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Digitalization and Economic Growth: A Bibliometric Analysis

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Abstract

The Digital Economy (DE) has significantly impacted the global economy. This paper presents a bibliometric analysis to explore the impact of digitalization on economic growth, covering literature from 2008 to 2024 sourced from the Scopus database. It aims to map the intellectual contours and evolution of research within economics, econometrics, finance, business, management, accounting, and environmental studies. The study identifies key themes, influential works, and authors by employing advanced data mining, visualization, and analytical techniques while highlighting theoretical and empirical underpinnings that connect digitalization with economic expansion. The analysis discerns a scholarly trajectory from the foundational role of digital technologies in economic development to a nuanced understanding of digitalization's interplay with sustainability and specific innovations like blockchain and Industry 4.0. The recent focus emphasizes integrating digital growth with sustainable development goals, indicating a shift towards examining the environmental impacts of digital advancements. This comprehensive overview charts the dynamic shifts in scholarly focus and underscores the significance of interdisciplinary approaches in navigating the complexities of digitalization's effects on economic growth, offering a roadmap for future research directions.

Keywords: *Digital Economy, Bibliometric Analysis, Sustainability, Economic Growth.*

Introduction

The Digital Economy (DE) has become the cornerstone of the transformation of the global economy. Throughout the past decades, several evolved concepts, such as development, productivity, and innovation, have been seen as the main drivers for economic growth (Bakhsh et al. 2024). In this regard, DE was introduced with the opportunity to catalyze these concepts for a paradigm shift of the new industrial global economy. The rapid increase of digital technology development has opened the door for redefining the boundaries of industries, altered consumer behavior, and unveiled new avenues for eco-nomic growth (Elshaiekh et al. 2023, Han et al. 2023).

The impact of digitalization on economic growth has attracted significant attention and investigations over the last few years, where several critical areas across different contexts were highlighted. Previous research reveals that digital infrastructure, access, and readi-ness are pivotal in determining economic outcomes. Furthermore, Studies show that digi-talization boosts GDP growth, labor productivity, and competitiveness through digital skills, ICT indicators, and e-commerce. In countries with robust digital infrastructure, like those in ASEAN and parts of Europe, digital technologies have strengthened productivity, reduced labor costs,

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and enhanced market efficiency. However, growth remains uneven globally due to disparities in digital access, often called the "digital divide." This gap is especially pronounced in regions where digital infrastructure and individual engagement with digital tools are limited, thereby constraining economic benefits. Moreover, develop-ing economies have shown that investing in digital readiness and infrastructure can sig-nificantly enhance economic resilience and sustainability, providing promising growth taking into account integration and prioritizing the digital inclusion policies (Aleksandrova et al. 2022).

Previous bibliometric analyses have provided insights to predict trends and prominent themes on the impact of DE. For example, a previous study used bibliometric tools to map over 10,000 articles from 2015 to 2022 in DE research. It identified blockchain, sharing economy, and digital business as the main clusters of interest, indicating the rapid growth in areas like management, economics, and business technology (Ahmad et al. 2022). Simi-larly, Doroiman conducted a comprehensive bibliometric review focusing on digitalization trends, identifying cluster areas like automation, employment, growth, and dynamic ca-pabilities, emphasizing the interdisciplinary nature of digitalization (Doroiman 2022).

Although the impact of digitalization on economic growth has captured the scholarly attention of exploring its implications across diverse socio-economic settings, previous work has been limited to capturing a specific narrative of the topic's complex and interdis-ciplinary nature. This resulted in fragmented yet valuable findings on the impact of digi-talization on economic growth. For example, previous studies gauged DE from techno-logical innovation, market dynamics, policy frameworks, and socio-economic and how these factors can impact economic growth (Benhamou 2016, Dyatlov et al. 2018, Malevskaia et al. 2018). This scatter of research efforts creates a significant challenge of hampering the ability to draw a cohesive conclusion and formulate comprehensive strategies to harness digitalization's full potential for economic growth.

Hence, we seek to integrate the evidence investigating how digitalization influences economic growth across different contexts and what coherent themes, trends, and gaps can be identified from the bibliometric analysis of the extant literature. At the same time, our motivation is to unravel the complexities of the relationship between digitalization and economic growth through a rigorous bibliometric analysis of the extant scholarly corpus. Our work aims to methodically explore the link between digitalization and economic growth by conducting a bibliometric analysis of relevant literature covering the period from 2008 to 2024. To achieve this purpose, we map the intellectual structure of the fields of ("Economics, Econometrics and Finance," "Business, Management and Accounting, and environmental studies") by tracking the evolution of key themes. This will enable us to capture the most influential works and authors and to uncover the theoretical and empirical ground works that have led to our current understanding of the DE's impact on economic growth. Therefore, this study aims to articulate a clear narrative of how digital transformation is a lever for economic expansion and development.

