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**Hanna Khaba***Ph.D. Student, Department of Marketing***Lyubov Sygyda***Ph.D., associate professor, Department of Marketing***Anastasiia Nazarenko***Student, Department of Marketing**Sumy State University**(Sumy, Ukraine)***BIBLIOMETRIC REVIEW OF BUSINESS-PROCESSES DIGITALIZATION**

*This study aims to analyze and systematize the scientific background concerning the impact of digitalization on business processes transformation. For achieving this goal, a bibliometric analysis of scientific articles was conducted. The research period is 2000-2020. The initial data for the study were formed based on the analysis of 1290 scientific articles indexed in the scientometric database Scopus. The authors applied the VOSviewer software instruments to analyze the panel data. According to the results of the theoretical study, the most prominent scientists, impactful scientific journals, the contribution of countries, and the role of financial sponsors in the development of the research issue were identified. Based on the obtained results, further research directions in the digitalization of business processes were determined.*

Keywords: digitalization, business processes, COVID-19, bibliometric analysis, business transformation.

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**Statement of the problem in general form and its connection with important scientific or practical tasks.** The rapid development of digital technologies requires the business sector to adapt its processes to new conditions. Digital development influences all business processes such as finance, marketing, logistics, production, etc. Because of the mentioned above, the demand for research in this field is growing. In turn, the snowballing growth of publication activity requires its systematization to determine the most prosperous research directions, identifying the scientific schools, the most prestigious journals, and authors' contributions depending on the country, affiliation, etc.

**Analysis of the latest research and publications, which initiated the solution of this problem and on which the author relies.** Systematization of literary sources showed that many domestic and foreign scientists devote their work to studying digital development's impact on changes in the economy. Herewith it stands to mention the study [22; 5]. The authors analyzed how digitalization influences the working climate in the communication process between different generations. In turn, the role of digital devices in developing the online economy was considered in the studies [31; 1; 8]. Notably, scientists Zhghenti T. and Chkareuli V. highlighted the necessity to increase technological awareness among society to overcome digital mistrust. The role of investment management in digital transformation was considered in the studies [3; 20; 2; 4].

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Notably, Mirdamad M. concluded that implementing innovative investment tools in business activity boosts digital transformation. Many studies were devoted to investigating the relationship between digital transformation and government policies [11; 12; 21; 24; 32].

Following Table 1, it is clear that the considerable research attention is devoted to investigating the development of Industry 4.0. Thus, three of the ten most cited articles [9; 26; 17] were addressed the industrial revolution. Remarkably, the scientists Ivanov D., Dolgui A., and Sokolov B. considered the impact of digitalization on supply chain risks. In turn, Sommer L. checked the SMEs' readiness for digital transformation. Gomber P., Koch J.-A., and Siering M. [6] described the future development of the finance sector under digitalization. In turn, in the studies [19; 30; 10; 13], the authors developed scenarios for economic growth under the digital influence.

Therefore, due to a wide range of scientific papers devoted to digital transformation, this study aims to give the research insights to prepare the business sector for deepening the digital transformation and strengthening the business process.

