processing and analysis of business data

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etc. Any implementation of a new digital solution into business will entail organizational changes, and these may relate to the organizational mission, vision, goals, culture and identity as well as its structure and processes [6], [4]. Therefore, digital transformation of the organization must be observed as an integrated technological and strategic change in crucial business processes, which will have effect on the final business value [49]. Considering that the business process management (BPM) approach is dealing with business process design, analysis, management, improvement and their initiation [9], the goal of this paper is to contribute to a scientific field of literature which explores connection between BPM and digital transformation.

Hence, this paper is formed as follows. The short theoretical part of the BPM and digital transformation is conferred in the second section. The third section describes the methodological part of this paper through the conducted literature review of the selected scientific field. Next, the results of the conducted literature review process are presented and discussed in the fourth section, and finally, conclusions, limitations and recommendations for further research in this field are given.

II. THEORETICAL BACKGROUND

A. Business Process Management

Confronting with today's unpredictable market, every organization wants to accomplish its business operations more efficiently and fulfill its clients' needs and requirements as quickly as possible. Today's competitive environment has a specific impact on the organizational performance and its sustainability, demanding organizations to use BPM approach due to improved comprehension of the existing and advanced development of new business processes [36]. Therefore, in order to be successful in a market, an organization must efficiently manage its business processes. According to the [26], by monitoring and controlling business processes within the organization, its performance can be also managed.

The concept of BPM has been extending for quite a long time across the different managerial and technological research fields, but its importance in scientific and practical circles has not been diminished over time. Its foundations have emanated on the development of the concept of Total Quality Management (TQM) that has emerged in 1949. In research circles, BPM has experienced the greatest flourish in the 2000s [12], [56]. According to [54], after 40 years of seeking a link between the organization and organizational processes, strategy, structure, technology and environment, the trigger for research in the field of BPM was in the unstable and constantly developing economic environment that has

demanding the adjustment of business processes to advance organizational efficiency.

BPM can be defined as enhancement of business process with the purpose of achieving preeminent business results for the organization, as well as greater business value for its customers [18]. Such advancement in business processes can be observed through the various results of business operation progress as reducing business operations errors, lessening costs, abbreviating time for the accomplishment of business tasks, etc. [18].

Through the years, BPM has been described and defined by various scientific and practical experts. It has also been connected and got through different managerial and technological themes, such as the above-mentioned TQM concept, Balanced Score Card (BSC), and various IT and process frameworks etc. [46]. By virtue of the technological innovation market, in today's business operation, BPM can be found in concepts of social, mobile, smart, adaptive and agile technologies, as for e.g., today's most notable BPM impelled by technologies for business analytics [46].

B. Digital Transformation Era

Technological innovations, a new way of doing business by competitors, creating and introducing new business models in organizations, are one of the key factors influencing the transformation of business processes [28]. Except the transformation of business processes, these factors also have an impact on the organizational structure, since the management in each organization is responsible for initiating digital transformation [43], [49]. Some of the main questions that an organization needs to consider before going into the process of digital transformation, are questions regarding new technology that it will be using in the whole process as well as which business fields need to be transformed, in what order, and in which way, as well as, what are the crucial changes that need to be conducted [28].

Looking at the term of digital transformation from the widest point of view, it can be described through different changes which can be projected in any part of the life of humans and which have been fostered by availing new digital technologies [51], [11]. In a closer look at this concept from the standpoint of different organizations, digital transformation is defined as a process of business transformation provoked by implementing new technology for the purpose of lining up business processes, strategies, business activities with structures (organizational and technological) contemporaneously enhancing organizational resilience and dexterity as well as inciting quicker adjustment to suddenly altered external condition [10], [29], [30].

According to many authors, a successfully conducted project of the digital transformation in the organization can be a dependable recipe for achieving better organizational performance [58], [23], [11], [21], [47], [40].

For each organization it is very important to go digital at the right time for appeasing their customers' requirements, establishing new cooperation with business partners and catching up with demanding competition. Therefore,

organizations are motivated to put new technological innovations at the center of their business operations, modify their existing business models or adopt completely new ones with the purpose of successfully completing their digital transformation journey [49]. The process of digital transformation cannot be considered as a short-term journey, since it demands lots of time to adapt to new business conditions as well as facing with arising problems that may imperil such organizational project [60], [49].

Except for the new technology affecting the successful conduction of the digital transformation project, each organization has to take into account its process performance [31]. Process performance is sustained by existing integral information systems, the organizational structure (supporting new digital changes), digital "mindset" as well as digital skills [31]. Moreover, the importance of digital transformation alignment with other concepts such as innovation management, change management, and talent development should also be pointed out [31].