To achieve the objective, we followed a bibliometric analysis strategy using the Scopus database, which employs advanced data mining, visualization, and analytical techniques to explore a large dataset of academic articles, conference papers, and reviews. We also carefully selected a variation of key terms to include various facets of the DE and economic growth to identify the citation patterns, co-authorship networks, thematic clusters, and temporal trends. We chose this strategy to construct a panoramic view of the research landscape, highlighting seminal works, emerging themes, and scholarly dialogues that have defined the discourse on digitalization and

economic growth over the last sixteen years. The results of this study will offer a holistic amalgamation of the scholarly narrative about the impact of digitalization on economic growth through mapping the evolution of research themes and identifying gaps in the literature. In addition, this study will create a foundational basis for future scholarly inquiries, determine unanswered questions, and suggest future direction for research about this topic.

Methodology

In the first step, we established a corpus by searching for the work on DE's impact on economic growth using the SCOPUS database. Due to this, all analyses related to outside citation counts also only relate to work compiled in SCOPUS. The key reason behind using the SCOPUS database is that it possesses an advanced and large multidisciplinary database of peer-reviewed literature in the social sciences (Schotten et al. 2017). More-over, the SCOPUS database is widely recognized and used in BDA quantitative analyses (Parlina et al. 2020). To assess the adopted terms, we only relied on keywords, and the search filter was filled with the following keywords: "DE," OR "Digitalization" OR "Digital Transformation" OR "Economic Digitalization" OR "Digital Innovation.") AND ("Economic Growth" OR "Economic Development" OR "GDP Growth" OR "Economic Expansion" OR "Growth Economics"). We also covered the years from 2008 to February 2024 and only targeted "Article,""" "Conference Paper,"" and "Review" that are fully pub-lished in "Economics, Econometrics and Finance, """ "Business, Management and Ac-counting,"" and "Environmental Science."""" The search revealed 517 articles to be in-cluded in our corpus. As outlined before, our corpus covered 3 time periods: from (2008-2018) with 26 work, from (2019-2021) with 110 work, and from (2022-February 2024) with 381 work. The copious included a broad range of data from SCOPUS, in-cluding article bibliographic details, citations, keywords, and abstracts.

In the following, we delve into the patterns of scholarly communication and thematic developments of the corpus by the following steps. In the first step, we employed the free VOS viewer for bibliometric mapping techniques to conduct a keyword co-occurrence analysis. Second, we set the minimum number of occurrences of a keyword at 10 to identify the 117 most repetitive keywords out of 2771. This threshold was chosen to maintain the focus on the targeted keywords and to allow for a comprehensive visual exploration of the data. Third, we also set the function of the co-occurrence analysis, which relies on author keywords for a nuanced capture of the research themes. Finally, Full counting methods were chosen to equal the weight of each keyword regardless of the number of keywords in a given article and to avoid the dilution of prevalent themes.

In addition, we also utilized the free Orange 3 text mining software for visualization, world cloud creation, and data analysis. This software is a powerful AI tool for dealing with corpus with big data. The "Preprocess Text - Orange" widget was first tokenized using a regex pattern to identify word boundaries; then, the English stop words were removed to filter out commonly occurring words with minimal semantic value. Fur-thermore, we apply a document frequency filter that excludes tokens that appear in less than 10% and more than 90% of documents to refine the data. Finally, we activate the option for part-of-speech tagging to retain only nouns and verbs considered the most relevant for the analysis. Finally, we used the free publish or perish 8 to assess the re-search impact and citation data over the 16 years of our study from 2008 to 2024.

This study followed two main strategies for bibliometric analysis. The first strategy is to separate the analysis into two main sections: context analysis and content analysis of the data. The second

strategy is to separate the data into three main periods, from 2008 to 2018, to map the intellectual structure of the fields at their infant stage. The following period is between 2019-2021 to cover the development in the field during one of the world's main events, namely, COVID-19. Finally, we aimed to map this field from 2022 and afterward 2022-February/2024.