**Table 1 – The most cited articles devoted to digitalization in business, 2000-2021**

N <sub>o</sub>	Title	Author(-s)	Journal	Year	Cited by
1	The impact of digital technology and Industry 4.0 on the ripple effect and supply chain risk analytics	Ivanov, D., Dolgui, A., Sokolov, B.	International Journal of Production Research	2019	341
2	Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal	Warner, K.S.R., Wäger, M.	Long Range Planning	2019	167
3	Industrial revolution - Industry 4.0: Are German manufacturing SMEs the first victims of this revolution?	Sommer, L.	Journal of Industrial Engineering and Management	2015	160
4	A time-based blended learning model [18]	Norberg, A., Dziuban, C.D., Moskal, P.D.	On the Horizon	2011	160
5	Digital Finance and FinTech: current research and future research directions	Gomber, P., Koch, J.-A., Siering, M.	Journal of Business Economics	2017	158
6	Managing for Political Corporate Social Responsibility: New Challenges and Directions for PCSR 2.0	Scherer, A.G., Rasche, A., Palazzo, G., Spicer, A.	Journal of 12Management Studies	2016	149
7	Tackling the digitalization challenge: How to benefit from digitalization in practice	Parviainen, P., Tihinen, M., Kääriäinen, J., Teppola, S.	International Journal of Information Systems and Project Management	2017	147
8	The role and impact of industry 4.0 and the internet of things on the business strategy of the value chain-the case of Hungary	Nagy, J., Oláh, J., Erdei, E., Máté, D., Popp, J.	Sustainability (Switzerland)	2018	142
9	Securing e-Government and e-Voting with an open cloud computing architecture	cloud computing architecture Zissis, D., Lekkas, D.	Government Information Quarterly	2011	128
10	Digitalization Capabilities as Enablers of Value Co-Creation in Servitizing Firms	Lenka, S., Parida, V., Wincent, J.	Psychology and Marketing	2017	126

Sources: systemized by the authors based on [25]

**Highlighting the previously unresolved parts of the general problem to which the article is devoted.** The current economic development is characterized by snowballing growth of information. There is a deep penetration of digital technologies into all life spheres. Figure 1 shows the constantly growing tendency of search requests "digitalization" worldwide. It stands to mention that the start of search interest was in 2013, while in 2021, it increased by 4.6 times. The rapid digital penetration provokes the transformation of the business processes. As a result, the business sector needed to invest more in analyzing the impact of digital development on the changes in demand, behavior, motives, and preferences of consumers, etc.

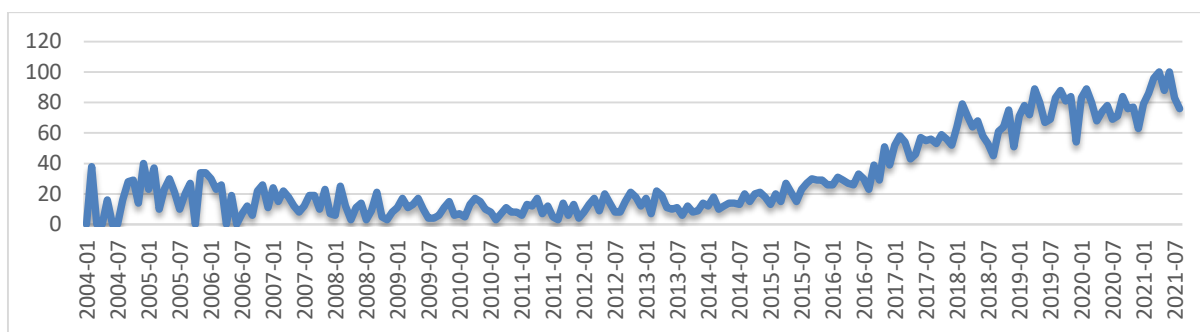


Figure 1 – The dynamics of search request "digitalization", 2004-2021

Sources: developed by the authors based on [7].

Systematization of scientific articles devoted to digitalizing business processes indicated the snowballing publication activity for 2000-2021. In turn, Figure 2 shows that the sharp growth of such articles in the Scopus database was in 2015. Notably, the number of scientific articles in 2020 increased by approximately 18 times compared to 2015. Moreover, as of August 2021, the number of investigated articles passed the previous year's value. Thus, it could be assumed that the COVID-19 pandemic has significantly boosted the research interest in the digitalization influence on the business process worldwide.