III. METHODOLOGY

The aim of this paper is to show the connection between the digital transformation and the BPM and contribute to the literature extension of this scientific field that examines the potential relation between named two concepts. Hence, the systematic literature review has been chosen and conducted as a preferred and convenient research method to support the above stated goal of the paper. In this literature review, a quantitative approach based on bibliometric analysis of the papers within one chosen journal, has been adopted.

The literature review process has been conducted on April 23th, 2019 within the selected BPM Journal. The chosen journal is one of the most recognizable journals in the area of BPM and within academic research circles. The strategy of conducting literature review has emanated from an interest for finding papers related to the topic of digital transformation that have been published in the one of the most recognized journals dealing with BPM as a main topic of interest. In order to identify the target journal, a search of Web of Science (WoS) database has been conducted.

Namely, the keyword "business process management" has been used for searching WoS and the analysis of source titles for the search results has been performed. A total of 2,230 documents have been found as a result of searching mentioned keyword among recorded topics. Out of the total search results, 174 records have been found in *Lecture notes in Computer Science*, 157 records within *Lecture notes in business information processing*, while 144 records have been published within the BPM Journal. Having in mind that the first two sources are lecture notes (i.e. book series), the BPM Journal is the publication with most works published from the field, and therefore has been selected for conducting the literature review for the purpose of this study. Another confirmation of that selection comes from the fact that the second journal with the most published BPM-related papers is the Business Information Systems Engineering Journal, which has only 30 BPM papers published, which is 111 papers less

than the BPM Journal. Fig. 1 presents the results of the analysis of WoS source titles with corresponding number of published BPM-related studies.



Fig. 1 WoS source titles and number of BPM related studies [57]

Inclusion criteria comprised of selected keywords related to digital transformation. According to [49], the most related and used keywords in conducted literature review similar to the one in this paper are:

1. digital transformation
2. digital business
3. digitalization
4. Industry 4.0

Although the definition of the term digitalization is not completely the same as that of digital transformation, and it only represents its alternative [49], the fear of losing some of the potential papers for further analysis has meant that digitalization as a keyword has not been excluded. Therefore, this literature review has been framed by the four selected keywords. Furthermore, there has not been any research restrictions considering time of publications. In Table 1, the criteria and corresponding restrictions for this systematic literature review are presented. The conducted literature review search process resulted with the identification of a total of 33 papers.

TABLE I
 RESTRICTIONS OF CONDUCTED LITERATURE REVIEW IN BPM JOURNAL

Criteria	Restrictions
Time	No restrictions - 2019
Language	English
Keywords	Digital transformation
	Digital business
	Digitalization
	Industry 4.0
= Total of 33 papers	

IV. RESULTS AND DISCUSSION OF FINDINGS

Conducted literature search resulted in 33 papers for further analysis and discussion. All of the papers have been published in the BPM Journal and written in English.

Taking 33 papers into consideration, further analysis has been made based on the frequency of keywords appearing in each paper, established on the formerly defined four keywords for this search process. Results show that the most common keyword used within most of the papers is the “business process management”, as was expected. Other keywords that are most commonly used after the term “business process management” are “supply chain management”, “big data”, “process management”, “digital technologies”, “simulation” and many others which are presented in the Fig. 2. Moreover, the font size of the keywords within the keyword cloud, as presented by Fig. 2, is correlated with the frequency of usage of a certain keyword within the selected 33 papers, i.e., the bigger font size represents more frequent usage than those words in a smaller font size.



Fig. 2 Keyword cloud. Source: Authors’ work based on [19]

Since the type of the document has not been one of the search restrictions, analysis of different types of the documents that have resulted in the conducted literature search process has been made. The type of the documents that have been found during the literature search process are research papers, conceptual papers, case studies, literature review, viewpoint and non-defined articles.

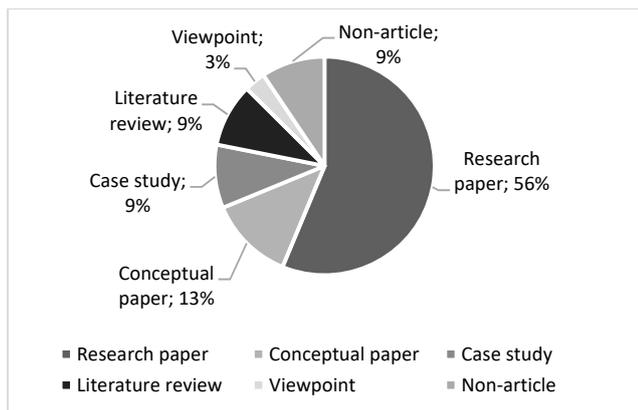


Fig. 3 Structure of publications related to digital transformation published in BPM Journal. Source: Authors' work based on [19]

Fig. 3 presents the structure of publications related to digital transformation which have been published in the BPM Journal. It is noticed that research papers related to digital transformation are the ones that are mainly being published in the BPM Journal, with a share of 56% in the total number of observed documents.