Results and Discussion

Context Analysis

The Publish or Perish citation metrics from 2008 to February 2024 to analyze the dataset were used in this study. The tests in Table 1 revealed a compelling narrative about the academic traction on the impact of DE on economic growth. The annual output of research amounts to 517 papers over 16 years, which indicates a sustained engagement in the field with this topic. Notability: The annual average of 487.13 citations indicates an impressive result that indicates high attention to this topic. In addition, the substantial citation count of 7794 shows the relevance and influence of this topic within the academic discourse. The average citations per paper of 15.40 also indicate a moderate to high impact for each publication produced in this field.

The collaboration coefficient average of 3.29 authors reflects the interdisciplinary nature of DE research, which requires diverse expertise to brief this complex topic. Further, the h-index of 46 and the g-index of 75 both indicate that DE's role in growth is gaining rapid interest; this is evident by the large number of papers that are frequently cited, and those that are mostly cited are influential and important in shaping followed research. The annual h-index of 1.56 and hA-index of 29 indicate a consistent addition of impactful research year on year and that the individual authors' contributions are widely recognized. Moreover, the citation distribution on different thresholds shows an impressive impact. 346 papers have been cited at least once, and 47 papers have been cited 20 times or more. This shows a long tail of impact over a broad range of studies within the corpus.

Metric	**Value**
Publication Years	2008-2024
Citation Years	16 (2008-2024)
Papers	517
Citations	7794
Cites/Year	487.13
Cites/Paper	15.4
Authors/Paper	3.29/3.0/2 (mean/median/mode)
h-index	46 (a=3.68, m=2.88, 4751 cites=61.0% coverage)
g-index	75 (g/h=1.63, 5733 cites=73.6% coverage)
hI,norm	25
hI,annual	1.56
hA-index	29
Age-weighted citation rate	3790.37 (sqrt=61.57), 1299.62/author
Papers with ACC >=	1,2,5,10,20 (acc1=346, acc2=275, acc5=166, acc10=93, acc20=47)

Table 1. Research Impact Metrics Summary (2008-2024)

Source: Compiled by the authors using results generated by Publish or Perish software.

Table 2 explores the annual publication and citation structure covering the study's period. The table also offers a longitudinal analysis of research productivity and influence. In 2008, the dataset indicated a modest inception with only one publication recorded, i.e., (Nadia Carmen CIOCOIU; Catalin Razvan DOBREA 2008). This is expected for a growing stage as this year did not accrue any citations, nor did it contribute to the h-index. Advancing to 2010, there is a noticeable moment with a cumulative total of two publications, one of which garnered an impressive 71 citations with an average citation per publication of 35.50, i.e., (Billon et al. 2010). These works can remark the beginning of the h-index at 1.

Moving to the years up to 2014, the dataset shows that the topic of DE's impact on economic growth has witnessed a gradual increase in research output and citations. The year 2016 showed that the cumulative publications rose to six, with an annual citation impact peaking at 47 for that year and a marginal h-index growth. Moreover, 2017 recorded a slight increase in total publications and a decrease in total annual citations, suggesting a potential shift in research focus or saturation. The 2018 results are essential for the DE and economic growth topic. The total annual publications jumped to 17, amassing 270 citations for the year and significantly elevating the h-index to 15. This rise indicates an increasing interest in the maturation of the research domain. The pattern of growth persists through 2019 even though the citations per paper begin to stabilize. Subsequently, the following years of 2020 and 2021 have marked a zenith in citation activity, with total citations per year cresting at 1275 and 1381, respectively. This indicates that the following years have witnessed a thriving research trajectory regarding this topic. Nevertheless, there is a visible efficiency in citation impact as it appears to reach an equilibrium.

In 2022, the research activity reached a new apogee with 125 publications within the year and a cumulative total of 261 publications. The total citations for 2022 are significant, however, the average citations per paper show a slight decline. This suggests a diversification in research topics or varying degrees of research impact may occur. The year 2023 was characterized by a significant increase in total annual publications to 223, doubling the previous year's output. Despite this increase, there is a notable contraction in both the total citations for the year and the citations per paper, which may indicate a saturation point or a shift in citation practices. Finally, the year 2024 presents a truncated view up to February, with 33 publications adding to the cumulative total.