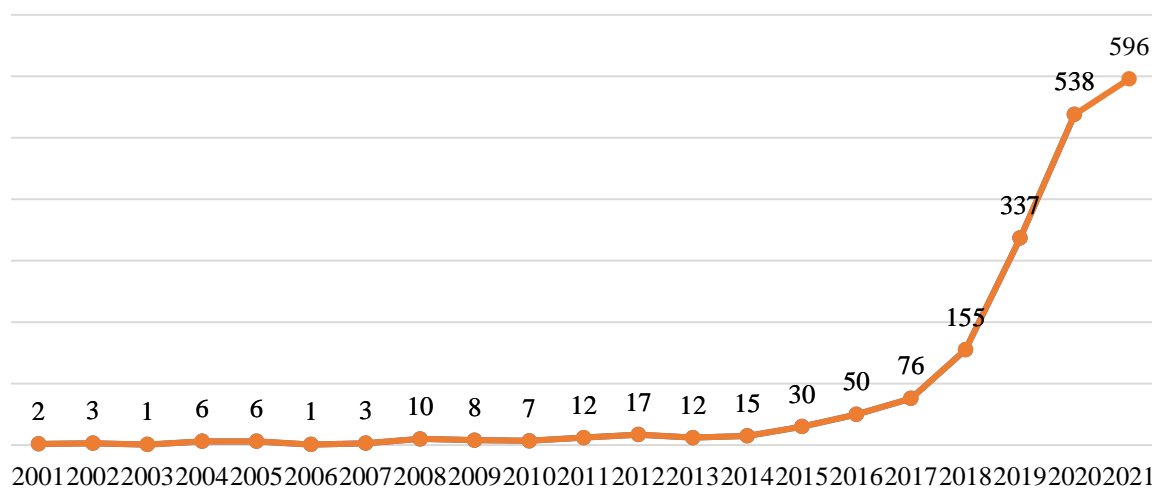


Figure 2 – Dynamics of publication activity regarding the digitalization in business, 2000-2020

Sources: developed by the authors based on [25].

Based on the rapid growth of scientific publications devoted to the digitalization of business processes, it is relevant to conduct the bibliometric analysis of the most qualitative

articles presented in the scientometric Scopus database to determine the most prominent research directions regarding the investigated topic.

**Formulation of the purpose of the article (statement of the problem).** This study aims to analyze the present scientific background that addresses the digitalization of business processes to determine the general scientific direction in this field. This study was conducted in the following logical sequence for bibliometric analysis of the scientific knowledge discussed the digitalization of a business process. At the first stage, the most relevant articles indexed in the Scopus database were selected. The relevant publications were searched by the "digitalization" and "business process" in the titles, abstracts, and keywords to create the study sample. To improve the findings, the boolean operators "AND" and "OR", as well as proximity operator "\*" were applied. The obtained results were limited to three subject areas: 1) Business, Management and Accounting; 2) Social Sciences; 3) Economics, Econometrics and Finance (Table 1). The study period is 2000-2020. The language of publication is English. The type of documents is articles. Thus, the study sample was created with 1290 articles. At the second stage, the descriptive analysis was applied for the most cited articles. The stage provides the determining the scientific directions in the digitalization of business processes. Then, the author's network analysis was built to identify the most productive authors and their contributions in developing the investigated issue.

**Statement of the main material of the research with full justification of the scientific results obtained.** Figure 3 shows that the scientists from Russian Federation most contributed to the investigation of business process digitalization (204 scientific articles). In turn, in the second place are the scientists from Germany – 170 articles, then UK – 86 articles, Finland – 85 articles, Sweden – 83 articles. Notably, Ukraine placed 13<sup>th</sup> place, while the number of issued publications devoted to the investigated theme is 38.