Since it has been expected that connection between BPM and digital transformation is in its early beginnings, it is noticed that papers focused on this theme have been mainly published in last few years. The results reveal that number of papers published in 2018 have greatly increased after a long period of stagnation, which lasted for 10 years (2003–2017), in this research field. In 2018, 55% of the total observed papers have been published, 12% in 2019, 6% in 2017 and only 3% in each year from 2010 to 2016. The periods of stagnation and the increase of the published papers, during the period between 2003 and 2019, is shown in Fig. 4.

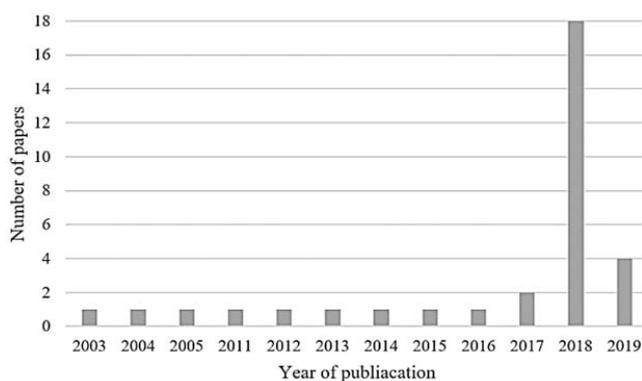


Fig. 4 Publication span 2003-2019. Source: Authors' work based on [19]

Considering the country from which each author came from, analysis of the authors' "source-country" has been made. This analysis revealed that most authors of the observed papers are from Italy, United Kingdom (UK), United States of America (USA), Germany, France and China. First place belongs to Italy as the country which has the most authors, at 19% of the USA with 12%. Authors from Bahrain, Cyprus,

Indonesia, Norway, Sweden and the United Arab Emirates (UAE) each contributed to the publishing of the observed papers with 1% of the total number of authors. The number of authors within each country for all of the 33 observed papers is shown by the Fig. 4.

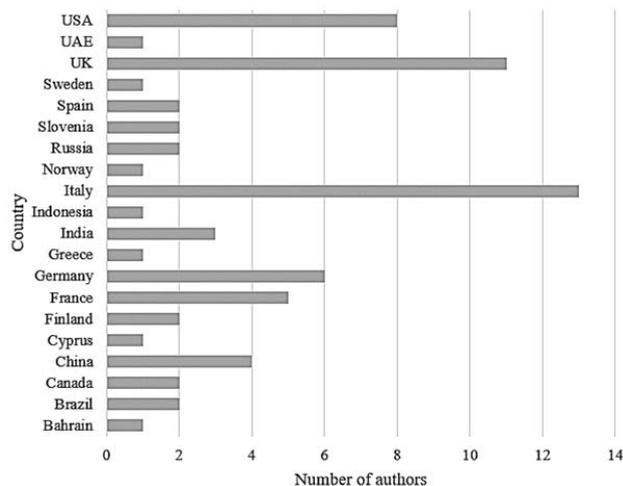


Fig. 5 Number of authors by country. Source: Authors' work based on [19]

Next, an analysis of each paper has been made. For that purpose, an analysis of the keywords usage has been performed. Each paper has been examined for the appearance of the four already mentioned keywords which have been used in the literature search process. First, an analysis of the frequency of keywords within all papers has been made. According to the results, the keyword "digital transformation" has been used 92 times in total of the 33 observed papers, while the term "digitalization" has been used 41 times, "Industry 4.0" has been mentioned 17 times and "digital business" has been found only 4 times in total. The frequency of keywords in the 33 observed papers is presented in Fig. 6.

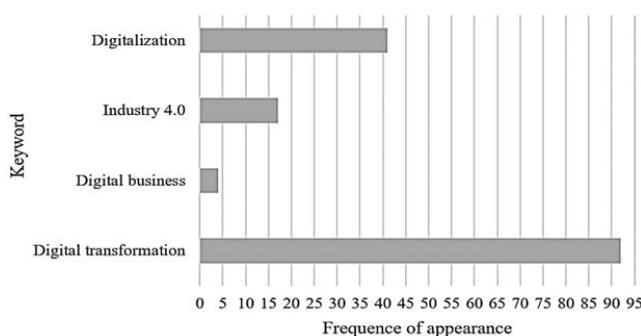


Fig. 6 Frequency of keywords appearance. Source: Authors' work, 2019

An analysis of used keywords with the regard of each part of the paper in terms of content (e.g. Title, Abstract, Keywords, Introduction, Theoretical part, Methodology, Results, Discussion, Conclusion, References, Cited by) has been performed and is presented in Table II. The analysis revealed that most of the found papers (42.4%) contain one of

the four observed keywords within their reference list, which is not strange since it is expected that the authors would rely their studies on the papers related to the digital transformation and related keywords. Furthermore, 39.4% of the observed papers have used at least one of the observed keywords within

the theoretical part of the paper, while 30.3% of papers used them within paper introduction and discussion. On the other hand, only two papers had one of the observed keywords within their titles, while four papers stated them as the keywords of the paper.