Year	TP	CTP	TC	TCP	TC/CTP	TC/TCP	h-index
2008	1	1	0	0	0.00	0.00	0
2010	1	2	71	1	35.50	71.00	1
2014	2	4	14	2	3.50	7.00	2
2016	2	6	47	1	7.83	47.00	1
2017	3	9	28	3	3.11	9.33	3
2018	17	26	270	17	10.38	15.88	15
2019	16	42	226	15	5.38	15.07	15
2020	36	78	1275	31	16.35	41.13	31

2021	58	136	1381	47	10.15	29.38	29
2022	125	261	2510	110	9.62	22.82	22
2023	223	484	1535	151	3.17	10.17	10
2024	33	517	8	6	0.02	1.33	1

Note: **TP:** Total Publications per Year, **CTP:** Cumulative Total Publications, **TC:** Total Citations per Year, **TCP:** Total Cited Publication per Year, **TC/CTP:** Citations per Paper, **TC/TCP:** Citations per Cited Paper, **h-index:** Yearly h-index, indicating the maximum number h such that h publications have at least h citations each.
Source: Compiled by the authors using results generated by Vosveiwer software.

Table 2. Annual Publication and Citation Structure from 2008-February 2024.

Table 3 shows a dynamic shift in scholarly attention as reflected in the publication frequencies within key journals over sixteen years. The first period from 2008 to 2018 shows that the journal' Sustainability (Switzerland)' emerges as a notable platform with 11 citations. Meanwhile, 'Technology in Society' showcases a singularly high number of citations, amounting to 71, which indicates an emphasis on the interplay between tech-nology and societal issues during this period. Other journals, such as 'Environmental Science and Pollution Research' and 'International Journal of Environmental Research and Public Health' do not present any publications that show that DE's impact on eco-nomic growth was yet to develop interest in their specific domains within this timeframe.

Later, the second period, from 2019 to 2021, showed a seismic shift in publication patterns. 'Sustainability (Switzerland)' witnesses an incredible increase to 554 citations, indicating an intensified scholarly focus on sustainability issues that perhaps mirrors the global urgency of sustainable development goals. Similarly, 'Environmental Science and Pollution Research' and 'Ecological Economics' show substantial engagement with 285 and 451 citations, respectively. This shift exhibited an intensified academic response to integrate DE within the environmental challenges and their economic implications, es-pecially regarding growth. 'Energy Economics' also emerges as a key journal with 393 citations, which reflects a growing scholarly discourse on the economic aspects of energy consumption and policy.

Finally, the last period covering 2022 to February 2024 shows that the journal' In-ternational Journal of Environmental Research and Public Health' has witnessed an ex-traordinary rise to 619 citations. This increase may suggest a possible surge in health-related environmental research amidst global health concerns marked by the COVID-19 era. 'Environmental Science and Pollution Research' continues its prominent route with 521 citations, while 'Technology in Society' maintains a steady stream of output with 265 citations. Interestingly, journals such as 'The Journal of Environmental Management' and 'Science of the Total Environment,' which had no citations in earlier periods, now record 368 and 337 citations, respectively.

Source Title	**2008-2018**	**2019-2021**	**2022-February 2024**
Sustainability (Switzerland)	11	554	532

Environmental Science and Pollution Research	0	285	521
International Journal of Environmental Research and Public Health	0	8	619
Technology in Society	71	158	265
Ecological Economics	0	451	2
Energy Economics	0	393	107
Technological Forecasting and Social Change	0	117	260
Journal of Environmental Management	0	0	368
Science of the Total Environment	0	0	337
Resources Policy	0	0	180

Table 3. Top 10 Journals by Citation Counts from 2008 to February 2024

Source: Compiled by the authors using results generated by Vosveiwer software.

Table 4 reveals a significant shift in global research focus towards the DE. This in-dicates the dynamic nature of the academic influence and the evolving priorities of countries in this domain. For instance, China's exponential rise in citation counts from 44 to 2921 characterizes its aggressive push to lead in DE research. Such findings reflect the broader strategic ambitions of China and its significant influence globally (Xia et al. 2023). The substantial rise in citations and focus on China, could be a subject for further research for understanding the impact of the DE on economic growth. On the other hand, countries like Germany and Italy experienced fluctuations suggesting a changing re-search outlook and possibly a shift in their national strategies or global interest in their work.

The Russian Federation has consistently explored the DE over the years, which has captured Pakistan's attention in the latest phase. Countries like Spain, Taiwan, the United States, Sweden, and the United Kingdom have contributed moderately to the DE con-tribution.