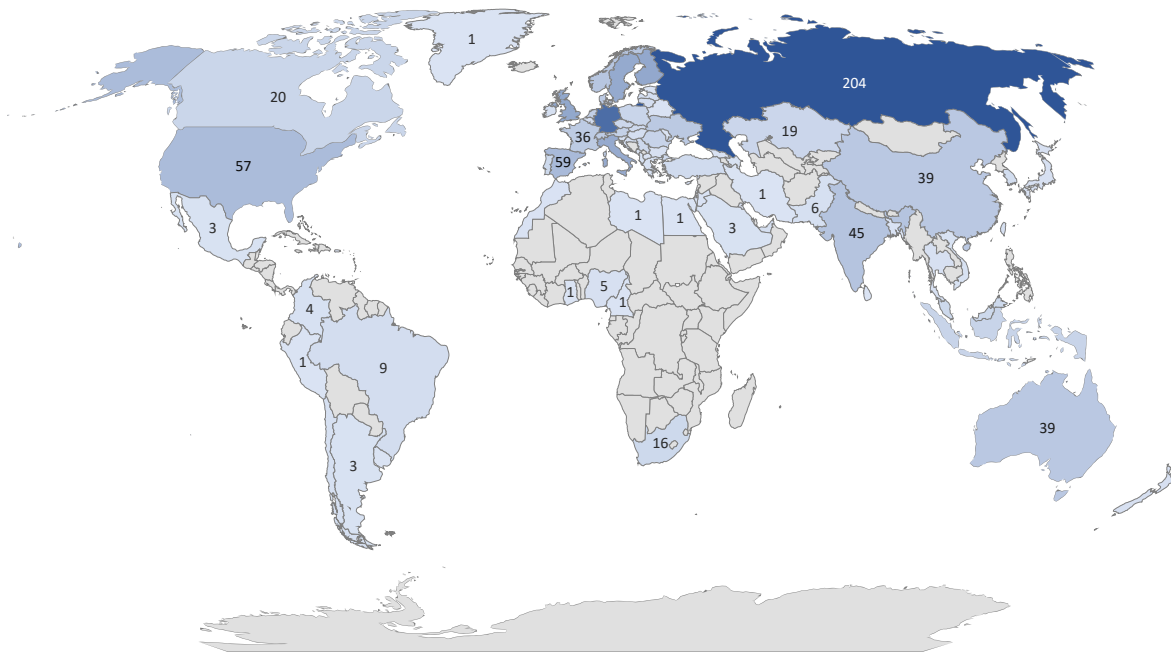


Figure 3 – Countries productivity by the number of published articles addressed to business process digitalization

Sources: developed by the authors based on [25].

In turn, it is worth analyzing the co-authorship between scientists worldwide to determine the existence of particular scientific schools investigating the business process

digitalization. In this case, the VOSviewer software was applied [29; 27; 28]. The co-authorship analysis by countries with limitation criteria of a minimum of 15 articles per country allowed building the network map (Figure 4). This map consists of 29 items (countries) grouped by 4 clusters, which indicate the close collaboration between the scientists. The clusters are visualized with a specific color.

Therefore, the most significant red cluster links 9 countries. Notably, this cluster combines mostly EU countries. Thus, there is a strong collaboration between Germany, the USA, Finland, Austria, Denmark, Netherlands, Norway, Sweden, and Switzerland. Notably, the most productive were the scientists from Germany. They published 170 articles in co-authorship. The second green cluster combines 8 countries, primarily East European and Asian countries, viz: Ukraine, Serbia, Romania, Slovakia, Czech Republic, Kazakhstan, Russian Federation, and China. The third blue cluster identifies the collaboration between India, Indonesia, UK, Australia, Malaysia, and Spain. The fourth cluster demonstrates the strong research relationship between Canada, France, and Italy. At last, the fifth cluster shows the cooperation between the Polish, Portuguese, and South African scientists.