TABLE II
KEYWORD ANALYSIS THROUGHOUT OBSERVED PAPERS

Paper ID/reference	Title	Abstract	Keywords	Introduction	Theoretical part	Methodology	Results	Discussion	Conclusion	References	Cited by
P01 [1]					DT (1); DGZ (1)					DGZ (1)	
P02 [2]	I4.0 (1)	I4.0 (3)	I4.0 (1)	DT (4); I4.0 (5)	DZ (1); I4.0 (14)	I4.0 (1)	I4.0 (2)	I4.0 (3)		DT (1); I4.0 (7)	
P03 [3]					DGZ (1)						
P04 [5]		DT (1); I4.0 (3)	I4.0 (1)	DT (1); I4.0 (1)	DT (3); I4.0 (2)	DT (1)	DT (12)		DT (17)	DT (1); I4.0 (2)	
P05 [7]		DGZ (1)	DGZ (1)	DB (1); DGZ (5)	DGZ (1)				DT (3); DGZ (5)	DT (2); I4.0 (1)	
P06 [8]				DGZ (1)							
P07 [14]								DT (2); DGZ (1)			
P08 [15]					DT (2); DGZ (1)					DB (1)	
P09 [17]					DGZ (2)					DGZ (1)	
P10 [20]		DB (1)									
P11 [22]						I4.0 (1)				DT (1); DGZ (1); DB (2)	
P12 [24]	DT (1)	DT (3)		DT (2)	DT (1)	DT (6)	DT (10)	DT (6)		DT (1)	
P13 [25]						DGZ (1)					
P14 [16]											I4.0 (2)
P15 [27]								I4.0 (1)			
P16 [32]								I4.0 (1)			
P17 [33]				DT (1)				DT (3)		DT (1)	
P18 [34]					DT (1)						
P19 [35]					I4.0 (1)					I4.0 (2)	
P20 [37]						DGZ (2)			DGZ (6)	DB (1)	
P21 [38]		DGZ (1)		DGZ (1)							
P22 [39]		DGZ (1)		DGZ (1)							
P23 [41]									I4.0 (5)	I4.0 (2)	
P24 [42]									DB (1)		
P25 [44]				I4.0 (2)					I4.0 (1)		
P26 [45]								DGZ (1)			
P27 [48]									DT (1)		
P28 [13]								DGZ (2)			
P29 [50]					DGZ (1)						
P30 [52]					DB (1)						
P31 [53]								DGZ (1); I4.0 (1)			
P32 [55]								DT (1)		I4.0 (1)	
P33 [59]			DT (1)	DT (1)	DGZ (1)					DB (1)	

Source: Author's work, 2019

Note: Following abbreviations have been used for keywords: DT=Digital transformation, DB= Digital business, DGZ= Digitalization, I4.0=Industry 4.0; numbers in the brackets represent the appearance frequency

V. CONCLUDING REMARKS

By conducting literature review in one of the most recognized publications in the field of BPM, BPM Journal, using search keywords related to digital transformation, this paper has been focused on a quantitative bibliographical analysis of given literature search results. The search process resulted in 33 papers in which at least one of the search keywords related to digital transformation has been mentioned

in some part of the text. The keyword analysis revealed that most of the papers contain at least one of the observed keywords within the reference list, followed by a theoretical part, introduction and discussion.

According to the results of the analyses of the number of papers published in the BPM Journal per year, the publication of works related to digital transformation achieved significant growth in 2018; until then, this field has been mostly

neglected. The analysis showed that most of the papers published in the BPM Journal have used the term “digital transformation” with the greatest frequency, while “digital business” has been the least used keyword in the 33 observed papers. It has also been revealed that most of the published authors originate from Italy, UK and USA.

Although this paper yields some interesting results, there are limitations that need to be perceived. Namely, the presented literature review has been only focused on the quantitative approach of analyzing the selected papers while a detailed content analysis has not been conducted at this point. Therefore, future research plans include expansion of this study in terms of additional and detailed qualitative analysis of the content of the papers.

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