The analysis reveals the interactive contribution of many aspects, such as techno-logical innovation, economic policy, and international collaboration, to driving global research on the DE. Furthermore, it indicates dynamic changes in academic focus, geo-political influences and country priorities. It highlights the vital role of a socio-economic matrix of the nations in the outcomes of digital economic growth.

Country	**2008-2018**	**2019-2021**	**2022-February 2024**

China	44	975	2921
Germany	0	520	9
Russian Federation	154	182	29
Pakistan	0	11	268
Spain	71	137	39
Italy	0	240	0
Taiwan	0	103	85
United States	0	104	53
Sweden	0	121	0
United Kingdom	0	24	88

Table 4. Total Citation Counts for the Top 10 Countries Across Three Time Periods: 2008-2018, 2019-2021, and 2022-February 2024

Source: Compiled by the authors using results generated by Vosveiwer software.

Context Analysis

The analysis reveals four main keyword clusters in the same context. The results show the role of the DE in economic growth as the first theme within the technological inno-vation scope, e.g., (Wang et al. 2023).

The cluster of topics "artificial intelligence," "electronic commerce," "Big Data," and "internet of things" points to a growing field centered on new technologies that boost economic growth in the DE, e.g., (Rieder et al. 2022) These results highlight the para-mount role of technological innovation in the DE. Cutting-edge technologies and inno-vation significantly contribute to the transformation of various industries (Gong et al. 2023). Such contributions of advanced technologies elevate productivity and facilitate the development of new business models and operations, nurturing economic growth (Tang 2024).

The second cluster is themed as a scientific research program on the impact of the growth of DEs, where researchers describe the progression of scientific knowledge via an array of theoretical advancements. Hence, the cluster contains terms like "agglomeration," "economic development," "economic aspect," "panel data," and "spatiotemporal analysis," which points to supporting hypotheses about the core assumptions of DE (Ren et al. 2022).

The third cluster represents sustainable and alternative energy in the DE. Keywords like "carbon dioxide and emissions," "alternative energy," and "renewable energy" have dominated the cluster, indicating the significant interest of researchers in exploring the inputs of sustainable and alternative energy in the DE, taking into account the integration of green technologies and renewable energy in building and strengthening digital infra-structure, e.g. (Gong et al. 2023). This cluster emphasizes the vital role of green technology and sustainability considerations in the advancement and evolution of the DE and the imperative of environmentally friendly practices and technologies.

Regional economic growth was the focus of the final theme in the cluster. Key terms such as "environmental policy," "Asia," "human and human capital," and "innovation" highlight the role of human capital and innovation within a regional setting, e.g. (Zenina et al. 2017). A

tremendous body of knowledge is created, primarily in Asia, about human capital for innovation in economic growth. This cluster may explore the different strate-gies taken by various countries to leverage digital transformation.

The four clusters suggest a scholarly consensus that the DE's growth is multifaceted, with critical emphases on technological innovation, economic methodology, sustainability, and regional development. The clear potential for progress in this field can be achieved by examining the interconnectivity between clusters, for example, exploring how technological advancements in AI and big data (Cluster 1) influence sustainable practices in energy use (Cluster 3), leading to growth, furthermore, how the empirical findings from economic development studies (Cluster 2) are shaping policy and innovation in different regions (Cluster 4). These more profound insights into the synergies and trade-offs that characterize digital economies can further contribute to sustainable and inclusive economic growth.

The frequent use of a keyword can provide insight into the dominant themes in the field of DE and its intersection with economic growth. Accordingly, the most frequently occurring keywords, such as "economic development," "DE," "China," "economic growth," and "innovation," with their respective average citations, indicate the research community's strong emphasis on these areas.

Hence, we observe that the concept of "economic development" has acquired the highest occurrences (298) and a substantial average citation count (14.0604). This suggests that economic development is a central theme in the discourse on the DE. The term "DE" closely follows with 294 occurrences and an average citation count of 12.8912. Notably, China's prominent role in this research domain is evident, with 236 occurrences and a high average citation rate (16.8347). Thus, this result confirms our prior content analysis, where China has been considered the main contributor in this field in recent years. This also reflects the impact of China's rapid digital transformation and its influence on global economic development.

"Innovation" is another widespread term intrinsically linked to the DE. The high average citation count (18.8137) reinforces the narrative that innovation is a critical driver in the digital transformation of economies. In addition, "digitalization" is among the most cited keywords, which suggests that the digitalization process is a significant point of interest and debate within the literature. The presence of "economic and social effects," "digital transformation," and "sustainable development" reflects the multifaceted impact of the DE, encompassing not just economic factors but also social and environmental dimensions.