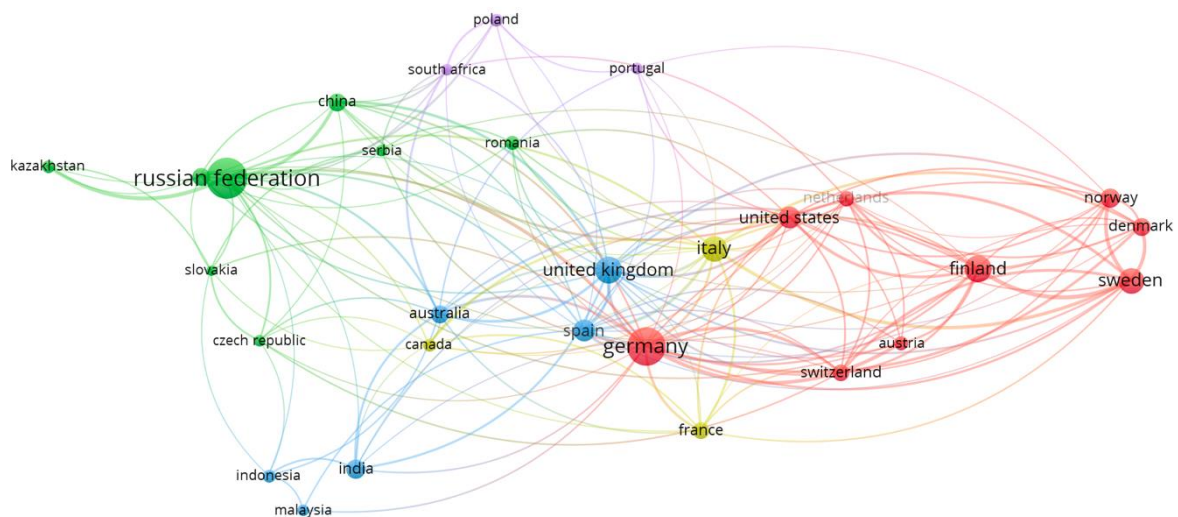


Figure 4 – Co-authorship network map

Sources: developed by the authors based on [25] using VOSviewer software.

On the other hand, the most influential scientist in developing the research on business process digitalization are Parida Vinit from Luleå tekniska Universitet in Sweden (Table 2). The author published 11 articles in co-authorship. It stands to mention that scientists from Kazan Federal University (Russian Federation) have a substantial impact on developing the scientific background in investigating digitalization business processes. The most prominent authors are Gapsalamov Almaz (6 articles), Vasilev Vladimir (6 papers), Akhmetshin Elvir (5 papers), and Bochkareva Tatyana (5 papers). At the same time, Gebauer Heiko from Linköpings Universitet (Sweden) and Kohtamäki Marko from Vaasan Yliopisto (Finland) published five articles per author in the investigated research area. Based on the authors' h-indexes, Gebauer Heiko (38), Parida Vinit (33), and Akhmetshin Elvir (30) mainly contributed to science development.

Table 2 – The most productive scientists in the researched area, 2000-2020

Author name	Affiliation	Country	No. of papers	Total no. of papers	h-index
Parida Vinit	Luleå tekniska Universitet	Sweden	11	117	33
Gapsalamov Almaz	Kazan Federal University	Russian Federation	6	25	8
Vasilev Vladimir	Kazan Federal University	Russian Federation	6	30	11
Akhmetshin Elvir	Kazan Federal University	Russian Federation	5	129	30
Bochkareva Tatyana	Kazan Federal University	Russian Federation	5	14	7
Gebauer Heiko	Linköpings Universitet,	Sweden	5	94	38
Kohtamäki Marko	Vaasan Yliopisto	Finland	5	85	28

Sources: developed by the authors based on [25]

Table 3 shows that most articles (54 papers) were published in the high impactful Switzerland journal "Sustainability Switzerland". Besides, the UK journal "International Journal Of Supply Chain Management" has issued 24 papers, Indian "International Journal Of Recent Technology And Engineering" and "International Journal Of Scientific And Technology Research" – 17 and 15 articles (respectively), the USA journal "Technological Forecasting And Social Change" and Canadian "International Journal Of Criminology And Sociology" – 11 papers per source.