From these findings, it is evident that the scholarly dialogue is robust around the transformative potential of the DE, with a particular focus on its implications for eco-nomic development, growth, and innovation, especially within the context of China's emerging digital landscape. This implies a consensus on the DE as a lever for economic progress, where digital technologies act as catalysts for innovation and sustainable de-velopment. The data also suggests a rich interplay between technological advancements and socio-economic outcomes, a dynamic likely to shape future research trajectories in this field.

Research Trend from 2008 to February 2024

As outlined previously, our corpus covered 3 time periods: from (2008-2018) with 26 work, from (2019-2021) with 110 work and from (2022-February 2024) with 381 work. To capture the development of DE impact on growth through time.

Phase 1: From 2008 to 2018

The recognition of digital technology characterized this period as a trigger of eco-nomic change and its impact on growth and development (Billon et al. 2010). The word cloud was prominent by keywords like "DE," "growth," and "development" as central themes. During the early period, the emphasis was on the overall development and expansion of the DE (Demidenko et al. 2020). Furthermore, the presence of words like "information," "technology," "industry 4," and "internet" indicate a significant em-phasis on the technological catalysts of the DE, like Industry 4.0 and Internet technolo-gies. In addition, terms such as "management," "market," "innovation," and "competition" suggest a focus on the digitalization economic attributes such as including market dy-namics (Shokhnekh et al. 2018), management strategies (Tovma et al. 2018), and innova-tion in competitive environments (Malevskaia-Malevich and Leonov 2018). The broader societal consequences, governance, and sustainability concerns associated with the DE were considered in research and reflected by the presence of words like "labor," "gov-ernance," "policy," and "sustainability" (Sarker et al. 2018). (Figure 1)

Figure 1. Keywords' Word Cloud From 2008 To 2018.

Source: Compiled by the authors using results generated by Orange 3 software.

These results represent the initial phase of the research corpus and the emerging attention of DE research. In that period, the research was primarily exploratory and fo-cused on exploring the outlines and frameworks of the DE and its potential economic outcomes. Terms such as "DE," "growth," and "development" were prominent and re-flected an academic curiosity about the broad expected role of digitalization in economic areas. In addition, emphasis on technological contribution as a sign of economic change was highlighted in the period through the dominance of words like "information," "technology," and "internet".

Concurrently, terms like "management," "market," "innovation," and "competition" highlighted a rising curiosity and expanded interest in the economic mechanisms of digitalization. Moreover, the broader societal implications of the DE were reflected through the availability of the terms "labor," "governance," "policy," and "sustainability," keywords indicate recognition of advanced approaches that extend beyond basic eco-nomic metrics.

Phase 2: From 2019 to 2021

From 2019 to 2021, the research interest was expanded to include specific technologies such as "blockchain," "ICT," and "Industry 4.0," and a remarkable transition to "sus-tainability." This indicates a level of maturation and advanced knowledge where re-search has transitioned from general concepts to specific digital innovations that benefit economic growth while considering their environmental impact (Zhou et al. 2021). Besides this, terms like "digital," "economic," "economy," and "digi-talization" along with terms such as "Growth," "development," and "transformation" are all pointing to a strong interest in how digitalization is driving economic develop-ment and transformative changes across industries and the ongoing focus on the DE (Subramaniam et al. 2021). The significance of "innovation" alongside "management" and "business" also indicates a concentration on how innovation is managed and inte-grated within business practices (Bahlooq et al. 2020, Mamphiswana and Bekele 2020). (Figure 2).

Figure 2. Keywords' Word Cloud from 2021 To 2021.

Source: Compiled by the authors using results generated by Orange 3 software.

As shown above, a significant shift in academic research and focus has been shown by moving to 2019-2021, which is aligned with the COVID-19 pandemic. The growing interest in specific technologies like "blockchain," "ICT," and "Industry 4.0," with a rising interest in "sustainability," indicates a maturation of DE research. The corpus also reflects a twofold focus: an ongoing interest in the impact of digitalization in enhancing eco-nomic development and transforming industries and the vital involvement and en-gagement of sustainability in this advancement. Similarly, the appearance of "innova-tion," coupled with "management" and "business," conveys research interest in unravel-ing the interactive relationship between innovation within digitalization, business prac-tices, and operational agility in a volatile period.