Table 3 – The top-10 journals by the number of publications, 2000-2020

No	Source title	No. of articles	Country	CiteScore 2020	h-index/Q
1	Sustainability Switzerland	54	Switzerland	3.9	85/Q1
2	International Journal of Supply Chain Management	24	United Kingdom	1	17/-
3	International Journal of Recent Technology and Engineering	17	India	0	20/-
4	International Journal of Scientific and Technology Research	15	India	0.2	18/-
5	Technological Forecasting and Social Change	12	United States	12.1	117/Q1
6	International Journal of Criminology and Sociology	11	Canada	0.3	6/Q2
7	Quality Access to Success	11	Romania	1.6	21/Q3
8	Industrial Marketing Management	9	United States	8.8	136/Q1
9	Technology Innovation Management Review	9	Canada	0.4	2/Q4
10	Entrepreneurship and Sustainability Issues	8	Lithuania	7	25/-

Sources: developed by the authors based on [25]

As was found above, the most productive scientists were from Russian Federation. However, Table 4 demonstrates that most of the issued research was financed by European Commission grants (37 papers). Then, the Russian Foundation for Basic Research financed 33 articles. It is appropriate to indicate such funding sponsors as Bundesministerium für Bildung und Forschung, Horizon 2020 Framework Programme, European Regional Development Fund, National Natural Science Foundation of China, and Deutsche Forschungsgemeinschaft. These foundations financed at least ten papers from 2000-2020. Therefore, they mainly contributed to developing the research regarding business process digitalization.



To determine the main research direction in business process digitalization, this study involved the co-occurrence analysis using the VOSviewer software. Under the limitation criteria of a minimum of 7 keyword co-occurrences, 114 met this threshold. Thus, Figure 5 demonstrates five clusters that indicate the vectors of research directions. The biggest yellow one covers 35 items showing the intense research interest in investigating the impact of information technologies on business development. The scientists primarily focused on small and medium enterprises. Besides, the issues of sustainable development and circular economy were considered.

The second green cluster is designed with 27 items that indicate the research interest in the industrial revolution – Industry 4.0. The scientist devoted special attention to e-business development, fintech, big data development under globalization. Moreover, the changes in marketing, management, and regulation came to the fore. The third blue cluster determines the research in investigating the business process development under the COVID-19 restrictions. The particular focus is on the tourism sector [12], education, labor market, and digital economy. The fourth red cluster shows the research direction towards studying business model innovations, development of digital platforms, blockchain [23], and Internet of Things (IoT). At last, the smallest orange cluster indicates the research of digital transformation's impact on the public sector and culture.

**Conclusions from this research and prospects for further developments in this area.** This study presents the bibliometric analysis findings regarding the impact of digitalization on business process changes. The obtained results indicated that the business process digitalization is a multidisciplinary issue. The obtained results showed that the COVID-19 pandemic caused the snowballing scientists' interest in the digitalization issue. Based on the above findings, it could be concluded that the most prosperous research directions are the studies that addressed the digitalization of education, labor, and tourism sectors. In turn, special attention should be paid to investigating the digital platforms, blockchain, IoT, and the impact of digitalization on changes in culture and the public sector. Therefore, it is essential to conduct additional marketing research to investigate the changes in consumer behavior.

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#### **Цифровізація бізнес-процесів: бібліометричний аналіз.**

*Метою даного дослідження є аналіз та систематизація наукового доробку щодо впливу цифровізації на розвиток бізнес-процесів. Для досягнення поставленої мети проведено бібліометричний аналіз наукових напрацювань, присвячених досліджуваній тематиці. Періодом дослідження обрано 2000-2020 роки. Вихідні дані для дослідження були сформовані на основі аналізу 1290 наукових статей, представлених у наукометричній базі даних Scopus. Для аналізу панельних даних авторами використано інструментарій програмного забезпечення VOSviewer. За результатами проведеного теоретичного дослідження визначено найбільш продуктивних науковців, перспективні наукові журнали, вклад країн, а також роль фінансових спонсорів у розвитку досліджуваного питання. Враховуючи отримані результати, авторами схарактеризовано напрямки подальших досліджень у сфері цифровізації бізнес-процесів.*

*Ключові слова: цифровізація, бізнес-процеси, COVID-19, бібліометричний аналіз, трансформація бізнесу.*

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