Phase 3: From 2022 to February 2024

The most recent period's research trends demonstrate a deep dive into the transfor-mative effects of digitalization with a strong emphasis on environmental sustainability. The results reveal a trend towards aligning digital economic growth with sustainability, evident by the growing interest in terms like "sustainability," "green," "carbon," and "energy." Such results point to a maturated interest in moving from general concepts to digging deep into the utilization of digital

innovation for economic benefits, considering the environmental impact (Huang et al. 2023) (Martínez et al. 2022). Moreover, the in-teractive nature of digital technologies with environmental sustainability and energy ef-ficiency is illustrated through growling, focusing on terms like “digital,” “economy,” “green,” “carbon,” and “energy.” Furthermore, terms like “innovation,” “digitalization,” “technology,” and “transformation” indicate ongoing interest in driving transformative changes in several fields from advanced technologies (Fang et al. 2022, Marcon et al. 2022, Yakovlev 2023). On the other hand, terms like “spatial,” “regional,” “growth,” “devel-opment,” and “environmental” indicate the role of economic and environmental con-siderations and emphasize regional development and spatial dynamics within the DE (Zhong et al. 2022) (Figure 3).

Figure 3. Keywords’ Word Cloud from 2022 To February 2024.

Source: Compiled by the authors using results generated by Orange 3 software.

These results indicate that up to February 2024, the research consensus towards aligning DE growth with sustainable development goals was apparent. The DE research is marked by a soaring rise of interest in "sustainability," "green," "carbon," and "energy." These findings demonstrate an academic response toward the genuine involvement of environmental considerations in economic growth. Furthermore, the integration of terms such as "spatial," "regional," "environmental," "growth," and "development" highlights a research trend that bridges digital economies with ecological and spatial dynamics. This connection is critical, as it points to the academic research interest in combining geo-graphical and environmental heterogeneities embarrassed by digitalization. It empha-sizes that digitalization is not isolated but critically evaluated for driving sustainable and inclusive economic growth.

This research asserts that a comprehensive and interdisciplinary approach is essential to capture digitalization's full potential and ensure that the DE is inclusive and sustain-able in the global economic landscape.

Conclusions

In conclusion, this bibliometric analysis has thoroughly highlighted the evolving landscape of

research on the DE and its impact on economic growth from 2008 to Febru-ary 2024. Examining 517 publications across 16 years has revealed the growing and ex-panding interest in this field and the dynamic shifts in focus that characterize scholarly inquiry.

Our findings confirm that the DE is increasingly recognized as a crucial driver of economic growth, centralized with technological innovation at its core. Early research revealed a basic understanding of the DE's aspects and its broad growth and develop-ment implications. As the field matured, the focus increased and shifted to specific technological innovations like blockchain, ICT, and Industry 4.0, alongside a growing interest in sustainability, reflecting efforts to align economic advancement with envi-ronmental stewardship.

The analysis has also highlighted the significant role of China in this analysis, with its rapid digital transformation providing a case study and a catalyst for global discourse. The research corpus highlights the digitalization approach of China, which could serve as a model for harnessing the DE's potential to drive economic growth. Moreover, the re-search trajectory up to 2024 spotlights exploring the interplay between digitalization and sustainability. The increased focus on terms like "green," "carbon," and "energy" indicates research interest in integrating digital economic practices with sustainable development goals, which is an essential consideration in the era of climate change.

The conclusion drawn from the bibliometric data suggests an increasingly interdisci-plinary field, with collaborations across various domains pointing to the complexity of the DE. The academic community has shown adaptability and responsiveness to global challenges, as seen in the shifts in thematic focus in response to events such as the COVID-19 pandemic, highlighting the DE's role in resilience and recovery.

The DE is a critical area of research in light of the extensive citation counts and the depth of engagement in the literature. The scholarly community should build on the existing corpus by further exploring the effects of digitalization across different economies and the harmonization of digital growth with ecological and societal well-being.

The areas of investigation are manifold. Future research should continue integrating insights from various disciplines, such as environmental science, sociology, and urban planning, with economics and business studies. This interdisciplinary approach is crucial for understanding the DE's complex socio-economic and environmental dynamics. In addition, sustainability has emerged as a key theme in the DE and development. Thus, exploring how digital technologies can contribute to sustainable development goals is a heated subject currently related to economic growth.

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